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Content

Prologue

The International Conference on Public Economics and Administration has been organized by members of the Department of Public Economics of the Faculty of Economics of the VSB – Technical University of Ostrava in two-year cycles since 1995. This year's 15th edition of the conference takes place on September 5, 2023 in the premises of the VSB – Technical University of Ostrava.

The conference creates space for the presentation of new findings in the field of public economics and management from the research of scientists, academics and practitioners.

This collection summarizes contributions that are focused on the presentation of research results in the field of public economics and administration. The international character of the proceedings is given by the representation of the contributions of experts from Slovakia, Poland, Hungary and the Czech Republic.

The papers registered at the conference were subjected to peer review and the conference proceedings contain 41 peer-reviewed papers. Peer review of contributions focused on scientific contribution, application of appropriate research methods, evaluation of conclusions etc. Reviews were conducted by members of the scientific committee of the conference and other experts.

The issue of public economy and administration is undergoing a series of changes within the changing economic conditions of the current period, changes in connection with computerization etc., which place demands on relevant research. The collection brings new knowledge about this issue, which is important not only for applications, but also for the development of theoretical knowledge.

The importance of the collection is given by the fact that it presents a wide range of new findings related to the functioning of the public economy and administration, which are intended for the further development of the public economy and administration, and are applicable in practice, but can also be used for the further development of scientific knowledge, for teaching or the focus of students' diploma theses, as well as the exchange of scientific knowledge at the international level.

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Evaluation of Psychiatric Care Indicators in the EU Countries

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Abstract: In recent years, mental health has become a subject of increasing interest in public health. In the European Union, mental health care has become one of the priorities of European health policy. As the population begins to realize the meaning and importance of mental health in terms of quality of life and work productivity, there is a growing effort to strengthen policies and strategies that are aimed at improving mental health, and thus also at improving psychiatric care. The paper is focused on the issue of evaluation of psychiatric care because a quality and affordable system of psychiatric care is the goal of every developed European country. The outcome of the research and its contribution is a comparison and evaluation of the state of psychiatric care in selected countries of the European Union in the period 2016 - 2020. To calculate the results, the multi-criteria method Weighted Sum Approach is applicated. The research confirmed the differences of the state of mental health systems in the countries of the European Union. The most affordable and high-quality psychiatric care was found in Germany, Belgium and Netherlands while the worst state of psychiatric care was confirmed in Spain, Poland and Ireland.

Keywords: European Union, psychiatric care, WSA method

JEL Classification: I10, I18, A13

1 Introduction

Although mental health is an important part of overall well-being, it has long been a neglected area of public health (Hook and Bogdanov, 2021) or (Höschl, Winkler and Pěč, 2012). In recent years, however, there has been a growing recognition of the importance of this topic, and European Union (EU) member states and EU institutions are beginning to take concrete measures to improve it, see European Union (2022) or WHO (2021). EU governments and politicians are increasingly aware that investment in mental health can have significant economic benefits, not only in terms of healthcare savings, but also in terms of increased productivity and improved social outcomes (Campion and Knapp, 2018) or (WHO, 2023).

According to WHO (2021) being mentally healthy means having the ability to self-actualize, be able to relate to others, participate in public life, and be productive at work. Poor mental health than can significantly affect the course of a person's entire life. Many studies report that the mental health situation of population is worsening in Europe. Winkler and Janoušková (2013) state, that there is an increasing burden due to mental illnesses and an increase in its share in the total burden for all diseases in the countries of the European Union in recent period. This trend than accelerated even more in connection with the period of the COVID-19 pandemic in 2020-2022 (Europa, 2023). Young et al. (2022), OECD/EU (2020) or Aliev et al. (2023) state that the COVID-19 pandemic and the subsequent economic crisis have had a negative impact on the mental health and satisfaction of the population, which is evidenced by higher levels of stress and the prevalence of anxiety and depression and worsening of the condition of people who have suffered from the diagnosis before. Young people and people with lower incomes are considered to be the most at-risk groups. According to OECD/EU (2022), almost half of young Europeans feel that they are not receiving adequate mental health care. In addition, the proportion of young people reporting symptoms of depression more than doubled during the pandemic, in several EU countries (Eurostat, 2023) or Castelpietra (2022).

The paper deals with the evaluation of the state of systems of psychiatric care in the countries of the European Union. The mental health care system represents the composition, functioning and organization of individual components covering the sphere of services, financing, education, prevention, research and legislation (Winkler and Janoušková, 2013). Approaches and policy applications of EU countries vary widely in this area. Nevertheless, affordable and high-quality psychiatric care is a priority of every developed country. Initiatives in this area are covered mainly by the European Union and OECD through strategic documents and evaluations in EU countries, see European Commission (2005), European Union (2022), OECD/EU (2022), Eurostat (2023) or WHO, see WHO

(2018), WHO (2021) and WHO (2023). In the Czech Republic, some authors are engaged in research in the field of psychiatric care, for example Dlouhý (2014), Höschl, Winkler and Pěč (2012), Winkler et al. (2013), Winkler and Janoušková (2013) or MZČR (2023). However, Eastern European countries have been rather overlooked in mental health research and practice initiatives in the past (Forsman et al., 2014) and were considered less advanced in this area (Krupchanka and Winkler, 2016). For this reason, it is necessary to pay attention to the evaluation of the implementation of the psychiatric care system in the Czech Republic in the international context of European countries.

The aim of the paper is the evaluation of the state of psychiatric care in the EU member countries in terms of quality and affordability on the basis of selected psychiatric care indicators for the period of five years from 2016 to 2020. The research is based on the application of selected methods of multi-criteria evaluation of variants. For the purposes of this research, hypothesis H1 was formulated:

H1: The state of the psychiatric care in the Czech Republic is evaluated as above-average among EU member countries in the period under review.

The premise of this hypothesis is the finding that the Czech Republic is rated as a country with above-average affordable and quality healthcare within the EU countries, see Ardielli and Bémová (2021).

The contribution of the research is an evaluation of the quality and availability of psychiatric care in individual countries of the European Union, a comparison of the achieved values of selected indicators of the Czech Republic and the countries of the European Union, and the identification of good practice applied in better rated countries.

1.1 Psychiatric Care in EU Policies

Because of the enormous burden due to mental illness and due to its gradual recognition, since the beginning of the 21st century, the field of mental health has received more intense political attention, see Aliev et al. (2023).

There are registered huge inequalities in the state of mental health within the member states of the European Union. For example, suicide statistics range from 3.6 cases per 100,000 population in Greece to 44 cases per 100,000 population in Lithuania, the highest rate in the world. The shares of financial resources allocated to mental health within the health budgets of individual member states also differ significantly (European Commission, 2005).

In 2001, the World Health Organization (WHO) focused on mental health in its flagship publication "The World Health Report". This publication, which has been devoted to current health topics every year since 1995, has provided a detailed view of mental health issues (WHO, 2001).

In 2005, a conference on the same topic was held in Helsinki, which followed the World Health Report of 2001. At this conference, a program called "Mental Health Global Action Programme" was developed. Its main goal is to implement the recommendations contained in the WHO report from 2001 (Panchartková, 2007).

In 2005, the European Union together with all the countries of the European region of the World Health Organization (WHO) agreed on two important documents. The first of these is the Mental Health Declaration for Europe, which expresses their common commitment in the field of mental health. The second document is the Mental Health Action Plan for Europe, which sets out specific measures and strategies for improving mental health in the European region (WHO, 2015). These documents aim to strengthen cooperation and coordination in the field of mental health between member states and strive for better care and support for the mental health of European citizens.

Also in 2005, the European Union published its strategic document on mental health, known as the Green Paper. This document represents a significant advance in the development of the European Union's mental health policy. The Green Paper provides analysis and suggests measures to improve mental health care and reduce negative perceptions associated with mental disorders (Winkler et al., 2013).

The Sixty-sixth World Health Assembly in May 2013 then adopted the WHO Comprehensive Plan of Action on Mental Health 2013–2020. In 2019, the action plan was extended until 2030. Furthermore, in 2021, the seventy-fourth World Health Assembly approved updates to the action plan, which included a revision of the plan's implementation options and indicators (WHO, 2023).

Policies and services addressing mental health are the responsibility of individual EU countries, however the European Commission has been supporting efforts in the field of mental health by initiatives promoting mental health care in Europe, funding research projects and supporting campaigns aimed at improving citizens' mental health (Europa, 2023).

The European Commission has launched in December 2021 the "Healthier together – EU non-communicable diseases (NCD) initiative" (European Union, 2022) to support EU countries in identifying and implementing effective policies and actions to reduce the burden of major NCDs and improve citizens' health and well-being. The initiative covers the 2022-2027 period and includes 5 strands, one of them is mental health and neurological disorders (Europa, 2023).

2 Material and Methods

The aim of the presented paper is to evaluate the state of psychiatric care in the EU member countries on the basis of selected psychiatric care indicators for the period of five years from 2016 to 2020 by usage of selected multicriteria evaluation method - WSA. For the purposes of this research, hypothesis H1 was formulated:

H1: The state of the psychiatric care in the Czech Republic is evaluated as above-average among EU member countries in the period under review.

The research is based on the usage of methods of multi-criteria evaluation of variants, which are used for modeling of multicriteria decision making tasks (Jablonský, 2002). There are a number of methods for multi-criteria evaluation of variants, which are based on different principles. Among the most used are the AHP, ELECTRE, PROMETHEE, WSA or TOPSIS method. Multi-criteria evaluation methods are very suitable for solving problems when decisions are made according to several decision criteria and these criteria are not in agreement with each other. i.e. a variant that is best evaluated according to one criterion is not usually best evaluated according to another criterion (Kampf, 2002) or (Žáček, 2015). The usual goal of multi-criteria decision-making is to select one of the set of assessed variants, or to sort the variants according to their advantages according to given preferences, see the application in Ardielli and Bečica (2018), Coronicova Hurajova and Hajduova (2021) or Ardielli (2020).

2.1 Model and Data

An important method of multi-criteria evaluation is the WSA method (Weighted Sum Approach) which has been applied in the presented research. The advantage of the WSA method is relatively easy processing and fast calculation. The ranking according to this method does not differ significantly from the average (Triantaphyllou, 2000) or (Tzeng and Huang, 2011). WSA method is based on the construction of a linear utility function on a scale from 0 to 1. The worst variant according to the given criterion will have a utility of zero, the best variant will have a utility of one, and the other variants will have a utility between the two extreme values, see Brožová, Houška and Šubrt (2003) and Jablonský (2002).

The total utility of the variant is expressed by the weighted sum of the values of the partial utility functions; see formula (1):

$$u(a_i) = \sum_{j=1}^{m} v_j \cdot u_j(y_{ij}) \tag{1}$$

where u_j are partial functions of utility of individual criteria and v_j is criteria weights.

The algorithm of the WSA method consists of three steps. First, ideal variant H with the evaluation $(h_1, ..., h_n)$ and basal variant D with the evaluation $(d_1, ..., d_n)$ are obtained. Next, a standardized criterial matrix R is acquired, the elements of which are calculated with the formula (2):

$$r_{ij} = \frac{y_{ij} - d_j}{h_j - d_j} \tag{2}$$

The matrix R is already the value matrix of utility function of the i-th variant of the j-th criterion as the elements of this matrix are transformed criterial values, such as $r_{ij} \in \langle 0; 1 \rangle$. Then the basal variant corresponds to the value of 0 and the ideal variant to the value of 1. Finally, the aggregate utility function is calculated for each variant, see formula (3):

$$u(a_i) = \sum_{j=1}^{n} v_j r_{ij} \tag{3}$$

Lastly, the variants are sorted in a descending order according to their $u(a_i)$ value (Jablonský, 2007).

The multi-criteria decision-making model is based on selected psychiatric care indicators. Indicators $I_1 - I_3$ describe the area of availability and capacity of psychiatric healthcare and indicators $I_4 - I_7$ describe the state of mental health of population. Indicators $I_1 - I_3$ indicate the importance of psychiatric health care in a given country, the capacity readiness of the system and the availability of psychiatric health care. Indicators $I_4 - I_7$ describe how

health systems and psychiatric care services contribute to the mental health of the population. When applying the WSA method, the weights of individual indicators are also considered, see Table 1.

Table 1 – Weights of psychiatric care indicators

Indicator I1 – I7	Weight of indicator	Character of function
Availability and capacity of psychiatric healthcare	60 %	
I$_1$ - Available hospital beds for psychiatric care (per 100,000 inhabitants)	0.2	MAX
I$_2$ - Psychiatrists (per 100,000 inhabitants)	0.2	MAX
I$_3$ - Total health care expenditure (% of GDP)	0.2	MAX
State of mental health of population	40 %	
I$_4$ - Deaths - mental and behavioural disorders (per 100,000 inhabitants)	0.1	MIN
I$_5$ - Hospital discharges by diagnosis - mental and behavioural disorders (daily cases per 100,000 inhabitants)	0.1	MIN
I$_6$ - Length of hospital stay - mental disorders and behavioural disorders (number of days per 100,000 inhabitants)	0.1	MIN
I$_7$ - Disability Adjusted Life Years (DALY) of Mental and substance use disorders	0.1	MIN

Source: Eurostat (2023), own processing

The data was drawn from the Eurostat database for the period 2016 – 2020, see Eurostat (2023). A total of 22 European Union countries were included in the analysis, for which data were available for selected indicators in the monitored time period.

3 Results and Discussion

The basic elements of the mental health care system are the number of psychiatrists (I$_2$) and the number of hospital beds for psychiatric care (I$_1$). In the monitored period, more than 80,000 psychiatrists worked in EU countries. The country with the largest number of psychiatrists per 100,000 inhabitants was Germany (28), followed by Finland (26), Greece (25) and the Netherlands (24). On the contrary, less than 10 psychiatrists per 100,000 inhabitants worked in Poland (9). In Bulgaria, Cyprus and Spain the number of psychiatrists there was also low (10 and 11). In the Czech Republic, there was a total of 15.5 psychiatrists per 100,000 inhabitants which is a below-average value within EU countries.

Also, the number of beds varied considerably across EU countries. The countries with the highest number of beds per 100,000 inhabitants were Belgium (138), Germany (129), Lithuania (121) and Malta (105). The smallest number of hospital beds was found out in Sweden (41), Spain (36), Ireland (33) and Italy (9). In the Czech Republic, there are 93 hospital beds for psychiatric care per 100,000 inhabitants. The average of the EU countries is 74.5.

An important indicator affecting the quality and availability of metal health care is the expenditure on healthcare (I$_3$). The highest expenditure on health care in % of GDP were registered in Germany (11.7), France (11.5), Sweden (10.9) and Belgium (10.8). On the contrary, the lowest values were found in Lithuania (6.47), Poland (6.47), Romania (5.54) and Luxembourg (5.34). The value for the Czech Republic was 7.76. Descriptive statistics for indicators I$_1$ - I$_3$ are available in Table 2.

Table 2 – Basic descriptive statistics of indicators I$_1$ – I$_3$

Indicator	Count	Mean value	Standard deviation	Median	Variance of selection	Minimum	Maximum
I$_1$	26	74.50	30.22	75.05	913.22	8.73	138.29
I$_2$	26	17.56	5.32	16.73	28.34	9.13	27.75
I$_3$	27	8.42	1.86	8.48	3.46	5.34	11.71

Source: Eurostat (2023), own processing

Health of population can be judged on the basis of mortality. Death as a result of mental and behavioural disorders per 100,000 inhabitants (I$_4$) reached the highest values in Netherlands (65.20), Denmark (59.35), Sweden (53.18) and Ireland (51.35). In the Czech Republic, the value of death due to mental disorders is 15.58 per 100,000 inhabitants, while the average of the EU countries is 28.26.

Mental and behavioral disorders were the most common diagnoses at hospital discharge per 100,000 population (I_5) in France (6403.64), Croatia (2339.38) and Estonia (749.52). In this indicator, the Czech Republic is below the average of EU countries.

Length of hospital stay due to mental and behavioral disorders in number of days per 100,000 inhabitants (I_6) was the longest in Germany (41520.42), Latvia (32443.06) and Austria (29533.29). The Czech Republic, with a value of 26 678.57, was among the above-average countries in the EU.

The burden caused by mental illness can be expressed with the help of summary indicator of the health status of the population DALY, which indicates disability-adjusted life years (Winkler and Janoušková, 2013). DALY represents the sum of two sub-indicators, YLD (Years Lived with Disability) plus YLL (Years of Life Lost). The lowest values are reached in Czechia (2.24), Slovakia (2.23), Romania (2.07) and Bulgaria (2.01). According to data from the World Health Organization (WHO), mental illnesses accounted for 24.5% of total DALYs in the Czech Republic (WHO, 2011). It is desirable to reduce the values of indicators I_4 - I_7. Descriptive statistics for indicators I_4 – I_7 are available in Table 3.

Table 3 – Basic descriptive statistics of indicators I_4 – I_7

Indicator	Count	Mean value	Standard deviation	Median	Variance of selection	Minimum	Maximum
I_4	25	28.26	18.09	26.95	327.46	1.08	65.2
I_5	26	436.36	1303.14	63.46	1698185.62	1.35	6403.64
I_6	27	17770.80	11261.86	19548.52	1126829491.69	515.88	41520.42
I_7	27	2.73	0.34	2.84	0.12	2.02	3.20

Source: Eurostat (2023), own processing

In Figure 1 there are displayed the results of WSA method application for period 2016 - 2020.

Figure 1 – Evaluation of EU countries using the WSA method in the period 2016 – 2020
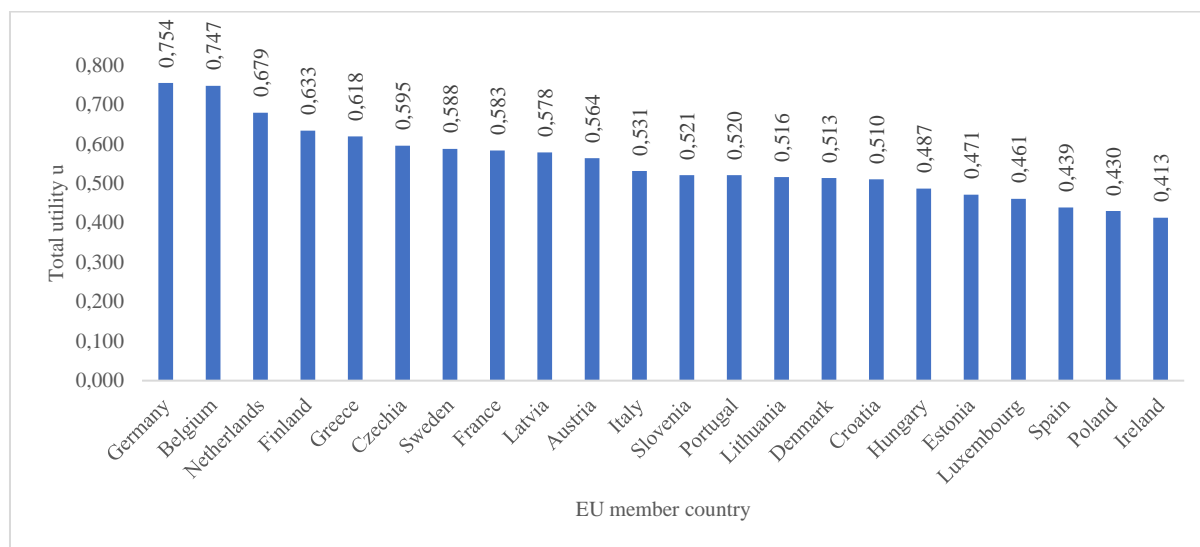
Source: Eurostat (2023), own processing

The selected EU member countries are ranked according to the state of mental health care. The first five positions are occupied by Germany, Belgium, Netherlands, Finland and Greece. The last five positions according to the monitored mental health care indicators were taken by Estonia, Luxembourg, Spain, Poland and Ireland. The Czech Republic ranked sixth among EU countries. The analysis does not include five countries of the European Union - Romania, Bulgaria, Slovakia, Malta and Cyprus due to the unavailability of data for the selected indicators.

Figure 2 shows the resulting ranking of EU countries in a map. The more saturated the color, the more affordable and high-quality the mental health care system is in the country.

Figure 2 – Visualization of the results of the WSA method

Source: Eurostat (2023), own processing

Based on the reached results the hypothesis **H1 was verified and confirmed**. *The state of the psychiatric care in the Czech Republic is evaluated as above-average among EU member countries in the period under review.* These results could be compared with other studies, see WHO (2018), Winkler et al. (2013) or Aliev et al. (2023).

According to the evaluation of selected indicators, it can be summarized that the mental health care system in the Czech Republic is rated above average. It is based on the available psychiatric care hospital beds, which the Czech Republic has in an above-average quantity (Ardielli and Bémová, 2021) while the number of general psychiatric beds is being reduced in most countries (Mundt et al., 2021). The Czech Republic belongs to the countries with the highest number of hospital beds in the EU, which was demonstrated in the handling of the COVID-19 pandemic, when large numbers of patients could be treated thanks to sufficient capacity. The Czech Republic is still characterized by a centralized and standardized healthcare system.

In Western Europe (Italy, Finland, Sweden), however, there are systems that are quite heterogeneous, and the beds here are diversified into different types of facilities, which is not yet common in the Czech Republic. In addition, the comfort that individual facilities offer usually varies dramatically among EU countries (Winkler et al., 2013). In Western Europe countries, innovative treatment methods such as Intensive home treatment (IHT), which is used in the Netherlands, are also more often applied, see van Asperen et al. (2022).

The number of psychiatrists in the Czech Republic is recorded as below average, which reduces the comfort of health services. Healthcare spending is also below average compared to European countries. The psychiatric care system needs to be reformed along the lines of good practice in Western EU countries and the number of beds in community-type services needs to be increased. There are also other challenges to overcome, see Zhou et al. (2018) or Saraceno et al. (2007).

Conversely, from the point of view of indicators of the mental state of the population, the Czech Republic appears to be in above-average condition. This is evidenced by the below-average values of DALYs or mortality due to mental disorders, but on the other hand, the length of stay in the hospital is above average, which is related to the applied system of centralized health care, see (Winkler et al., 2013).

The research is largely limited by the selection of available indicators of mental health care, which do not include indicators describing community-type services, beds in non-hospital facilities, other medical personnel, etc.

4 Conclusion

Mental health is one of the major topics of the coming decade. Although the EU has made significant progress in prioritizing this topic in recent years, it is necessary to continue the current efforts. Mental health must be included among the main priorities not only of the European Commission, but also of the European Parliament and future Council presidencies. It is also necessary that the countries of the European Union continue to reform their mental health care systems.

The health care system and mental health status of the population of the Czech Republic is rated as above average. However, the Czech Republic should carry out reforms following the example of more developed countries such as Germany, Belgium and the Netherlands, which were ranked high in the evaluation of EU countries. Moreover, these are countries that apply the same health care model as Czech Republic, based on Bismarckian principles.

Currently, the first phase of the reform of psychiatric care has been completed in the Czech Republic, new community services have been prepared and pilot-tested, e.g. 30 mental health centers have been established and new acute psychiatric wards have been modernized and built in general hospitals (MZČR, 2023) or Aliev et al. (2023). These positive steps will be reflected in the quality of psychiatric care and will subsequently be reflected in statistical data. Subsequently, it will be possible to evaluate the progress achieved, which is a topic for further research.

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Implementation of Mental Health Care Systems in the Czech Republic and EU Countries

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Abstract: Psychiatric care in the Czech Republic is considered long-term underfunded, it is considered not sufficiently available, and compared to most countries of the European Union, the Czech Republic lags behind in the development of this field. At the same time, the number of people who need psychiatric care is increasing. The COVID-19 pandemic and its consequences have significantly increased the demand for mental health services in all European Union countries. The COVID-19 pandemic has highlighted vulnerabilities in the health systems, as well as the consequences of their inadequacy for population health, economic progress, trust in governments and social cohesion across Europe. The paper is focused on the comparison of the mental health care systems in the countries of the European Union. The aim is to evaluate the state and development of implementation of mental health care systems in the Czech Republic and to compare it with other EU countries. The research brings knowledge about the approaches of individual European countries to the implementation of policies in mental health care, as it covers comparison of all EU countries. The results show the state of implementation of the Czech mental health care system as ranking of individual positions of EU countries, where Czech Republic is placed on the eight position. The evaluation is based on the application of multi-criteria decision-making method MAPPAC.

Keywords: Czech Republic, European Union, MAPPAC method, mental health care

JEL Classification: I10, I18, A13

1 Introduction

The proportion of mental illnesses is constantly increasing in EU countries (Eurostat, 2023). According to OECD/EU (2018), mental health problems affect around 84 million people in EU countries. These problems also have financial consequences for the entire society (Prince et al., 2007). The total cost of treating mental illness in the 27 EU countries and the UK exceeded 4% of GDP in 2015, which is more than 600 billion EUR (Eurostat, 2023), (Campion and Knapp, 2018) or (Rajkumar, 2022). The COVID-19 pandemic is also considered as a significant factor affecting the mental health of the population of the European Union countries and the increasing demand for mental health services (Europa, 2023).

In connection with the COVID-19 pandemic, among other things, extraordinary pressure was put on EU citizens in all areas of life (Europa, 2023). A heavy workload combined with family care was a source of stress for many individuals (remote work combined with teaching children). The high workload also affected the medical staff in particular. Employers and the self-employed were threatened with existence in connection with the decline in services and production.

According to the European Statistical Office, this pressure contributed to the deterioration of the mental health of the European Union citizen and increased the demands on psychiatric care systems and the availability of psychiatric services (Eurostat, 2023). However, mental health care systems are not capable of rapid adaptation and do not meet contemporary requirements. Therefore, reforms of mental health care systems are among the important topics of European Union policies, see Aliev et al. (2023) or Winkler and Janoušková (2013).

Quality and affordable psychiatric care is also a priority of the Ministry of Health of the Czech Republic and the Czech Psychiatric Society. MZČR (2023) states, that the reform of psychiatric care is a systemic change in the provision of psychiatric care, where the main goal is to increase its quality and efficiency, and especially to increase the quality of life and reduce the stigmatization of people with mental illness.

The paper is focused on the implementation of mental health care systems in the countries of the European Union. **The aim is to evaluate the state and development of implementation of mental health care systems in the Czech Republic and to compare it with other EU countries. Hypothesis HI** was formulated: *The implementation of mental health care system is under average of EU countries.* Psychiatric society (2017) states,

that the mental health care system in the Czech Republic is under developed and doesn't meets the contemporary requirements. The research is based on selected indicators describing the development and the actual state of the implementation of mental health care systems in EU countries, like mental health policy, mental health legislation or mental health prevention, see WHO (2020).

1.1 Models of Psychiatric Care in European Countries

There are described various models of psychiatric care that are classified from a different point of view. The basic and main model of psychiatric care in EU countries is the Balanced care model (Thornicroft and Tansella, 2013) or (Winkler and Janoušková, 2013). From another point of view, psychiatric care models in EU countries can be divided into four basic models. The first model is the Multidisciplinary model. This model is also quite often used by countries. The second model is a comprehensive bio-psycho-social view. The third model is the gender perspective and the last fourth model is coordination and smooth communication, see Fonseca, Mestre and Torrens (2022).

The Balanced Care Model recommends that the overall mental health care system includes both community and hospital care. The model is based on a structured review of scientific knowledge and evidence and is also based on the experience and knowledge of professionals in the field of mental health changes across countries around the world (Thornicroft, Tansella, 2013). The balanced care model cannot be applied worldwide because of the huge differences in resources available at national and local levels (Saraceno et al, 2007). The model is therefore divided based on the World Bank's three categories of country resources, offering components of mental health services for low-, middle-, or high-income countries (WHO, 2023).

In low-income countries, care is provided by primary health care workers and community facilities. In middle-income countries, provision of care is strong primary care for treating people with more common mental illnesses (Patel, et al., 2007). The model then identifies five elements of general adult mental health services. These are specifically the following elements of general services: ambulatory services, community mental health teams, acute inpatient care, long-term community residential care and work and occupations (Freeman, 2022).

In high-income countries, the balanced care model recommends that a range of specialized services could be provided in each country according to resources (Jacobs and Lesage, 2019). These are, for example, specialized services such as ambulances for people with eating disorders, treatment-resistant affective disorders, for people with psychotic disorders and substance use disorders, and ambulances for mentally ill mothers. Specialized services also include supplementary care, which refers to acute constitutional care. Acute inpatient care includes day care centers, crisis homes, or home crisis teams.

Three basic types of specialized care have been identified in high-income countries, see (Thornicroft, Tansella, 2018):

1) 24-hour staffed residential care (staffed accommodation, nursing homes),
2) day staffed accommodation (residential accommodation that is inspected daily,
3) accommodation with a lower level of staff support.

However, many authors stress, that defining and articulating a balanced mental health care strategy and mental health care plan is necessary but not sufficient to ensure that service improvements are delivered into practice (Jailobaeva et al, 2021). In the future, it will be important to have available not only models important for planning, but also models important for clear implementation. For example, there is no evidence that the overall mental health care system can be delivered by hospital care, but there is also no clear evidence that it can be delivered by community services. In economically developed countries, the overall picture throughout the past two decades has been for a progressive reduction in hospital beds, along with an unbalanced, inadequate and slow investment in community services (Thornicroft, Tansella, 2009).

Rather, some balance should be set between hospital care and community services. Certain recommendations have been developed in some countries for countries to strive for balance. In reality, the relationship between hospital care and community services is determined by local conditions, which change over time (Thornicroft, Tansella, 2013) and (Killaspy, 2020).

1.2 Reform of Psychiatric Care in the Czech Republic

The system of mental health care in the Czech Republic has its roots in the period of the Austro-Hungarian Monarchy (Winkler et al., 2013). Psychiatric care in the Czech Republic experienced the greatest development in the period between the world wars. Subsequently, there was a slowdown in development during the period of

communism. Since 1989 (Velvet Revolution), Czech psychiatry and psychiatry again began to participate in global development. Unfortunately, however, psychiatric care in the Czech Republic has not changed significantly since the 1990s (Höschl, Winkler and Pěč, 2012). It is based on the concept of psychiatric hospitals, which are materially and technically outdated. Psychiatric care in the Czech Republic is considered long-term underfunded and its availability is unsatisfactory. The Czech system faces an uneven representation of ambulatory services across regions and a lack of so-called community care, where patients receive help directly in their environment. At the same time, the number of people who need mental health care is increasing. International statistics confirm the unsatisfactory situation in connection with availability of psychiatrists. For example, in Germany there are almost 28 psychiatrists per 100,000 inhabitants, in the Czech Republic there are only 15.5 psychiatrists, see OECD/EU (2022) In this situation emerged in the last period the need for an urgent systematic reform of Czech psychiatric care with built-in principles of deinstitutionalization, destigmatization, reintegration, training, popularization and public education emerged.

The psychiatric care reform strategy in the Czech Republic was approved by the Minister of Health in 2013. Psychiatric care reform is a long-term process that will according to the experience of other countries, take 15 to 20 years. Currently, the first stage has been completed, which initiated the necessary systemic changes and created the prerequisites for their further continuation. Changes will be made in the care system with an emphasis on primary health and psychiatric care. Collaboration between primary care and specialized psychiatric services will be encouraged. There will be a significant expansion of community care. In parallel with this process, there will be a gradual reduction of long-term inpatient care (Psychiatric Society, 2017).

The goal is to create a balanced model of mental health care (balanced care model), where:

- services reflect the priorities of patients/clients and those who care for them,
- there is a balanced ratio between community and outpatient and hospital (conventional) services,
- services are provided as close as possible to the patient/client's residence,
- the intervention focuses both on alleviating the symptoms of mental illness, thus increasing independence, quality of life and developing abilities of patient/client.

Currently, the situation is slowly improving and psychiatric care in the Czech Republic is undergoing a fundamental change. The reform is covered by a ten-year action plan "National Mental Health Action Plan 2020-2030" (Government Office CR, 2020). The main goal of the reform is to improve the quality of life of people with mental illness, for example through the expansion of community care and the introduction of new services. At the same time, however, a reduction in inpatient care is expected.

2 Material and Methods

The paper is focused on the evaluation of the mental health care system in the Czech Republic and in the countries of the European Union. Mental health care systems are evaluated based on WHO data obtained from the Mental health atlas 2020 (WHO, 2020). Due to the larger number of indicators, multi-criteria decision-making methods were used for data processing. The use of MCDM is common in a wide range of economic and social cases where it is possible to find an efficient solution or create a ranking of variants, see Ardielli (2020).

2.1 Model and Data

The MAPPAC (Multicriterion Analysis of Preferences by means of Pairwise Actions and Criterion comparisons) is one of MCDM methods. The principle of this method is a pairwise comparison of variants in terms of each pair of partial criteria. The basic preference index is calculated based on the vector of weights and normalized criteria values for individual variants.

MAPPAC is described by Matarazzo (1991) as follows:

- design of the criteria data matrix,
- normalization of the criteria data matrix,
- the paired comparison of variants is processed (two relations *are possible* preference or indifference),
- preferences are aggregated, resulting in a final order

The row totals of the aggregated matrix π are calculated according to the equation (1):

$$\sigma^l(a_i) = \sum_{j=1}^{p} \pi(a_i, a_j), \ i \in J^l \tag{1}$$

Variants with the highest σ^l values are placed in the first place in the arrangement. The set of variants is reduced from these variants, new set of variants A^l is created, the set of indexes of variants from A^l are marked as J^l. The procedure is repeated for *m* steps where *m* is the number of indifference classes by the arrangement from above.

In a similar procedure is reached the value of $\tau^1, \tau^2, ..., \tau^n$, where *n* is the number of indifference classes in the arrangement from below, by the usage of equation (2):

$$\tau^t(a_i) = \sum_{j \in J^t} \pi(a_j, a_i), \ i \in J^t, t = 1, 2, \dots n. \tag{2}$$

From the obtained arrangements from above and below, the resulting arrangement can be obtained according to the average sequence numbers of the variants (Fiala a Maňas, 1994).

The multi-criteria decision-making model is based on selected mental health care system indicators. Basic characteristics of the mental health care systems and policies of all European Union countries were selected and scored according to availability. Subsequently, individual indicators I_1 - I_6 were calculated. Table 1 shows the individual criteria of the individual characteristics that were monitored.

Table 1 – Methodology of criteria evaluation

Criteria	Points
I_1 - Mental health policy / plan	
Stand-alone policy or plan for mental health	0-3
Year of policy / plan	0-3
Policy / plan is in line with human rights covenants	0-5
Human resources are estimated and allocated for implementation of the mental health policy/plan	0-1
Financial resources are estimated and allocated for implementation of the mental health policy/plan	0-1
The mental health policy / plan contains specified indicators or targets against which its implementation can be monitored	0-2
I_2 - Mental health legislation	
Stand-alone law for mental health	0-3
Year of law	0-3
Law is in line with human rights covenants	0-5
The existence of a dedicated authority or independent body to assess compliance of mental health legislation with international human rights	0-2
I_3 - Child and/or adolescent mental health policy/plan and Suicide prevention strategy/policy/plan	
Stand-alone or integrated policy or plan for child mental health	0-1
Year of child mental health policy / plan	0-3
Stand-alone or integrated policy or plan for adolescent mental health	0-1
Year of adolescent mental health policy / plan	0-3
Stand-alone or integrated strategy/policy/plan for suicide prevention	0-1
Year of strategy/policy/plan	0-3
I_4 - Insurance for mental health	
How the majority of persons with mental health conditions pay for mental health services	0-2
How the majority of persons with mental health conditions pay for psychotropic medicines	0-2
The care and treatment of persons with mental health conditions (psychosis, bipolar disorder, depression) is included in national health insurance or reimbursement schemes in your country	0-2
I_5 - Integration of mental health into primary health care	
Integration of mental health into primary care is considered functional	0-5
I_6 - Mental health promotion and prevention	
Existence of at least two functioning programmes	0-1
Number of mental health promotion & prevention programme	0-7

Source: WHO (2020), own processing

When applying the MAPPAC method, the weights of individual indicators and character of function are also an important factor. All selected indicators have a maximizing character. The calculating method of equal weights was chosen, so that no indicators are disadvantaged. All indicators are given equal importance.

3 Research Results

The evaluation of the implementation of mental health systems in the EU countries was carried out on the basis of the application of the MAPPAC method. The results are summarized in Table 2. The results of the method include top-down and bottom-up ordering. The resulting arrangement is then the arithmetic mean of both results. EU

countries are ranked according to state of implementation of mental health care system from the best to the worst. The five top positions are occupied by Slovenia, Portugal, Germany, Denmark and Lithuania. On the last five positions are placed Spain, Malta, Cyprus, Netherlands and Bulgaria. The Czech Republic is placed on the eight position together with Italy.

Table 2 – Evaluation of the implementation of mental health care systems in EU countries (2020)

Variant	Top	Down	Class
Slovenia	1	1	1
Portugal	2	2	2
Germany	3	3	3
Denmark	4	4	4
Lithuania	5	5	5
Ireland	6	6	6
Finland	7	7	7
Czechia	9	8	8
Italy	8	9	
Poland	10	10	9
Latvia	11	11	10
Croatia	13	12	11
Greece	12	14	12
Romania	16	13	13
Sweden	15	15	14
Belgium	14	19	15
France	17	16	
Hungary	20	17	16
Austria	18	21	17
Slovakia	19	20	
Estonia	22	18	18
Luxembourg	21	23	19
Spain	23	22	20
Malta	24	24	21
Cyprus	25	26	22
Netherlands	26	25	
Bulgaria	27	27	23

Source: WHO (2020), own processing

In comparison with EU the above average results in case of the Czech Republic are reached in indicator I_1, I_3, I_4, I_5 and I_6. Under average result is achieved only in indicator I_2 – Mental health legislation, see Table 3.

Table 3 – Comparison of the implementation of mental health care system with EU average

Country	I_1	I_2	I_3	I_4	I_5	I_6	Total score
Czech Republic	11	1	6	6	4	5	33
EU average	9,7	7,7	4,2	4,6	2,3	3,3	32

Source: WHO (2020), own processing

The **research objective was met**. **Based on the evaluation of mental care systems according to selected indicators, a ranking of EU countries was created. Hypothesis HI was verified and was denied.** *The implementation of mental health care system is above average in comparison with other EU countries.*

Limitations of the research include the selection of indicators and selection of the MCDM method. If a different MCDM method were chosen, slightly different results could be obtained. Compared to other methods, MAPPAC favours variants that reach ideal values in some criteria and basal values in others, over variants that are average in all criteria.

The Czech Republic is currently lagging behind in the area of mental health legislation. There is no stand-alone law for mental health. NRZP ČR (2010) states, that the primary goal is not to create a good mental illness law, but a well-functioning care system. Even in the EU, there are still states that have not developed and issued a Mental Health Protection Act. Its goal is to legally treat mental health in all population groups. Based on the principle of an economically developed society, the mental health of the population becomes the most valuable value that must

be supported and protected (Prince et al. 2007). An example of good practice is, Germany, which has implemented mental health legislation since 2015, or Denmark (since 2019), see WHO (2020).

4 Conclusion

In the evaluation of EU countries, the Czech Republic ranked above average in the implementation of the mental health care system. Despite the fact that the mental health care system is currently being reformed, the Czech Republic still faces significant challenges. The reform of psychiatric care is a systemic change in the provision of psychiatric care, where the main goal is to increase its quality and efficiency, and especially to increase the quality of life and reduce the stigmatization of people with mental illness.

One of the basic changes in psychiatric care in the Czech Republic is the transfer of care from psychiatric hospitals, which until now have been the mainstay of psychiatric care in the Czech Republic, to one's own social environment. In the Czech Republic, the construction of so-called centers for mental health is developing, which will provide health and social services to patients with serious mental illness.

The Czech Republic ranks among the backward countries of Europe in terms of mental health protection. With regard to the recommendations of international institutions (EU, Council of Europe, UN), a Mental Health Protection Act should be drafted and issued in the Czech Republic.

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Subjects of the Administrative or Financial Law and their Role in Public, or Financial Administration

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Abstract: The paper deals with the comparison of subjects of the administrative and financial law with regard to the common doctrinal roots. The principle objective of the paper is to analyse main characteristic of subjects of the administrative and financial law and to present some differences between these subjects of law. For this reason, the analytical, comparative and descriptive methods were used to write this paper and to fulfil its objective. A descriptive method is used for a presentation of subjects of the administrative and financial law and their role in the public or financial administration. Afterwards, the comparative method is applied for a comparison and an emphasis on differences in the legal regulation of role and positions of subjects of the administrative and financial law. Owing to the analytical method is possible to gain required results concerned to crucial distinctions between subjects executing the public administration and subjects executing financial administration. As for results, it is also possible to mention the comparison of selected aspects of the administrative and financial procedure, or rather tax procedure in the Czech Republic and in France.

Keywords: Administrative law, financial law, subjects of law

JEL Classification: K0, K10, K30

1 Introduction

Both an administrative law and a financial law belong to the public law. Although the administrative law and the financial law are two separate and independent branches of law, these branches of law have a common basis and roots. This fact is expressed, for example, by the use of the same principles or superordinate position of the subject of public (financial) administration. Same principles are applicable in both substantive (e.g. the principle of legality) and procedural (e.g. the principle of legitimate expectation) administrative law and financial law. The superordinate position of the public subject is the main typical feature for the public law and is expressed by the possibility of a public (financial) administration authority to impose rights and obligations authoritatively, even against the will of persons.

Common basis of the administrative law and the financial law is given by the fact that the financial law has separated from the administrative law. In fact, the financial law is the youngest branch of law in the Czech Republic. (Bartes, 2019: 39) As well, the financial law is one of the most dynamic legal branches, especially due to the many changes in the tax law as one of the sub-branches of the financial law. These common foundations result in the similarity of these branches, and therefore the appropriate possibility of their comparison in details.

The principal objective of the paper is to analyse main characteristic of subjects of the administrative and financial law and to present some differences between these subjects of law.

That is why the paper describes and then compares subjects of the administrative law and the financial law. Although these subjects are public authorities, their authority is different and in administrative or financial procedures fulfil different roles. For that reason, the administrative and financial procedure is described and subsequently compared.

2 Material and Methods

Regarding to the scientific literature, it is important to base on the Czech scientific literature of the administrative and financial law. Nowadays, the most important and well-known authors in this field are administrative lawyers as Petr Průcha or Vladimír Sládeček and financial lawyers as for example Petra Hrubá Smržová. As regards the comparison of administrative and financial procedures, Michel Bouvier or Jean-Pierre Lassale can be mentioned. These French authors present a great opportunity to compare Czech and French procedural law in the area of the administrative and financial law.

In this respect, not only authors such as Petr Průcha and Vladimir Sládeček, but also Soňa Skulová, Alena Kliková or Lukáš Potěšil should be mentioned. These authors present mainly theoretical aspects of both the substantive administrative law and the procedural administrative law. The work of these authors does not neglect the issue of the public administration and its organization. Petra Hrubá Smržová represents authors of the financial law.

Another crucial source are valid and effective laws. The main law for the state administration is the Act No. 2/1969 Coll., on the establishment of ministries and other central authorities of the state administration of the Czech Republic. However, the state administration is not only executed by state authorities, but also by other public administration entities different from the state (such as for example municipalities and regions). That is why is necessary to mention two another laws – the Act No. 128/2000 Coll., on Municipalities and the Act No. 129/2000 Coll., on Regions. These laws regulate the status of municipalities and regions that have the right to self-governance. In last years, according to the Act No. 51/2020 Coll., on the territorial administrative division of the state and on the amendment of related laws, the territory of the Czech Republic is divided into administrative districts of regions for the performance of state administration. As far as the financial administration is concerned, it is necessary to mention the Act No. 456/2011 Coll., on the Financial Administration of the Czech Republic.

To fulfil the aim of the paper, which is obtained in the introduction, analytical, comparative and descriptive methods were used. First of all, it is important to use a descriptive method for a presentation of subjects of the administrative and financial law and to present administrative and financial procedure. Afterwards, the comparative method is applied for a comparison and an emphasis on differences in the legal regulation of role and positions of subjects of the administrative and financial law.

3 Results and Discussion

In the chapter "Results and Discussion" is so important to clarify crucial terms linked with subjects of the administrative and the financial law and to explain their role and function in administrative, or rather financial procedures.

For further analysis, it is first necessary to start from the definition of the subject of law as such. In general, a person who has a legal personality can be considered a subject of law. Whether persons are subjects of the administrative law or the financial law, they can be divided into two basic groups. On the one hand, persons who execute the public or the financial administration, and on the other hand persons towards whom the public or financial administration is executed.

3.1 Subjects who execute the public or financial administration and subjects towards who the public or financial administration is executed

The notion of the public administration means the administration of the society, state and state´s individual territorial units. The public administration is executed either by the state of other public entities. If the public administration is executed by the state, it is a state administration. If the public administration is executed by an subject other than the state (e.g. public law corporations as municipalities or regions), it is a local administration. The financial administration is a specific section of the public administration.

The state is within the public or financial administration represented by authorities such as for example the Office for Personal Data Protection (central state administration body that supervises compliance with obligations in the processing of personal data and can punish the sender of unsolicited commercial messages in administrative procedure) or the National Security Agency (ensures e.g. the protection of classified information in accordance with the obligations resulting from membership in the European Union, NATO and international treaties to which the Czech Republic is bound) in the case of the public administration, or for example the General Financial Directorate (as an accounting unit of the Ministry of Finance that administers central records and registers necessary for the exercise of powers of financial administration authorities and conducts procedures on administrative offences) or the Appellate Financial Directorate (the appeal authority against the decisions of tax offices) in the case of the financial administration. In the case of public law corporations that have the status of legal persons, a distinction is made between territorial public law corporations (municipalities or regions) and professional public law corporations (professional chambers as for example the Czech Medical Chamber gathering all doctors or the Czech Bar Association). The aforementioned public law corporations can own property and enter into contracts (e.g. a public law contract), because they have a legal personality. These public law corporations are represented by particular administrative bodies that have authority and jurisdiction given by law.

Subjects towards whom the public or financial administration is executed are both natural and legal persons. In the case of the public administration, for example, it may be a person who has been found guilty of committing a misdemeanor and has been imposed an administrative sanction, in the case of the financial administration, it may be a taxpayer who is obliged to file a proper tax statement.

As mentioned, the financial administration is a specific section of the public administration and therefore common features can be seen here. It is possible to differentiate the following characteristics of the public and financial administration, or rather concept:

- Organizational (formal) concept and functional (material) concept,
- Centralization or decentralization and concentration or deconcentration of public and financial administration,
- Concept of public and financial administration in the broader and narrower sense of the word.

3.2 A view of public and financial administration subjects from the point of view of the organizational and functional concept of public and financial administration

The organizational (formal) concept means the institutional structure (i.e. the administration bodies themselves) of the public or financial administration. A set of these bodies then executes the public or financial administration. In the case of the functional (material) concept, it is no longer about the structure of administration bodies, but about the definition of the relevant public activity, or the financial administration (i.e. the actual performance of the relevant authorities). For example, the Act No. 128/2000 Coll., on Municipalities and the Act No. 129/2000 Coll., on Regions can be considered organizational legal norms.

The organizational and functional concept can be applied either positively (i.e. by a specific enumeration of bodies such as a municipal council, municipal board or mayor) or negatively (i.e. by taking into account other state activities). In this sense, however, the positive definition of public administration appears to be problematic, due to its considerable diversity within their activities and the variety of tasks. Therefore, a negative definition is preferred. This is specifically described in the functional concept as a set of state activities that are not legislation, judiciary or government. The public administration in the formal sense is made up of a similar theoretical construction, because the public administration means the activities of the state or other subject of public authority outside of state bodies executing legislation, judiciary or government. (Sládeček, 2009: 21) As part of the comparison, the aforementioned can be reasonably applied to the financial administration, which can be considered a certain subsystem of the public administration. Therefore, the organizational concept of the financial administration can be understood according to the same principle. This fact is – as in the case of the public administration – expressed by the institutional structure of the financial administration, i.e. by the representation of selected subjects of the financial administration. The functional concept is also built on the same basis, which expresses the very activity of these relevant subjects (bodies) within the framework of the financial administration.

However, unlike the public administration, it is possible to define the organizational as well as the functional concept of the financial administration positively. This is due to the fact that the financial administration, compared to the public administration, is much narrower in terms of its specific organizational structure and the scope that forms the object of its interest. From the point of view of a positive definition of the organizational concept of the financial administration, it can be stated that it is made up of tax offices, the Appellate Financial Directorate and the General Financial Directorate. It is clear from the above list that it is also a multi-level system, whose bodies are established by the Act No. 456/2011 Coll., on the Financial Administration of the Czech Republic. The aforementioned bodies are administrative offices and organizational components of the state. The first degree, or the first instance is made up of tax offices, the second degree, or the second instance is made up of the Appellate Financial Directorate, which is the reviewing body. The Czech Financial Administration is two-instance, because the General Financial Directorate has the position of coordinator and the tax subject does not come into contact with it. From a functional point of view, the financial administration can be divided into three groups, namely the administration of public finances, the administration of the economic system and the administration of public property. The public property is specific kind of property whose specificity lies not only in the type of property, but also in the entity handling this property and also in the purpose for which this property is used. (Bartes, 2021: 33)

3.3 The view of public and financial administration subjects from the point of view of the principles of their organization

The public administration and the financial administration in the organizational concept have been clarified. Now, it is necessary to reflect that this concept also reflects the territorial and objective aspect. The territorial and objective aspect can naturally be seen in both public and financial administration.

While the territorial aspect can be understood as meaning that, the authority of the public administration body is determined exclusively or mainly by territorial considerations, the objective aspect consists in the application of an exclusively or mainly content-homogeneous or related agenda that is within the authority of the public administration body. The distinction between territorial and objective aspects is based on the purpose and function of the relevant part of the public administration or the financial administration, therefore the structure of bodies of the public administration or financial administration shows signs of both centralization and decentralization, as well as concentration and deconcentration. Another possible differentiation of the public administration or the financial administration subjects is their designation as monocratic or collegial.

Regarding the issue of centralization and decentralization of public and financial administration subjects, the public administration and the financial administration are a rigid system of bodies and the concentration of the execution of the public or financial administration in one state management center, which excludes a real and legally relevant territorial and professional self-government. On the contrary, a decentralized system can be understood as a delegation of competence and authority to self-governing bodies.

Other principles in the accomplishment of public or financial administration are a concentration and a deconcentration (horizontal and vertical). A horizontal concentration means an effort to concentrate all functions at one level in one authority (e.g. merger of ministries). A horizontal deconcentration is the opposite of the procedure, when functions at the same level are divided into several authorities. A vertical concentration and a deconcentration consists in the division of functions between lower and higher levels within one organizational system, either by concentrating them at a higher level (concentration) or, on the contrary, by delegating to a lower level (deconcentration), during deconcentration the relationships of superior and subordinate remain (Sládeček, 2009: 250).

According to the latest division of public or financial administration subjects, it is possible to designate them as monocratic or collegial authorities. A monocratic authority is headed by an individual who makes his own decisions. Such an example can be any ministry, in the case of the financial administration, the Ministry of Finance, as the supreme body of the financial administration. Although certain powers may be delegated to subordinates (e.g. a deputy minister), the responsibility of a specific minister is still preserved. In the case of collegial authorities (e.g. the government), it is a collective of persons who make decisions in the assembly, while maintaining a certain quorum.

If the above is applied to practice in the financial administration, then it can be stated that there have been a number of steps towards its decentralization within financial administration. These steps mainly concern the area of public finances. On the contrary, the administration of currency, money, insurance and the capital market is centralized, which is reflected in the existence of the Czech National Bank, as the central bank, which is the cardinal subject in the mentioned areas of the non-fiscal part of the financial law.

In the financial administration, there is a dual concentration, where the responsibility for financial administration is divided between the central bank and the Ministry of Finance. This dual concentration can be considered a manifestation of the horizontal deconcentration. It manifests itself in the fact that public administration is accomplished within the system of governmental administration and non-governmental public administration. In addition to the government, the representative of the government financial administration is the Ministry of Finance as the highest administrative authority, or the central body of the state administration, namely in the area of state finances (state revenues), insurance, cooperative finance, the capital market, etc. Relatively independent of the government, i.e. also of the Ministry of Finance, the Czech National Bank works as a financial administrative authority, namely in the area of supervision of the financial market, currency and foreign exchange administration. However, the financial administration also includes a financial control, which is carried out on the one hand in the system of the mentioned administrative authorities and on the other hand by the Supreme Audit Office.

Based on the above, the financial administration can be characterized as a horizontally and vertically deconcentrated. A horizontal deconcentration can be seen in the first instance of the financial administration, which is represented by a large number of tax offices. A vertical deconcentration manifests itself in such a way that that

the first instance (tax office) is obliged to assess and collect the tax, and the second instance serves as an option for redress. The another part of the financial administration, represented by the General Financial Directorate has the position of supervisor vis-à-vis the aforementioned authorities

This above-mentioned interpretation of subjects from the perspective of the principles of their organization can be followed in the framework of the financial administration by its concept in a narrower and broader sense. The decisive factor is whether public administration officials execute this activity as their basic competence, which is specifically theirs. According to this criterion, the financial administration in a broader sense can be considered as all activities that affect the material basis of the public sector, including the impact on the private sector, through the methods and forms of the public administration. In a narrower sense, the financial administration is limited to the activities of mainly deconcentrated authorities, whose competence includes the realization of executive power in the management of public funds, whereby the financial administration is limited only to the administration of public finances. Given the interconnectedness of the material basis of the public sector and public finances, it is appropriate to understand the financial administration in a broader sense.

3.4 Public and administration public subjects and their administrative law and finance law relationships

The specifics of administrative law relationships result from the fact that they arise and are accomplished during the execution of the public administration, and their subjects are bearers of authorizations and legal obligations established and secured by legal norms of the administrative law. Administrative law relationships are a reflection of the object of the administrative law regulation. (Průcha, 2012: 147)

Administrative law relationships are divided into so-called absolute (general) ones and relative (specific) ones. A decisive aspect is the certainty of the subjects of the relevant administrative law relationships. In the case of absolute relationships, administrative law relationships containing subjects determined only by a model, in the case of relative relationships, administrative law relationships accomplish among specific subjects of the administrative law, and the content of the administrative law relationships includes specific subjective rights and obligations. Within administrative law relationships, relative relationships prevail, i.e. specific administrative law relationships, which are typically individualized for subjects and concretized for content. In other words, these are real legal relationships between specific entities, when these entities become the bearers of mutually related rights and obligations, established by the relevant legal norm, under the conditions prescribed by the given norm. (Průcha, 2012: 148) In other words, it is a real administrative law relationship among specific subjects, where these subjects become the bearers of mutually related rights and obligations, established by the relevant legal norm, under the conditions prescribed by the given norm.

Another characteristic and mandatory feature of the administrative law relationship is the fact that one of its subjects is always a public administration authority with a characteristically superior position. On the other side of such administrative law relationship can be either another subject or subjects of the public administration, who may take the form of either another administrative authority or a natural or legal person towards whom the public administration is executed.

Financial law relationships can be understood as specific legal relations. Basic subjects of these relationships are the state and public law corporations, then especially banks, insurance companies, business entities including natural persons and other entities that are not established for the purpose of business. Financial relationships arise among these subjects during the creation, distribution and use of monetary funds.

Since the financial law (as well as the administrative law) is a branch of the public law, inequality primarily prevails in these legal relationships, where the state or bodies representing the state have a superior position. However, despite the public law nature of this sector, it is also possible to find a purely horizontal position of certain subjects. This fact will primarily concern financial administration authorities in the first instance. Conversely, the vertical position can be observed in the legal relationship between the Appellate Financial Directorate and the General Financial Directorate. Then one can speak of such a relationship as the superiority of one subject and the subordination of another subject. However, the majority of financial law relationships are vertical relationships, which is the case of the relationship between the state (represented by the relevant financial administration authority) and a tax subject.

As for specifics of financial law relationships with respect to their subjects, it can be stated that one of the subjects is always the state or authorities representing the state. Another specific feature is the fact that for some of the subjects, financial law relationships represent a property income, for others a property loss. This fact is caused by the property aspect of financial law relationships. The relationships among subjects of financial law relationships

are fundamentally unequal, which is due to public coercion by the state, which results in the power nature of these subjects.

3.5 Administrative and financial procedures

The administrative procedure is a manifestation of the authoritative application of the administrative law when deciding on the rights and obligations of individuals. In other words, the authoritative application of substantive legal norms of the administrative law by an administrative authority is realized in administrative procedures. The object of the administrative procedures is the decision-making activity of a public administration authority, the purpose of which is to issue a decision that establishes, changes or cancels the rights and/or obligations of the relevant subjects in a certain matter, or it is declared whether such subject has rights or obligations or has not. (Skulová, 2012: 31-32)

The aim of the administrative procedures is the issuance of an administrative decision as an individual administrative act. At least two subjects are always participating in administrative procedures, namely the subject of the public power, which, thanks to its superior position, establishes, changes or cancels rights and obligations (this is a constitutive decision with *ex nunc* effects) or authoritatively declares whether the person against whom the decision in the administrative procedure is issued has rights, or obligations or has not (this is a declaratory decision with *ex tunc* effects).

The term of the financial procedure is more general than the term of the administrative procedure. The financial procedure could be for example a tax administration expressing a procedure whose goal is the correct identification and determination of taxes and ensuring their payment. In other words, it is a set of activities of the financial administration in the application of the tax law. The term of the tax procedure expresses a procedure conducted for the purpose of correctly ascertaining and determining the tax and securing its payment. The tax procedure ends with the fulfillment or other termination of the tax obligation related to this tax. As part of the comparison with the administrative procedure, it can therefore be noted that the tax procedure is not defined by a formal initiation and its termination by the issuance or announcement of a decision. However, the term of financial procedure could be also a budget procedure of the state or municipalities.

On the basis of the above, it is clear that the term of the tax administration is a more general term than the term of the tax procedure, as it also includes the activities of the tax administrator carried out outside of ongoing procedures (e.g. search activity). The legal regulation of the tax procedure is contained in the tax code, which has priority over the administrative code.

The main subjects of the administrative procedure are the administrative authority and participants of the procedure. In addition to these two basic subjects, other subjects may appear in administrative procedures, in particular the so-called affected authorities (professional authorities such as the cadastral office in the procedure on land adjustments, or municipalities or regions) and other persons (usually the so-called interested persons). (Skulová, 2012: 72)

Subjects of the tax procedure are the same as subjects of the tax administration. Tax administration subjects include public administration authorities to the extent that they are legally entrusted with powers in the field of tax administration. These authorities include financial administration authorities or customs authorities, but also courts (court fees), municipal authorities (local fees) or building authorities (administrative fees) can be considered.

3.6 Tax procedure from the French perspective

Just as the way of thinking of French citizens is quite different, certain differences can also be found in the French tax theory. While within the Czech system of the financial law we are talking about the fiscal part (represented mainly by budget law, subsidy law or tax law) and the non-fiscal part (banking law, monetary law or foreign exchange law) of the financial law, in France, the financial law is presented by the area of very strictly defined public finances and other aspects are subordinated to banking law, or other branches of law such as public economic law.

The area of the tax law is understood as an integral part of public finances that belongs to the public law. In other words, tax law is considered a separate branch of law in France, just as the whole of financial law is understood separately in the Czech Republic. Whereas the Czech procedural tax law and substantive tax law have the same importance, according to the French tax theory, the position of the procedural tax law is dominant over the substantive tax law. This is due to the fact that the French tax procedure is made up of all norms that regulate tax activities, which allow actors (the financial administration and the tax subject) the so-called "tax discussion"

(a term of the French tax doctrine) to realize their rights (i.e. the right of the financial administration to collect taxes and the tax subject's right to pay tax only on the basis of the law).

The French procedural tax law is almost entirely codified in the *Livres des procédures fiscales* (i.e. analogue of the tax code), while French substantive tax law is codified in the *Code général des impôts* (i.e. analogue of individual substantive tax acts). This is another difference compared to Czech tax law, in which each tax is regulated in a separate tax law.

4 Conclusion

The presented paper was dealing with subjects of the administration and financial law and their role in the public and financial administration. In the paper, there were described typical characteristics of the subjects and their categories. The attention was drawn to the differences between public and financial administrations subjects. The principal objective of the paper was to analyse main characteristic of subjects of the administrative and financial law and to present some differences between these subjects of law. In this context, the structuring of the public and financial administration was clarified, including the introduction of organizational principles of the public and financial administration.

For a better understanding of the legal activity of public and financial administration subjects, the public law and financial law relationships of these subjects were also analyzed. On the basis of this analysis, the description and subsequent analysis of administrative and financial procedures could be approached. As a supplement to the global view of this issue, a description of the French tax procedure was presented.

Having analysed first subjects who execute the public or financial administration and subjects towards who the public or financial administration is executed, it can be noted that there are differences consisting in the category of persons. While natural or legal persons can be subjects towards who the public or financial administration is executed, the public or financial administration can be executed only by legal persons. Another difference lies in the different nature of tasks of administrative authorities. Administrative authorities of the public administration ensure an operation of the public administration, such as a building administration (buildings authorities), infringement procedures or issuing driving licences and identity cards (local authorities). On the other hand, authorities belonging to the financial administration are obliged to administer taxes – it means a tax collection or a control of subsidies. Authorities belonging to the financial administration include not only tax offices (the tax collection), but also municipal authorities (the local fees collection) and courts (the court fees collection).

As already mentioned in subsection 3.1, the notion of the public administration means the administration of the society, state and state´s individual territorial units. The financial administration is a specific section of the public administration, whose mission is to care for the material basis of the provision of public goods and the supervision (surveillance) of financial activities within the public sector. It is not realistic to provide an exhaustive list of administrative authorities of the public administration. But it is possible to summarize administrative and financial authorities according to the organization of the public and financial administration. As for the hierarchy of the state administration, the highest authority is the government composed of individual ministries. The Ministry of Finance is the supreme body of financial administration. In addition to the ministries, there are also so-called other central administrative offices operating throughout the state territory (e.g. Czech Mining Office, Security Information Service or Czech Statistical Office). At the lower level of the state administration hierarchy, there are administrative offices whose powers are limited not only materially, but also territorially (they are territorial administrative offices). These are, for example, social security authorities (District Social Security Administration), public health protection authorities (Regional Hygiene Stations) or Customs Directorate and customs offices that operate in the field of customs, customs policy, customs rates, customs statistics and other areas established by law. The financial administration is constituted by the Ministry of Finance, the General Financial Directorate, the Appellate Financial Directorate and tax offices that administer taxes, levies and advances on these incomes and administrative fees assessed and collected by them, administer subsidies, carry out financial audits, conduct procedures on offenses in the field of their competence.

The state administration is executed in a delegated authority by self-governing territorial corporations. The basis of the Act No. 128/2000 Coll., on municipalities is the so-called mixed system, where municipalities execute delegated powers (a certain part of local state administration) in addition to their own powers (self-government). The delegated power of municipalities is the decentralized state administration entrusted to municipalities by law on the basis of Article 105 of the Constitution of the Czech Republic. In a similar way, the delegated performance of state administration is dealt with in the Act No. 129/2000 Coll., on regions.

Another interesting juridical phenomenon are administrative law and financial law relationships. A common characteristic is the supremacy of a public or financial administration authority. On the contrary, a different feature is the applicability of the administrative and financial procedure in the practice. The result of the administrative procedure is a decision, which sets down rights and obligations of individuals in the sphere of the public administration. The financial procedure expresses, for example, the tax administration including actions of the financial administration concerning taxes – the identification and determination of taxes and ensuring their payment. The financial procedure can also expresses various budget procedures of public law corporations. The result of comparing the concept of the administrative procedure and the financial procedure is the finding that the concept of the financial procedure is a more comprehensive concept.

The paper also mentioned the example of tax procedure in France as a kind of the financial procedure. In this context, differences between the Czech and French concepts of financial law were recalled and the French legal regulation of tax procedure was mentioned.

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Financial literacy and specific conditions of debt repayment for seniors in the Czech Republic

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Abstract: The article is aimed at explaining the current situation of the specific conditions of debt settlement for the elderly in the Czech Republic, both by evaluating the current situation and the expected development in the near future after the approval of the amendment to the Insolvency Act, in comparison with other countries. The shortened insolvency regimes, which also apply to the elderly, have introduced new possibilities into insolvency law, especially for those debtors whose economic position is limited by certain factors and whose economic handicaps. In particular, it is an evaluation of the question concerning material deprivation of the household, which shows that seniors in the Czech Republic usually cannot afford a week's vacation away from home or pay for an unexpected expense. Based on this finding, it can be concluded that seniors build financial reserves for purposes other than meeting their own needs. The main objective of this article is therefore to show the most common reasons why seniors currently borrow money, from which institutions they borrow money, what things seniors could not afford in the past year, how many seniors have used the institution of debt relief.

Keywords: Debtor, senior, insolvency, insolvency law

JEL Classification: A22, G33, G39, G51

1 Introduction

This article focuses on senior debt repayment, first focusing on the theory of senior debt repayment, and then presenting the legislative development of senior debt repayment in a temporal context, from 2008 to the present. Over time, the conditions for personal bankruptcy have constantly changed, and seniors have not always been able to meet these challenging conditions and thus even achieve the initiation of insolvency proceedings (IP). It was only over time that more favourable conditions for the insolvency of seniors were introduced into *Act No. 182/2006 Coll. on bankruptcy and methods of its resolution, as amended* (InsZ), which opened up the possibility of the insolvency institute for many seniors who were in their executions. It is also indicated what effect the implementation of the Directive of the European Parliament and the Council (EU) into our legal system, which is expected to come into force in 2023 or 2024, would have on the insolvency of seniors. This Directive needs to be implemented into domestic law for the reason that it is necessary for the Czech Republic to honour the same rules as other EU countries, as it is part of the EU single market.

It is also important to mention that a very common problem that is currently ignored is the issue of courts deciding that the initiation of an IP must be issued by a court. Only insolvency courts (ISo) with jurisdiction under Article 3 of Regulation (EU) 2015/848 of the European Parliament and of the Council have such jurisdiction, which provides that the courts of a Member State are empowered to initiate an IA, but only if the main interests of the debtor are within the territory of such Member State. However, some publications deliberately try to avoid the situation, which would deal with a step-by-step description, of a court of a Member State without jurisdiction initiating an IJ. However, a Regulation of the European Parliament and of the Council (EU) cannot lay down any principles for dealing with the issue outlined above. Each individual state has the right to defend itself against any unjustified decision of the ISo, both through the normal 38 mechanisms and through proceedings before the Court of Justice of the European Union. If the decision to initiate an ISO is issued in another member state, then, pursuant to Article 3 of Regulation (EU) 2015/848 of the European Parliament and of the Council, the proceedings have the same effects as if they had been initiated in the state in which the proceedings were initiated. In the situation where the main insolvency proceedings are opened by the ICO of the relevant member state and are recognised in another

member state, the court of the second member state has the possibility to open ancillary insolvency proceedings. The insolvency of the debtor does not then have to be reassessed in the other member state where the ancillary insolvency proceedings may be opened if the main ICO required the debtor's insolvency. The last important condition specified in Article 3 of Regulation (EU) 2015/848 of the European Parliament and of the Council is the debtor's assets in the secondary insolvency proceedings. Indeed, the effects of an ancillary proceedings can only apply to the debtor's assets situated in the member state in which the proceeding is opened. The relationship between main proceedings and ancillary proceedings has been widely debated from the outset. The closest link between the two can be considered to be the fact that the opening of ancillary proceedings is a prerequisite for the opening of the main proceedings, while ancillary proceedings are acceptable to be opened in all other states that retain their relative autonomy and procedural independence (Bělohlávek, 2020). The amendment to the Insolvency Act that will implement the Directive will result in many changes to the existing Insolvency Code and will affect the insolvency of the elderly too.

The article continues to show the analysis of the questionnaire survey, the research conducted between August 20, 2022 and February 1, 2023. Based on the findings thus obtained, it is possible to gain a better understanding of whether seniors are to be financially literate, what situations lead them to borrow money, and how they are able to cope in today's times marked by the constant rise in the price of food, medicines and fuel if they are dependent on their pension to meet their basic needs.

It should also be stressed that many seniors who have already found themselves in debt relief are often unable to pay even the minimum amount of debt relief, which is CZK 2,200 per month, as due to high inflation currently averaging around 11.1 %. As a result, seniors are forced to look for a full-time job or part-time work from which they would be capable of paying the minimum monthly amount of the debt settlement, which is compulsory for everyone. If the senior fails to make the mandatory minimum monthly payments, the debt relief is cancelled. It is also necessary to mention that many entrepreneurs are currently abusing the institution of debt relief, because even if they are insolvent and unable to pay their debts, they wait until retirement age to pay their debts. This delaying of insolvency has only one meaning, namely that entrepreneurs do not want to pay as much money under insolvency later than they would have to pay in their pre-retirement age' insolvency. The vast majority of entrepreneurs believe that once they become seniors and file for a bankruptcy petition together with the insolvency petition, it would be sufficient to pay only the minimum monthly amount of CZK 2,200 to successfully complete the bankruptcy. However, in a situation where the debtor has more than CZK 1,000,000 in claimed debts, the insolvency court puts much more pressure on the insolvency administrator to satisfy the creditors' claims in order to achieve a higher percentage of satisfaction. In view of the above-mentioned situation, it would be good to introduce additional conditions or rules into the insolvency institution that would strictly prohibit such behaviour of entrepreneurs.

1.1 Debt relief for seniors

At the very outset, it is desirable to ask the question: *"What is debt relief?"* Debt relief, or personal bankruptcy, is a way to help a debtor who is in a situation where he or she is no longer able to pay his or her debts.

- From the point of view of the article, the most important way to deal with bankruptcy or imminent bankruptcy of a senior citizen is debt relief. It follows from the Insolvency Act that a debtor is bankrupt if he has several creditors with whom he has monetary obligations more than 30 days overdue and he is unable to meet these obligations. Therefore, a situation where a debtor has multiple debts, but to the same creditor, cannot be considered bankruptcy. The debtor is insolvent then:
- when he/she has multiple creditors (at least two),
- when he/she has debts more than 30 days overdue and is unable to repay them,
- stopped paying a substantial part of his/her monetary obligations,
- he/she has been in default for a period of more than three months (this legal presumption is, by design, more useful to creditors than the condition set out in point three),
- if it is not possible to obtain satisfaction of any of the outstanding obligations by enforcement or execution,
- the debtor has not fulfilled the obligation to submit a list of his/her assets, debts, employees and documents proving bankruptcy or threatened bankruptcy,
- each of these variants, as elaborated in the previous six points, is considered to meet the conditions for the debtor to be insolvent (Sprinz, Jirmásek, Řeháček, Vrba, Zoubek, 2019).

The current legal legislation provides for an easier process of debt settlement for people in old-age pensions and invalids in the second and third degree (Glogar, 2021). They are not subject to the condition to repay at least 60 %

of their debts within a given period of time, i.e. within three years. These people can repay debt in as little as three years, but can only choose this option once in their lifetime. In any further insolvency proceedings of the same debtor, a reduction of the repayment period under the cited exceptions could be granted only for reasons of special consideration (Strnad, 2019). If such a debtor meets the relevant conditions on the date of the decision on the approval of the debt relief, the court will subsequently reduce the period of debt relief for the purpose of assessing the fulfilment of the debt relief to three years. The arrangement will then be fulfilled regardless of the actual level of creditor satisfaction. The only condition is that the arrangement must not be revoked during the three-year period.

The 30-day time test was adopted into our law mainly to ensure that the Czech Republic, on the initiative of the EU, complies with its obligation as a member state in relation to European legislation. The whole of this legislation was linked to the creation of the right to payment of default interest and is contained in Section 369a of Act No. 513/1991 Coll., the Commercial Code, as amended. This introduced into the Czech legal system the principles of Directive 2000/35 of the European Parliament and of the Council on measures against late payment (Moravec, Kotoučová, 2021).

A special case of bankruptcy is a situation where the debtor is either a legal entity (hereinafter referred to as a legal entity) or a person (hereinafter referred to as a person) who is an entrepreneur and is over-debted. Over-debtedness occurs when the debtor's aggregate liabilities exceed the value of his assets and when the debtor has multiple creditors. If the value of the debtor's assets is determined, it must be assumed that the debtor will be able to continue to manage the assets or to operate the business[13].

The definition of debt relief can be found in Sections 389 to 418 of the Insolvency Act. It is clear from the provisions of Section 389 that every person as well as legal entity, which does not have business debts and is not considered an entrepreneur under the law, may propose that its existing or threatened bankruptcy be resolved in the form of debt relief. Since January 1, 2014, a proposal for the authorisation of debt relief may also be filed by a person which is an entrepreneur and whose business debts remained unsatisfied after the bankruptcy was closed or if the creditors of the unsatisfied claims agreed to the resolution of the bankruptcy in the form of debt relief [13]. Another important point is that only the debtor is entitled to file a proposal for the authorisation of debt relief on his/her own behalf. A creditor is not entitled to take such a step, even if it has a sufficiently large number of claims against the debtor.

According to Section 398 of the Insolvency Act, the partition can be implemented in two ways, namely:

- by sales of the assets,
- by means of a payment plan with the sales of the assets.

Until 2019, the instalment plan method of payment was allowed, but with the *law* coming into force 31/2019 *Coll.* in force as of 1 June 2019, it is only possible to comply with the instalment plan with the sale of the assets, as the law no longer allows the instalment plan method.

The first method relates to the sale of the assets in the case of insolvency. This execution works on the same principle as the sales of the assets in bankruptcy as they both have the same effect. The proceeds of the assets sales are used to satisfy the claims of the debtor's creditors. However, in this case, the assets acquired by the debtor after being granted the arrangement are not included in the estate (Smolík, 2016).

On the other hand, in the second option, i.e. the implementation of the repayment plan with the monetisation of the assets, the debtor is obliged to surrender his assets registered in the estate to the insolvency administrator for monetisation. Pending the issuance of a report on the fulfilment of the arrangement, the debtor is obliged to pay the same amount per month from his income to his unsecured creditors as would correspond to the satisfaction of priority claims in the execution of the execution. The repayment plan with asset sale may be terminated and discharged even earlier than after five years if the debtor is a second or third-class old age or invalidity pensioner, where the debtor is obliged to pay at least the minimum monthly instalments for three years or if the debtor repays at least 60 % of the claims of unsecured creditors within three years or repays the unsecured creditors in full (Moravec, Kotoučová, 2021).

The main difference between the two aforementioned methods of repayment lies in the fact that the first method, repayment by monetisation of assets, leaves the debtor with assets and future income which he/she will receive or acquire after the repayment is approved. In contrast, under the second type of insolvency arrangement, the debtor is obliged to monetise the assets determined by the court and, after the approval of the insolvency arrangement, to pay a certain part of his future income.

2 Significant changes in the area of debt relief for pensioners

On January 1, 2008, the new Insolvency Act was forced in the Czech Republic, replacing the previous *Act No. 328/1991 Coll., on Bankruptcy and Settlement*. However, this legislation did not take much into account the insolvency of seniors, who had strict conditions that had to be met in order to start insolvency, and therefore only 8 % of seniors aged over 65 years met the insolvency conditions. Based on Table 1, it can therefore be said that from 2008 until 2019, when *Act No 31/2019 Coll. amending the Insolvency Act and a number of other acts* came into force, the number of pensioners in foreclosure executions ranged from 85 000 to 87 000 pensioners. The table further shows that the number of pensioners with execution deduction has been decreasing since December 2020. Compared to 2016, there were 14,613 fewer pensioners recorded in 2020. The largest decrease can be seen in September 2022, when the number of seniors with execution deduction dropped to a figure of 52,196. These decreases in figures are due to the amendment to the Insolvency Act, which is in force as of June 1, 2019 and which allowed seniors to go through foreclosure in a shortened time and under much more lenient conditions than ordinary debtors and than seniors had had so far (Cyhelsky, Kahounová, and Hindls, 1999).

Table 1 - Number of seniors with foreclosure deduction from 2016 to 2022

12/2016	12/2017	12/2018	12/2019	12/2020	12/2021	12/2022
85 028	86 969	86 575	86 472	70 415	69 750	52 196

Source: Czech Social Security Administration, own processing

Furthermore, it is important to mention the impact of Directive (EU) 2019/1023 of the European Parliament and of the Council, which could be implemented in Czech case law as early as 2023, and the amendment to the Insolvency Act can be expected to come into force even earlier than January 1, 2024, probably on September 1, 2023. The key change in the forthcoming amendment to the Insolvency Act is the reduction of the insolvency period to three years for all debtors, but this is not the only change that the amendment to the Insolvency Act would bring about. Another forthcoming change would concern, for example, the sale of the debtor's assets. If any property included in the debtor's estate that has not been sold within the framework of the insolvency arrangement, it may still be sold even after the insolvency arrangement has been terminated. Further changes are to be made to the remuneration of insolvency administrators (IA) and the debtor's obligation to provide the administrator with cooperation in the sale of the debtor's assets after the end of the arrangement. However, the amendment to the InsZ would not change the period of registration of debtors in the insolvency register, which is five years after the end of the insolvency today (Žižlavský, 2023).

The most important change from the seniors'perspective can be considered the changes concerning IS remuneration. Previously, IS remuneration was paid only during the course of the insolvency and IS was no longer entitled to claim any remuneration once the insolvency was completed and fulfilled. Now, based on a directive of the European Parliament and the Council (EU), it is envisaged that although the monthly remuneration of IS will remain unchanged, IS will only become entitled to a higher remuneration after the end of the insolvency. In practical terms, however, this means that the IS will continue to be able to deduct money from the debtor beyond the non-forfeitable amount even after the end of the insolvency, with certain disadvantages for the elderly. According to the current InsZ regulation, insolvency for the elderly is fulfilled after three years and there is no minimum repayment condition. However, the amendment to the Insolvency Act show that the new rules, which could come into force in 2023 or 2024, would extend the repayment period for seniors, since the insolvency administrator would still be able to deduct money from the debtor (Hovorka, 2022).

The authors add to the text of the amendment to the Insolvency Act that at present (July 2023) the amendment to the Insolvency Act is approved by the Chamber of Deputies and then by the Senate, and then it still has to be signed by the President of the Czech Republic, so in practise this means that its final version can be updated by amendments, and also its effectiveness can be postponed until January 1, 2024, assuming that the Senate does not approve the amendment and returns it to the Chamber of Deputies for further processing. Last but not least, it is also necessary to point out the significant impact of creditors, whose claims are significantly shortened and will be shortened even more after the approval of the amendment.

It is therefore only a matter of time before this directive comes into force and what negative effects it will have on the debt settlement of seniors. The current legislation is positively favourable to seniors compared to previous laws and decrees, resulting in a higher percentage of seniors becoming insolvent and reintegrating into normal life. However, once this directive comes into force, second or third-degree elderly and disabled seniors will no longer fall into the so-called protected category, which had more lenient conditions for debt relief. In fact, all debtors, regardless of age or disability, will now be subject to a reduced insolvency period of three years.

Once the amendment to the InsZ is implemented into the Czech legal system, a percentage increase in seniors with enforcement deductions from their pensions can be expected, as debt settlement will no longer be as advantageous and attractive for them as it was before the introduction of the directive into the domestic law (Hovorka, 2022).

3 Methods

Data evaluation was carried out using the questionnaire survey method. Questionnaire survey is one of the techniques of data collection in the field, in which the necessary information is obtained from the respondents in written form through the questions contained in the questionnaire. Currently, either paper questionnaires or electronic questionnaires created in an online environment are used.

3.1 Questionnaire survey

The questionnaire survey was conducted on the basis of the chosen topic of the article and its aim is to determine the financial literacy of seniors today, as well as their awareness of the possibility of using the insolvency institute in case of existing unpaid loans and finding themselves in a debt trap. The questionnaire was sent and presented to a diverse group of seniors from different social strata in the course of procuring the material for the article, in order to obtain a generally valid sample. A total of 184 responses were obtained from seniors living in a retirement homes or attending a university of the third age, debt counselling centres or various courses for seniors. In this section of the paper, the data from the questionnaire are used to analyse the individual questions, some of which are graphically displayed. For the purpose of the article, only the essential questions that are relevant to the topic are selected from the questionnaire.

In this part of the article, the data from the questionnaire is used to analyse the individual questions, which are graphically displayed below. The questionnaire contains a total of 27 questions, and for the purpose of this article selected and specified were only those questions relevant to the topic. The processed results of the questionnaire show that the vast majority of the respondents were women over 70 years with secondary education graduated, who received a monthly pension between 16,200 and 21,000 CZK.

Figure 1 - Material deprivation of the household (select from the following options items that the household could not afford in the previous year)
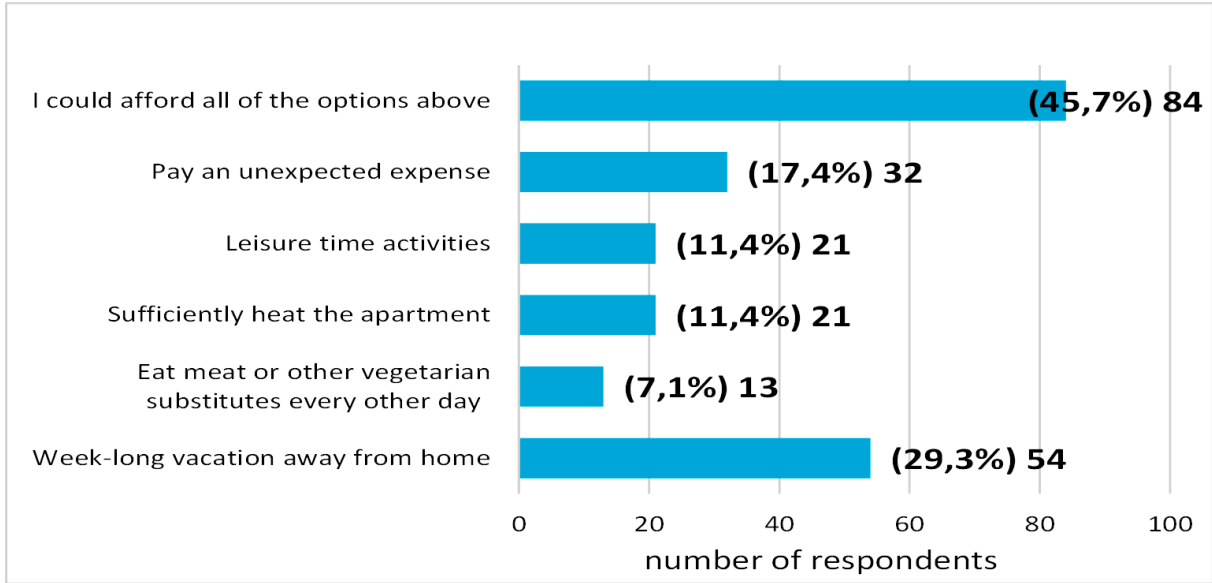
Source: own processing

Figure 2 - How high is your reserve?
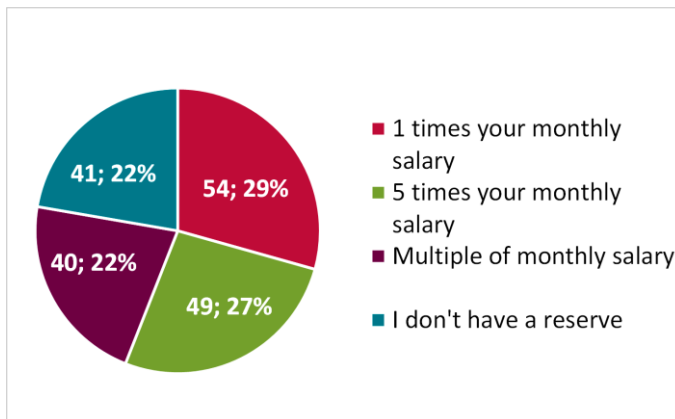
Source: own processing

Figure 3 - The most common reasons for getting into financial problems?
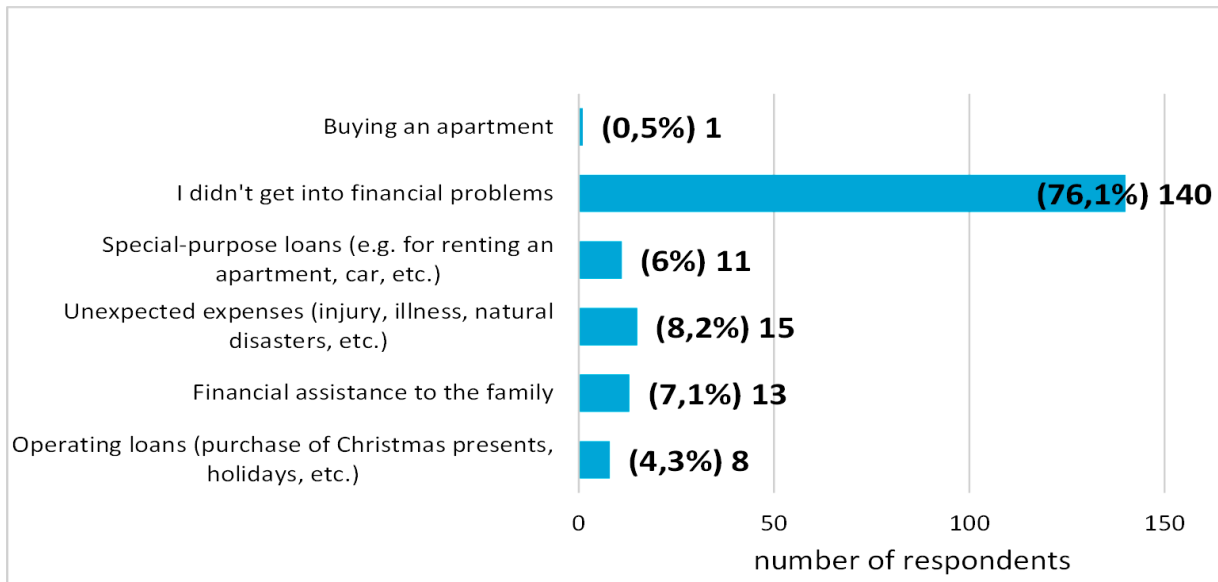
Source: own processing

In view of the initial increase in food and especially energy prices at the end of 2021 and the beginning of 2022, the questionnaire (Figure 1) on household material deprivation is evaluated, which show that seniors were mostly unable to afford a week's vacation away from home or to pay for an unexpected expense, even if the vast majority of seniors were building up financial reserves in the household, and the amount of reserves of each respondent can be deduced from Figure 2. The figure show that the vast majority of seniors build up financial reserves equal to once their monthly salary. Based on this finding, it can be concluded that seniors build financial reserves for purposes other than meeting their own needs. The results of the questionnaire also serve as a basis for assessing the most frequent reasons for the indebtedness of seniors, who indicated unexpected expenses, financial assistance to family and/or purposeful loans as the most frequent reasons, and this question is shown in Figure 3.

Figure 4 - Do you know what the size of your debt is at the moment?

4; 21%
1; 5%
4; 21%
10; 53%

- Up to 150 000 CZK
- 150 000 – 300 000 CZK
- 300 000 – 450 000 CZK
- More than 450 000 CZK
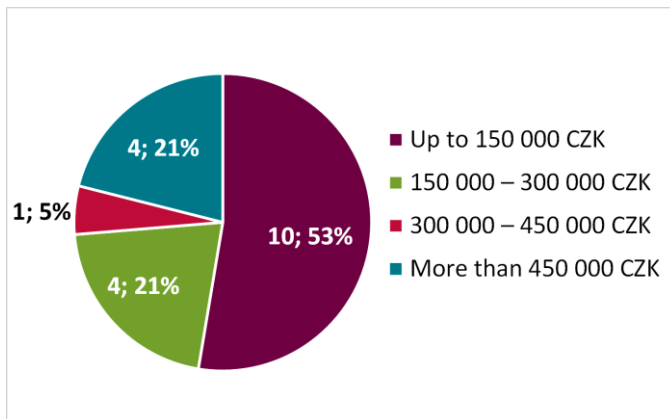
Source: own processing

Figure 5 - How many loan or credit agreements have you signed?

10; 53%
9; 47%

- 1 contract
- 2 – 4 contracts
- More than 4 contracts
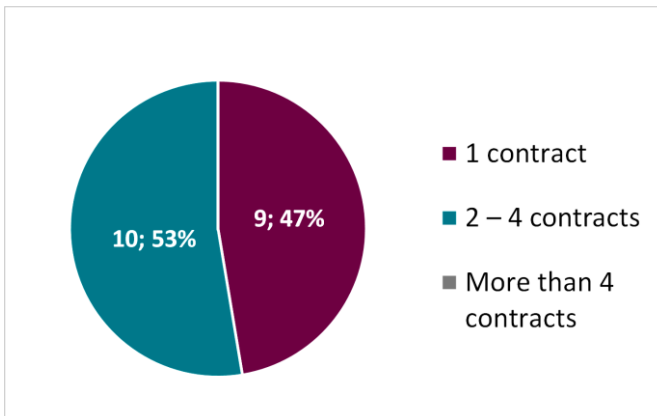
Source: own processing

The questionnaire survey also showed that out of a total of 184 respondents, only 19 seniors are in debt, with the amount of their debt being mostly up to CZK 150,000, which can be seen in Figure 4. Figure 5 shows that the vast majority of seniors have signed one or two to four contracts.

Figure 6 - Did you understand the written contract? Did you know what you were signing?

3; 16%
8; 42%
8; 42%

- Definitely yes - I understood everything, everything was explained to me
- Rather yes - some things I did not understand
- Not really, but I didn't really understand the contract, but I needed money
- Absolutely not - I did not understand the contract or read it thoroughly
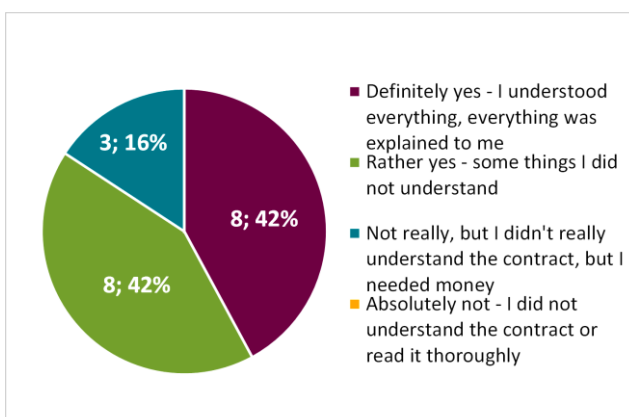
Source: own processing

Figure 7 - Are you in debt relief?

7; 37% ■ Yes

12; 63% ■ No
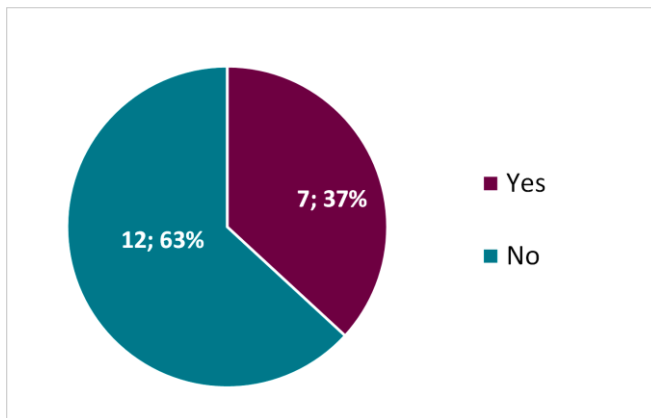
Source: own processing

Based on Figure 6, the financial literacy of seniors can be inferred, where, taking into account the most frequently reported educational attainment (full secondary education), one would expect good financial literacy, which was confirmed because, as can be seen from the figure, 42 % of the respondents said that they understood everything written in the contract or understood the content of the contract partially. Figure 7 show that only 7 out of 19 seniors who were in debt have used the institution of debt relief.

Figure 8 - What is the non-confiscatable amount left for you?

1; 14%

6; 86%

■ Up to 12 000 CZK

■ 12 000 – 16 000 CZK

■ 16 000 – 20 000 CZK
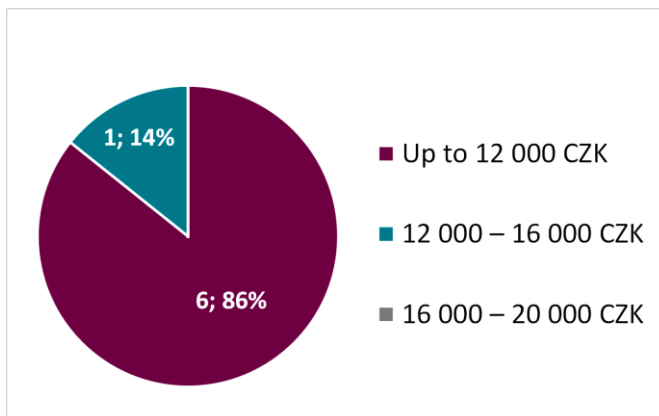
Source: own processing

Figure 9 - How much monthly deposits do you pay for utilities?

3; 43%

4; 57%

■ Up to 5 000 CZK

■ 5 000 – 12 000 CZK

■ 12 000 – 20 000 CZK

■ More than 20 000 CZK
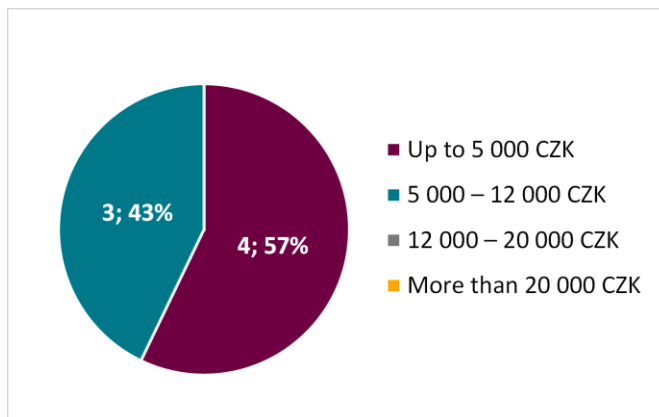
Source: own processing

Last but not least, it can be inferred from Figures 8 and 9 that the uncollectable amount of seniors who used the institution of debt relief was mostly up to CZK 12,000, and it can still be seen from the above figures that, despite the significant increase in energy prices in 2021 and 2022, most seniors paid monthly energy bills up to CZK 5,000.

The questionnaire survey shows that out of all 184 respondents, only 19 seniors were in debt and the amount of their debt was mainly up to CZK 150,000. The vast majority of seniors borrowed money from banks, nonbank institutions, or family and signed one or two to four contracts. On the basis of the results detailed above, the financial literacy of seniors could also be assessed, where, taking into account the most frequently reported educational attainment (full secondary education), good financial literacy could be expected, which was confirmed.

4 Discussion

Hui's study uses microdata from the Canadian Financial Capability Survey to examine financial knowledge and financial confidence among seniors (65 years and older) and those close to seniors (55 to 64 years). The study examines how financial knowledge and confidence relate to three areas of financial behaviour that are critical to retirement readiness: money management and debt handling, planning for the future in relation to savings, financial best practises, and protective measures. The study also compares individuals' level of financial knowledge with their financial confidence scores. Thus, people are classified as underconfident, overconfident or overconfident based on their financial confidence in relation to their financial knowledge. The results of the quantitative analysis suggest that financial confidence has a significant impact on the retirement readiness of seniors and nearly seniors. The analysis also show that financial confidence is positively correlated with financial knowledge. Among seniors with high financial knowledge, lack of financial confidence can lead to behaviours that appear inappropriate in managing finances. Thus, self-confidence can guide seniors with low financial literacy toward financially desirable behaviours in several key areas, namely managing debt, managing bank accounts, building savings and otherwise acquiring assets, owning more than one account, creating multiple insurance products, and generally being better prepared for unexpected expenses. The overconfidence associated with higher knowledge among seniors can already lead to poorer financial decisions about how to manage accounts or pay unexpected expenses, and they are more likely to be in debt. In general, therefore, underconfident seniors are at higher risk of financial mismanagement – they are unable to manage money and deal with debt, plan for the future, save or otherwise control their finances. The findings suggest that financial literacy education programs and initiatives must strengthen both general financial knowledge and financial confidence among seniors. When designing and targeting programs to increase financial skills, it is important to consider not only the financial and cognitive abilities of seniors, but also their changing financial confidence in key areas of money management (Hui, 2016).

Doll et al. (2017), in a study conducted on 351 seniors in Brazil, found that more than half of the seniors had some debt (57.3 %), most often caused by other family members (35.8 %). Even as many as 25.9 % of seniors showed signs of severe indebtness. And this factor was also found to be positively correlated with their inability to give up their wants and needs. Other common reasons for indebtedness were critical life events such as disasters, death, illness or unemployment.

Finke et al. (2017) show in their study financial awareness of Americans is declining in retirement. This is troubling because seniors over 60 years old generate more than half of the wealth in the United States. With fewer employers providing pensions than ever before, more people are completely dependent on their retirement savings. In their study, the authors report that financial literacy increases for individuals until about age 50 and then tends to decline. The authors also point to the high level of self-confidence in financial decision-making among seniors, which is still above 70 % between the ages of 60 and 90, while financial literacy, along with cognition, severely declines from 70 % to 20 %. Also, the study say that the downward trend in financial literacy is analogous for all sub-areas such as basic financial management, credit, loans and investments.

The results of another study showed that financial literacy education, along with demographic and financial attitude factors, play a key role in financial planning for retirement, thus before retirement itself. The results further suggest that psychological factors such as money goal setting, early exposure to positive financial influences, and financial awareness influence the financial education of older adults, which ultimately affects financial planning related to retirement. To improve financial planning for retirement, policy makers and governments should implement financial literacy education policies that would help older people with financial planning and retirement with greater financial freedom and awareness (Sel Vadurai, 2018).

The analysis of financial literacy of seniors in Poland allow us to draw the following conclusions. Higher education and financial literacy determines their further investments and savings. Half of the seniors surveyed are dissatisfied with their available resources and income. More than two-fifths of seniors have financial resources in the form of cash, bank deposits or securities. Around 60 % of seniors admit to having no savings, and 5 % of them say that they had had some savings before retirement, but have already spent them. A large percentage of seniors with savings have invested them in cash or in bank deposits in zlotys. The least common choice for seniors is investing in securities. Seniors who can save some savings report that they most often save for unexpected situations, medical care, rehabilitation, helping their own children, fixed fees, and current consumption expenses (Zalega, 2016).

The following article examined the relationship between financial literacy and private pension saving for retirement in Germany. While in aggregate Germans scored relatively high on financial literacy questions, this was not the case for those who attended lower secondary school only. This is worrying, as not only do they lack basic financial knowledge, but they are also a group in which only 40 % of them hold private pension plans. This may be because they do not know how to calculate their pension entitlements or because they do not know all the different types of pension savings plans available to them. However, women scored significantly lower than men on the financial literacy questions, but almost as many women as men have had a private pension accounts. Seminars on basic financial skills and retirement security aimed at those with low education could help them decide on the appropriate level of private retirement savings (Honekamp, 2012).

In an analysis of financial literacy in Austria and Switzerland, Aubrama et al. (2016) concluded that financial literacy is at a higher level in Switzerland when comparing the two countries. They also showed that higher financial literacy has positive effects on the level of retirement planning, which is true for both countries analysed. They also showed that older people are more interested in saving for retirement compared to younger people. Other findings were also interesting, e.g. despite higher financial literacy among people working in financial services, they did not show a greater need to save for retirement (Sprinz, Jirmasek, Řeháček, Vrba, Zoubek, 2019). In contrast, Fessler et al. (2020) point out in their paper that financial literacy is lower among Austrian citizens "rather younger" (so-called young millennials: 15-28 years) and people over 75 years (the so-called silent generation) in three areas: financial knowledge, financial attitudes and financial behaviour.

Dealing with debt and financial literacy can be summarised as a global issue that needs to be addressed because, according to a study (World Population Ageing 2017: Highlights [online]), most countries are experiencing an increase in the number of seniors in the population due to low or declining fertility. In 2017, globally, one in eight people was aged 60 or older. By 2050, it is projected that one in five people would be seniors. Population ageing is most advanced in Europe and North America, where more than one in five people were already 60 years or older in 2017. The smallest number of seniors is in Africa, where the prevalence of seniors in the population is projected to be 9 % in 2050.

5 Conclusion

Based on the results of our own questionnaire survey, we can evaluate that the financial literacy of the seniors who participated in the questionnaire survey was good. However, it is not possible to say that seniors do not have financial problems and are financially literate enough, just based on the selected sample. Many seniors today still borrow money to make purchases on the Internet, to buy home sales or because of the constant rise in food prices, for example.

Recently, there has been a growing trend to borrow money, but for seniors, the reason for this behaviour can be seen mainly in the low pensions they receive, from which they are unable to cover even basic expenses, due to rising inflation. Therefore, many seniors borrow money, but no longer take into account that they will not be able to repay the loan in a given period of time. It is also worth noting that the vast majority of seniors are very trusting and easily influenced and often take the word of the lender without reading the contract and familiarising themselves with its terms. Some seniors also borrow to help a relative, girlfriend, or friend financially or to 'wedge' a loan, which means that they try to pay off an existing loan that they do not have the funds to repay by taking out a new loan.

In the context of the anticipated development and the proposed amendment to the Insolvency Act, we can state that this will have the least impact on the elderly, as the three-year period of debt settlement for the elderly has already been in place as of June 1, 2019. The recommendation would be, in particular, based on practical experience, to clearly establish and tighten the rules for the authorisation and subsequent approval of insolvency so as to eliminate the possibility of purposeful insolvencies for seniors, or dishonest insolvency proposals, and to clearly establish the condition in the legislation that under these conditions there is only one such an insolvency.

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Evaluation of clients in the provision of outpatient care in the field of neurological and mental diseases of the company MENSSANA, z.ú. within the territory of the Moravian-Silesian Region

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Abstract: The contribution is focused on the evaluation of the prerequisites for the provision of selected social services for the population. The primary aim of the paper is to evaluate the number of clients using the services of the Memory Training Center, which is part of the company MENSSANA, z.ú. The number of clients using social rehabilitation services, which are intended for persons with chronic mental illness in the form of outpatient and outreach services, is evaluated. The output of the contribution is a more detailed description of clients who used cognitive rehabilitation services in 2015-2021. The evaluated organization operates in the Czech Republic on the territory of the Moravian-Silesian Region and is a registered provider of social services in the field of social rehabilitation and at the same time a provider of additional activities that are not social services according to Act No. 108/2006 Coll. On social services, but as such they complement social services. As part of the paper, the network of social services in the territory of the Moravian-Silesian region in service providers for mental illness is also evaluated and the potential number of clients of this service is assessed through the granted care allowance. Based on the analysis carried out, it was found that interest in cognitive rehabilitation was growing in the evaluated organization in the period before the Covid-19 pandemic and declined only with the onset of the Covid-19 disease in 2020, which continued in 2021. Until 2019, the most frequent clients for cognitive rehabilitation were clients with neurological diseases, which from 2020 were replaced by clients with mental illnesses. The analysis of potential clients of the network of social services in the Moravian-Silesian region showed that this number increases slightly over time. Providers of outpatient cognitive rehabilitation services do not compete spatially in most of the Moravian-Silesian Region, except for the cities of Ostrava and Opava.

Keywords: Cognitive rehabilitation, company Menssana, z.ú., mental illness, Moravian-Silesian Region, neurological disease, social services

JEL Classification: H42, H44, I15, P43

1 Introduction

Under the term "social services", the majority of the population imagines a typical client at a senior age, i.e., 65+, which is a completely wrong assumption right from the start. But it is true that the aging of the population is a phenomenon that none of us can influence and at the same time cannot avoid, which in practice means that the increasing number of seniors also increases the number of clients who use social services. In today's hectic times, full of stressful issues, various health complications associated with various mental problems are beginning to appear even among residents under the age of 65, which must be dealt with in some way in society. The number of clients who have been diagnosed with one of the chronic mental illness disorders increases over time, and thus a certain pressure is exerted on the providers of these social services. The truth is that the population of the Czech Republic is gradually aging, so the question arises whether there are well-developed health and social systems, or a network of organizations that provide the population with a dignified life not only in old age, but also when the health or social situation of clients (not only seniors) deteriorates. A network of organizations providing various social services to citizens, both for payment in a market-oriented environment and as part of the co-financing of services through public budgets, is currently in the Czech Republic, due to the deepening economic insecurity of a large number of people (increasing prices of essential life needs due to inflation; the rise in energy prices as a result of the war conflict in Ukraine; the approaching economic crisis) is a hotly debated issue. Neither the long-term insufficient financial evaluation of workers working in social services nor the method of financing organizations that provide social services, usually based on short-term grant schemes provided from public budgets, contribute to solving the aforementioned problem in the current Czech Republic. The financing of social services is rather undervalued in the long term, which is also reflected by the lack of interest in jobs in this area of employment. These prospects, together with the ever-expanding number of clients, not only existing but also potential ones, open up a whole range of questions to which it is not easy to find an answer. In the long term, even

increasing pressure on efficiency in spending public funds from different levels of public budgets does not contribute to the development of social services in the Czech Republic. The pressure on research within the framework of public spending is constantly increasing, together with the increasing life expectancy of the population, low birth rate, the increasing age of young people starting work, but also other economic problems.

The practical part of the contribution is focused on the evaluation of the number and character of clients using the social services of cognitive rehabilitation in the Memory Training Center, which is part of the company MENSSANA, z.ú. The long-term primary goal of the organization is the integration of selected target groups of the population with disabilities or disadvantages into the work process and the abandonment of long-term records of unemployment statistics maintained by individual employment offices. The company is a registered provider of social services and at the same time a provider of additional activities that are not defined as social services according to Act No. 108/2006 Coll. on social services, but as such they complement social services. The aim of the contribution is to evaluate the number of clients using social rehabilitation services, which are intended for people with chronic mental illness in the form of outpatient and field services within the Memory Training Center at the organization MENSSANA, z.ú. The sub-goal of the contribution is to evaluate the number of potential clients of social services in the Moravian-Silesian Region through a contribution to care and a network of outpatient services for persons with mental illness in the Moravian-Silesian Region.

2 Social services in the context of public policy and in the theory

Potůček (2016) states that public policy as a scientific discipline includes several elements from a number of areas that define the scope for social policy action. Public policy can be defined as a discipline that works through and applies explanatory frameworks of sociology, economics, political science, law, management theory and other fields to analyze and forecast the processes of formation and application of public interests, weighted towards the solution of differentiated social problems. Among the political instruments applied in public policy, Potůček (2016) considers public administration, law, power instruments, information means, means of communication and also public social services. In this context, social services are understood as public services that are part of public policy. In another work, Potůček (1995) states that social science includes a range of social problems of society and related analysis of solutions, as well as methods for influencing social phenomena. In a similar vein, Tomeš (2010) states the same.

Public services, as the name implies, are intended for the general public, at the same time they are linked to public budgets, and their regulation is given by legislation, unlike other services, and this creates a dependency between public services and the political decision-making of the state, regions or municipalities (Matoušek et al., 2007). Public services were also defined by Brůna et al. (2005) in a document published by the Ministry of the Interior of the Czech Republic, as services that belong to public administration bodies, which created them mainly for the purpose of providing services through which the needs of society are to be fulfilled in accordance with the principle of subsidiarity. Jech (2014) states that financial support is tied to securing the operation of a specific public service and from different levels of public budgets, which is also stated by Varadzin and Bečica (2016).

According to the Social Services Act, social service means an activity or a set of activities providing assistance to persons who are at risk of social exclusion, which includes prevention against social exclusion and activities aimed at supporting social inclusion. In § 32 of the Act on Social Services, types of social services are included, which are social counseling, social care services and social prevention services. It is evident from the above list that the issue of social services is quite broad. The predominant target group of social services can be, for example, children and youth under the age of 26 at risk of socially undesirable phenomena, victims of domestic violence, homeless people, people at risk of addiction or addicted to addictive substances; persons with chronic mental illness; persons with combined, mental, physical, hearing, medical or visual disabilities. Furthermore, it can be people in crisis, people living in excluded locations or people who lead a risky way of life. We also include families with children and seniors here. This list of target groups of social services also corresponds to a number of different social service providers (publicly or privately established), different forms of financing social services (from public sources, private sources or their various combinations) and different forms of providing social services (residential x outpatient x field), which can be included under social services in the Czech Republic.

Matoušek and Koldinská (2007) define social services as services that are targeted at people who do not receive all the benefits due to their social status, and therefore it is necessary to focus on improving the quality of their lives and also try to integrate these people into society. Another perspective on the definition of social services is provided by Malík Holasová (2014), who at the same time connects social services with social work, where the task of social workers is to mediate and provide these social services. Matoušek and Koldinská (2007) state that

social services in the Czech Republic should represent such provision of social services, according to which human rights are respected on the basis of an individual approach to the user of social services.

2.1 Cognitive rehabilitation in the theory of social services

The concept of rehabilitation can be understood as prevention in order to preserve the current state of a person. Rehabilitation belongs to interdisciplinary approaches that include health, pedagogical, socio-legal and psychological aspects (Válková 2015; Vostrý, 2021). The World Health Organization defines rehabilitation as: "a set of interventions designed to optimize functioning and reduce disability in individuals with disabilities in their natural environment" (WHO, 2021). According to Vacková (2020) and Vostrý (2021), we can distinguish between social, medical, occupational or coordinated rehabilitation. All types of rehabilitation help people with disabilities maintain their physical, sensory, psychological and social standards with the aim of higher self-sufficiency and reduction of negative impacts. Cognitive rehabilitation is a part of all types of rehabilitation with the aim of reducing the cognitive deficit, i.e. restoring self-sufficiency and the inclusion of people who draw it back into normal life. According to Prigatano (2004) and Válková (2015), cognitive rehabilitation does not aim to teach the individual something new, rather it is about restoring the individual's original knowledge and skills that were caused by a brain injury or other disease that affected this organ of the human body. According to Kit Malia and Anne Brannagan (2010), the most common diseases that cause cognitive disorders are psychiatric diseases, which include depression, traumatic brain damage and stroke, neurodegenerative diseases caused by Parkinson's, Alzheimer's or Huntington's disease, but also multiple sclerosis and other types of dementia, which appear to a greater extent, especially in older patients.

According to Novotná et al (2018), the most common forms of cognitive rehabilitation include music therapy, zootherapy, art therapy and other movement therapies that support the training of cognitive functions. As part of the therapy, memory, attention, concentration and orientation in place and time are most often practiced. Among the methods of cognitive rehabilitation, we also include the processing of mathematical problems, logic exercises, word problems and practicing coordination and spatial orientation together with the speed of processed information. Preiss (2009) lists among the basic methods of training attention exercises, working with words, tasks with numbers, memory training using pictures or mnemonic aids. Nilius and Nikolaj (2018) reflect on the effects of cognitive rehabilitation. Ressner et al. (2018) states that cognitive rehabilitation is necessary for success in rehabilitation training. Other authors then mention in their articles experiences with cognitive rehabilitation for a specific type of illness. Brueggen et al. (2017) e.g. in Parkinson's disease. Chmelařová (2017) or Klein (2019) in patients with multiple sclerosis. Loetscher et al. (2019) in people after stroke. Zultak-Baczkowska et al (2010) in stroke clients and Daravani et al. (2020) in chronic neurodegenerative disease. All publications have one thing in common, namely the measurement of the improvement of cognitive functions on a sample of clients after long-term regular exercise. It also follows from the individual articles that the improvement of cognitive functions is dependent on a number of factors. Among the most frequently mentioned are the age of the client, the acquired level of education and the type of disability of the client.

The practical part of the contribution is secondarily devoted to the evaluation of the number of potential clients of social services in the Moravian-Silesian Region through the contribution to the care and evaluation of the network of outpatient services for persons with mental illness in the Moravian-Silesian Region. The primary goal is then devoted to the evaluation of the number of clients and their characteristics in the provision of selected neurological and mental diseases in the company MENSSANA, z. ú, specifically in its organizational unit "Memory Training Center" in the years 2015-2021.

3 Material and Methods

Within this part of the contribution, the Moravian-Silesian Region will first be briefly introduced and the organization MENSSANA, z.ú. and its organizational unit "Memory Training Center". Subsequently, the activities of the Memory Training Center will be characterized.

3.1 Presentation of the Moravian-Silesian Region

The Moravian-Silesian Region is one of the 14 higher territorial administrative units (NUTS 2) and is located in the northeast of the Czech Republic. The territory of the region is crossed by the historical border of Moravia and Silesia. It borders the territory of Poland to the north and Slovakia to the east. Within the regions of the Czech Republic, it is adjacent to the Olomouc and Zlín regions. Among the regions of the Czech Republic, it is the fourth most populous region with 1,177,632 inhabitants as of 31/12/2021. The territory of the region consists of 6 districts: Bruntál, Frýdek-Místek, Karviná, Nový Jičín, Opava and Ostrava-město. The territory of the region is

divided into 22 administrative districts of municipalities with extended jurisdiction with a total number of 300 municipalities including 42 cities. The seat of the region is the third largest city of the Czech Republic, Ostrava. Other important centers of the region include Opava, Karvinou and Frýdek-Místek. The total area of the region is 5,431 km2, which ranks the region in sixth place in the Czech Republic in terms of territory size.

3.2 Presentation of the organization MENSSANA, z.ú. and its organizational unit "Memory Training Center"

The organization MENSSANA, z. ú. is based on Ukrainská Street in Ostrava-Porubá and has been providing comprehensive cognitive rehabilitation within its organizational unit "Memory Training Center" since November 2011. The offer of professional activities of this kind is limited on the market for users, i.e. clients requesting these services. In 2014, the organization managed to acquire an unused building in Ostrava-Porubá, which was ceremonially opened in September 2015 after carrying out basic building modifications, including ensuring that the building was barrier-free. This is also the time when the independent organizational unit of the organization MENSSANA, z.ú. in the form of the aforementioned "Memory Training Center". The main purpose of MTC is to provide cognitive rehabilitation to clients. Cognitive rehabilitation is provided to a large extent especially to residents of Ostrava-Poruby and the surrounding area.

In 2019, in cooperation with the Ostrava-Poruba Municipal District Office, a partial reconstruction ofthe Memory Training Center building took place. Two previously separate rooms were arranged for the needs of the MTC. The renovation created a new multi-purpose hall, which was equipped with modern PC technology and new furniture. This enabled MTC workers to implement a wider spectrum of group activities, including activities aimed at the general public, including work demonstrations for school youth. The construction modification carried out also preserved the possibility of dividing the acquired space of the multi-purpose hall back into two smaller rooms, which can be used in case of such a request by MTC workers. Since 2020, MTC has become a partner of the "Everyone Together" Community Center, which also operates in Ostrava - Poruba, and where MTC staff provide a group cognitive rehabilitation service 3 times a week. The participants are mainly residents of the Ostrava-Poruba district. MTC also offers its activities to other cooperating organizations, or their users or members. These are, for example, the Center for Vocational Rehabilitation Ostrava Poruba, ROSKA Ostrava, Company E and others.

3.3 Characteristics of "Memory Training Centers (MTC)" activities

The memory training center provides a variety of cognitive rehabilitation services. This is especially intended for those clients of the organization whose cognitive abilities (memory, logic, spatial imagination, concentration, etc.) have been impaired or damaged due to various health reasons. As a result of this damage, individuals are faced with a number of everyday problems, especially in the area of employment, family life, or dignified old age, which they perceive as very burdensome.

Originally, the cognitive rehabilitation program was intended only for people with mental illness. The program of the memory training center was gradually expanded to include a target group of people with neurological and traumatic brain injuries and clients with mental disabilities. The primary target group is people with a health disadvantage, especially people with impaired cognitive functions due to traumatic damage, after cerebrovascular accidents or due to chronic organic or mental illness.

In practice, clients are approached by MTC employees according to the specifics of individual target subgroups, depending on the nature of their disability, or on the type and severity of their cognitive deficit. Cognitive rehabilitation is thus adapted to users with neurological disabilities, dementia, mental illness, etc.

The basis of MTC training is computer programs that were purchased under license specifically for cognitive rehabilitation. These are the programs Happy Neuron and Neurop3 and the didactic system Logico Piccolo. Within the mentioned programs, MTC clients can solve written and graphic tasks under the supervision of experienced social workers. Other training aids and collective games are also available within the MTC. The memory training center also has a specially equipped art-therapeutic and music-therapeutic workshop, where individual and group activities take place, as well as tai-chi health exercises. In the premises of the MTC there is also a designated area where an external psychologist regularly works with the clients of the centre. The psychologist's work mainly consists in determining the correct concept of cognitive rehabilitation and setting up training, which is individually prepared for each individual MTC client.

In addition to individual work with the user, MTC also provides memory training in the form of a group meeting, where assigned tasks are solved in pairs or in the whole group, with an emphasis on the social aspects

of the training. The interest of clients in cognitive rehabilitation was assessed by MTC staff before 2020 as stable and very necessary, especially among selected groups of the population.

4 Results and Discussion

Within this part of the contribution, the findings obtained within the main and sub-objectives are presented. A partial goal is to evaluate the network of social services in the territory of the Moravian-Silesian region in the area of social service providers for clients with neurological and mental illnesses and to evaluate the potential number of clients of this service through the granted allowance for care. The main goal is to evaluate the number of clients with chronic mental illness who used social rehabilitation services in the form of outpatient and field services within the Memory Training Center at the organization MENSSANA, z.ú. in the years 2015-2021.

4.1 Social services in the territory of the Moravian-Silesian Region

The need to ensure the availability of social services in the Czech Republic is based not only on valid legislative documents, but also on a number of prepared strategic documents, not only at the state level, but also at the regional and municipal level. The network of social service facilities in the Moravian-Silesian Region is determined by the regional network of social services. This network is listed in the medium-term plan for the development of social services in the region. The social network within the Moravian-Silesian region tries to respond to ensuring the necessary capacity, appropriate quality and adequate local availability for different types of clients within the various facilities that provide social services in the region.

Průša (2021, 2020, 2015) states that the growing need for social services results not only from the growing share of the number of care allowances, but also from the total expenditure of health insurance companies on the health care of the insured.

To illustrate the above, it is possible to state that a total of 43,485 people were registered in the Moravian-Silesian Region in 2021 as receiving a care allowance and are therefore potential clients of one of the types of social services. More than 61% of the total were women, and in terms of age category, more than 69 % of the total number of care allowances were awarded to people aged 65 and over.

Table 1 - Number of care allowances in 2021 in the Moravian-Silesian Region

	0-17 age	in %	18-64 age	in %	65 age and more	in %	Total	in %
Men	1 945	63,79	5 881	56,46	9 023	30,06	16 849	38,75
Women	1 104	36,21	4 536	43,54	20 996	69,94	26 636	61,25
Total	**3 049**	**100,00**	**10 417**	**100,00**	**30 019**	**100,00**	**43 485**	**100,00**

Source: Ministry of Internal Affairs and Communications 2021, own processing

From table number one, it can be seen that in the paid care allowances in the age category of minors up to 18 years of age, the allowances awarded to men predominate in the ratio of 64% compared to 36% for female minors. A total of 3,049 allowances were paid to minors under the age of 18, which accounted for 7% of the total number of care allowances granted in the Moravian-Silesian Region in 2021. In the 18-64 age group in 2021, the ratio was 56% in favor of men and 43% for women, and this age category contributed to the total number of care allowances amounting to 24%. The largest number of people receiving a care allowance in the Moravian-Silesian Region is for people aged 65 and over, which is shown in table number two, broken down into men and women in the evaluated period.

Table 2 - Number of care allowance recipients in the 65+ age category in the Moravian-Silesian Region in 2016-2021

	2016	2017	2018	2019	2020	2021
Men	8 492	8 782	9 079	9 369	9 197	9 023
Women	21 000	21 292	21 354	21 579	21 089	20 996
Total	**29 492**	**30 074**	**30 433**	**30 948**	**30 286**	**30 019**

Source: Ministry of Internal Affairs and Communications 2016-2021, own processing

Table number two shows the development of the number of care allowance recipients in the Moravian-Silesian Region in the period from 2016 to 2021. For men, the number of recipients increased by 531 between 2016 and 2021, while for women there was a decrease of 4. Overall, the number of care allowance recipients in the age

category of 65+ in the Moravian-Silesian Region in the evaluated years is slightly increasing at around thirty thousand people per year.

An analysis from 2021 under the auspices of the Association of Social Service Providers of the Czech Republic (APSS ČR) assumes that the aging population of the Czech Republic will create pressure, which will be exerted on the financial sustainability of the social system within the framework of the public budgets of the Czech Republic. The analysis estimates an increasing number of care allowance payments to individual clients. According to the analysis, by 2040 it is assumed that the volume of funds paid out in the form of care allowances to clients will double. The analysis also states that apart from the financial aspect, there are also other problems in the social field, e.g. different education of workers working in social services, increasing requirements for staffing of social services, non-uniform system of remuneration according to different founders, etc.

Marek et al. (2013) states that with the accession of the Czech Republic to the European Social Charter, the contracting party undertook to gradually increase the availability of social services to clients, both territorial and transport. From the point of view of the provision of social services, we can mention, for example, Article 14/2000 Coll. European Social Charter, where, according to the Ministry of Foreign Affairs, the "right to use social care services" is enshrined, and this right also applies to the use of social care services, e.g. in the form of financial support for individual entities when establishing such services, which cannot be done without additional financial resources from the public resources of the Moravian-Silesian Region.

Průša (2007) points out that social services in the European context may have a somewhat different interpretation than in the Czech Republic, which is also stated by Tomeš (2009). Social services, in contrast to the Czech system, where social services are strictly separated from health care, can be defined abroad in a much broader dimension and can additionally include, for example, the area of health care, housing, employment or social protection of individuals, families and groups. Making comparisons in the area of social services between individual countries is therefore very difficult, e.g. due to different systems of financing from public sources. It is therefore extremely important to note that a given type of service in one country may be part of a different category in another country. For example, a service provided to a certain group of people may be part of the social care system in one country, and conversely, in other countries the same service may be included in the financing of the health care system.

The amount of public funds spent affects and is closely related to the local availability of the network of social services in the Moravian-Silesian Region. This network was established by Resolution of the Regional Council No. 17/2133 of 3 September 2020 for the years 2021-2023. The network is regularly updated on the basis of requests from contractors, providers and users of social services in order to ensure the availability of the necessary help in the territory of the Moravian-Silesian Region.

Currently, the shortage of resources for financing social services is being addressed throughout the Czech Republic. This lack causes a negative society's view of professions working in social services not only in the Moravian-Silesian Region. The fact that the funded network of social services within the region is limited by the amount of free financial resources of the state and regions that they are able to spend in the social field does not contribute to this. (MSK, Regional Network of Social Services in the Moravian-Silesian Region, 2020)

4.2 Mental illness in the context of the network of social services provided in the Moravian-Silesian Region

It follows from publicly available data from the network of social service facilities in the Moravian-Silesian Region that the same social services as the lower-rated organization MENSSANA, z.ú. are provided by seven other organizations within the region. The names of these organizations and their basic identification data are listed in the appendix.

From the available data from the MSK social services network as of 7/17/2023, it follows that the organizations listed in the appendix provide clients, as well as MENSSANA, z.ú. social services in the field of social rehabilitation in the form of outpatient and outreach services, which are intended for persons with chronic mental illness.

Clients with this disease most often use cognitive rehabilitation services. This is especially intended for those clients whose cognitive abilities (memory, logic, spatial imagination, concentration, etc.) have been impaired or damaged due to various health reasons. As a result of this damage, individuals are faced with a number of everyday problems, especially in the field of employment, family life, or dignified old age, which they perceive as very burdensome.

In practice, organizations approach clients according to the specifics of individual target subgroups and depending on the nature of their disability, or on the type and severity of their cognitive deficit. Cognitive rehabilitation is thus adapted differently to users with neurological disabilities, dementia, mental illness, etc.

Within the territory of the Moravian-Silesian Region, in addition to our evaluated organization, MENSSANA, z.ú. a total of 7 subjects. Most of them are established in a non-profit legal form by a private founder and are thus at least partially dependent on publicly redistributed financial resources from the budget of the Moravian-Silesian Region, earmarked for the social sector. In addition to the organization evaluated by us, 2 other entities operate in the territory of the Statutory City of Ostrava, namely Asociace Trigon, o.p.s. and Spirála Ostrava, z.ú. Clients from the territory of the Statutory City of Opava, in addition to our evaluated MENSSANY, z.ú. also the organization ANIMA VIVA, z.s.; FOKUS – Opava, z.s. and the Psychiatric Hospital in Opava. The other listed organizations Charita Frýdek-Místek and the Silesian Diakonie do not compete geographically with the other listed organizations within the place of service provision in the territory of the Moravian-Silesian Region. It is also evident from the table in the appendix that in terms of recalculated full-time hours in direct care, the organization MENSSANA, z.ú. in the provision of social services for persons with chronic mental illness in the territory of the Statutory City of Ostrava and within the Moravian-Silesian Region, the largest provider of ambulatory social services within the social network and the given place of provision of services for patients with diagnosed neurological and mental illnesses.

4.3 Evaluation of clients of "Memory training centers"

From the analysis of the number of clients, it emerged that within the framework of the MTC, the program of cognitive rehabilitation, or a total of 891 clients through individual interventions for the period 2015-2021. During the monitored years, approximately 60-80% of the mentioned number of clients have a permanent residence in the territory of the Statutory City of Ostrava, the remaining 20-40% of clients travel for interventions from the wider area of the Moravian-Silesian region, especially from the territory of adjacent municipalities within the Opava district. Data on the number of clients commuting from the territory outside the Statutory City of Ostrava varies from year to year. Before the spread of the Covid-19 disease, the number of non-Ostrava clients in the center gradually increased and was the highest in 2018. However, in the last monitored years, the number of commuter clients has stabilized at about 1/5 of the total number of clients who attend MTC interventions. According to MTC employees, the distribution of clients by gender is almost equal. The distribution of clients according to individual disability categories is shown in table number three below.

Table 3 - Clients of the Memory Training Center in 2015-2021 by disease

Number of clients of MTC	2015	2016	2017	2018	2019	2020	2021	2015-2021
With mental disease	43	51	32	42	43	46	62	319
With a neurological disease	42	63	61	87	56	38	47	394
With traumatic brain injury	12	11	12	13	19	16	5	88
With a mental disability	0	16	18	19	13	12	12	90
In total	**97**	**141**	**123**	**161**	**131**	**112**	**126**	**891**
Of those with residence in city Ostrava	66	92	98	93	106	88	103	646
With residence outside the Ostrava city, within Moravian-silesian region	31	49	25	68	25	24	23	245
Total interventions provided	3 000	5 400	5 437	8 433	7 999	5 532	5 000	40 801
Number of interventions per client per month	**2.58**	**3.19**	**3.68**	**4.36**	**5.09**	**4.12**	**3.31**	**3.82**

Source: Own processing based on internal materials of the organization MENSSANA, z. ú.

From the results of the analysis in table number three, it can be seen that the largest number of interventions in the individual monitored years of MTC was provided to people with neurological diseases, approx. 34-54 % of all interventions in individual years. However, in the last two monitored periods (years 2020 and 2021), the number of interventions provided to persons with mental illness is already predominant, which in 2021 amounts to less than half of all interventions provided. Interventions provided to people with mental and neurological diseases were between 75-88% of the total number of interventions implemented in individual years. In total, in the evaluated period of 2015-2021, 12-25% of all interventions were provided to persons with traumatic brain injury and persons with intellectual disabilities. Figure number one shows the breakdown of the number of clients in 2017-2021 by client age.

Figure 1 - Age composition of MTC clients in 2017-2021
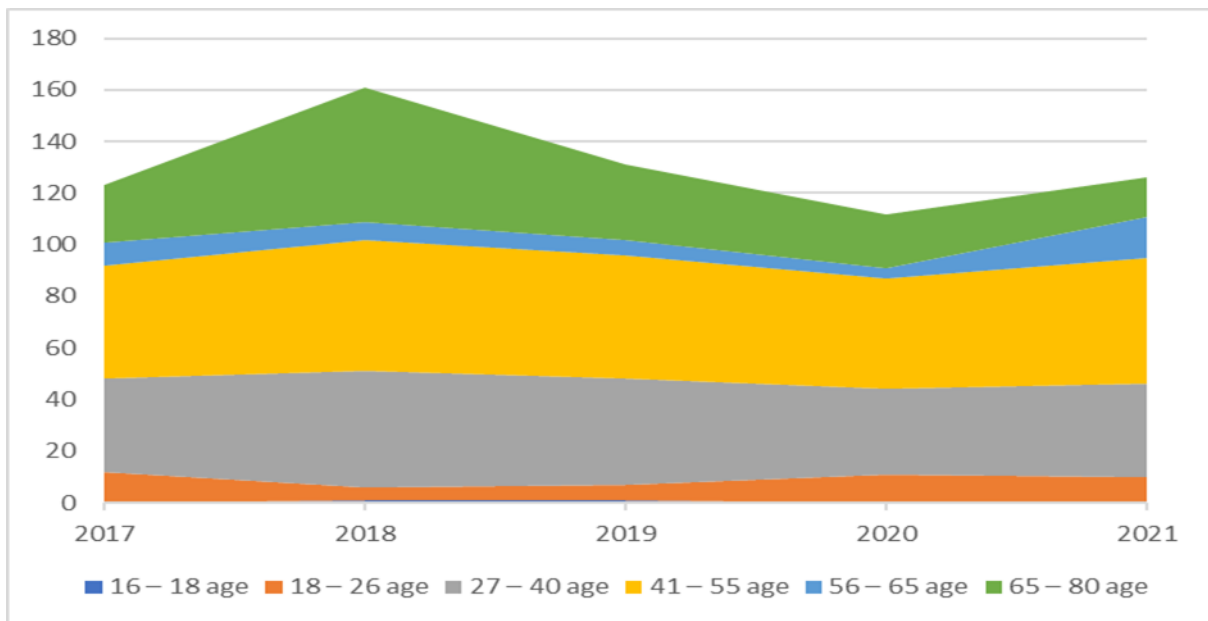
Source: Own processing based on internal materials of the organization MENSSANA, z. ú.

Figure number one shows that in the last evaluated year, 2021, 126 users went through the cognitive rehabilitation program at MTC, despite the restrictions resulting from anti-epidemic measures in connection with the disease COVID-19. All interventions were provided to individuals between the ages of 21 and 83. Of the total number, in 2021 there were 62 persons with mental illness, 47 persons with neurological illness, 5 persons with traumatic brain injury and 12 persons with intellectual disability. 103 clients had permanent residence in the territory of the city of Ostrava, the other clients commuted to MTC from other territories of the Moravian-Silesian Region. From the point of view of the age distribution of clients, it can be seen that due to the fact that the organization provides cognitive rehabilitation services in outpatient and field form, the number of clients in the age category 65+ in the total number of clients has been decreasing in recent years. The largest number of clients in the 65+ age category was recorded in 2018, when they accounted for 32% of all MTC clients. After the outbreak of the Covid-19 pandemic, the number of clients in this age category decreased in the following years. In 2021, the share of this age category of people using MTC services was only 12 % of the total number of clients. MTC services have long been used most by clients in the 27-40 and 41-55 age categories, followed by the 56-65 age category, i.e. that potentially able-bodied clients predominate.

Figure number two shows the percentage of provided interventions from the total number of provided interventions according to clients' permanent residence in the years 2015-2021.

Figure 2 - Share of the number of MTC interventions provided in 2015-2021 according to clients' permanent residence
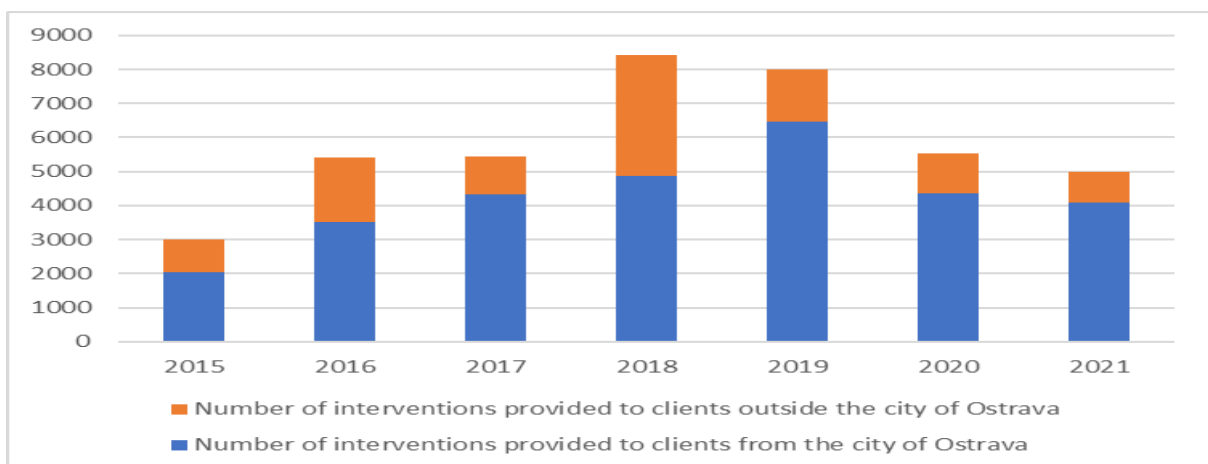
From figure number two, it can be seen that until 2018 the number of interventions provided to MTC clients gradually increased, a drop is recorded in 2020 and 2021, which was primarily caused by the restrictions introduced regarding the Covid-19 disease and the impossibility of MTC workers to meet clients in physical form, which MTC clients were used to until this time, because during all the monitored years the training program was adapted to each individual by MTC workers according to their individual health and psychological conditions ical dispositions. The number of interventions provided to each client depended on the MTC's time options, or individual social workers and the time available for each client. The usual rate of interventions was provided to MTC clients once or twice a week for approximately 60 minutes. Apart from this time, when each client was worked with individually, clients could also spend additional time in the memory training center, e.g. individual work on a PC, or other activities, most often in the form of e.g. board games, art therapy or music therapy.

From 2021, the MTC staff will also test with clients a remote method of memory training, the advantages and disadvantages of which are also examined in comparison with the results obtained from classic physical presence within the ongoing project within the framework of the financial support of the Technology Agency of the Czech Republic, number TL05000160, and the overall results of this form of memory training compared to physical memory training will be presented to the public after the end of the project at the end of 2023.

Figure 3 - Number of newly enrolled clients within MTC services since 2012
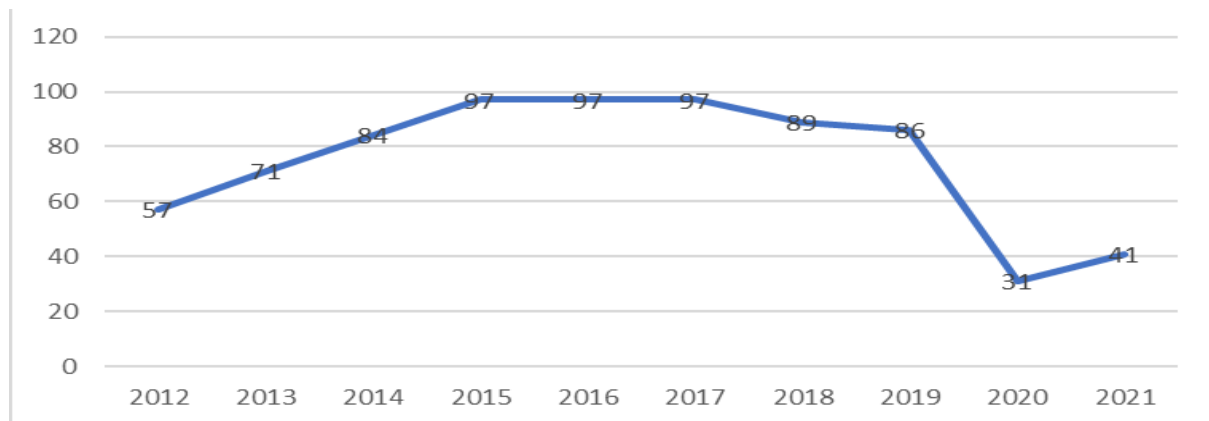
Source: Own processing based on internal materials of the organization MENSSANA, z. ú.

Interest in cognitive rehabilitation within MTC had an upward trend in the period before the Covid-19 pandemic. This is evident from the number of people who have been enrolled in the program every year since its inception in 2012. Figure number three shows the number of newly registered regular users in individual years and the stagnation of the growth of new users since 2020, which was caused by restrictions regarding the Covid-19 disease, which were introduced by the government in 2020 and 2021 throughout the Czech Republic.

5 Conclusion

From the results of the analysis of the number of clients using cognitive rehabilitation services within the Memory Training Center at MENSSANA, z.ú. it follows that the number of interventions and new clients within the MTC was on a growing level until 2019. In 2020 and 2021, there was a drastic decrease in the number of clients and interventions provided, which is in mutual correlation. The reason for the decrease in both the number of clients and the interventions provided was the government's restrictions regarding the symptoms of the Covid-19 disease. The services provided to clients within the Memory Training Center were fully restored to clients after the lifting of restrictions due to the Covid-19 disease. At the moment, however, they are limited on the one hand by the non-growing number of regular employees, their specific education and experience, and on the other hand by the current way of financing the services provided. Mokrá et al (2023) states that a number of factors influence the work performance of employees. This is evidenced by research regarding the work commitment of employees associated with burnout syndrome, which was also affected by the Covid-19 disease pandemic. Papcunová et al (2022) states that the determinant of economic development is, among other things, the availability and quality of

school facilities. Pollak et al (2022) state that there was a change in the behavior of electronic consumers during the Covid-19 pandemic, but this will partially return to its original form after the pandemic subsides.

MTC is an organizational unit of the parent organization MENSSANA, z. ú, which is primarily dependent on publicly obtained financial resources, which are mainly obtained by the management of the organization in the form of one-year or multi-year specifically targeted grants, both from European Union funds and from grant schemes within the framework of public budgets, primarily of the municipal district of Ostrava-Poruby, the Statutory City of Ostrava and the Moravian-Silesian Region. This system of financing, mainly from short-term grants from year to year, is inappropriate in the long term and is one of the limiting factors for the long-term development not only of the organization MENSSANA, z. ú., but also of the Memory Training Center established by it, which has negative effects on the functioning of the Memory Training Center itself, and thus also the cognitive rehabilitation services provided by it to potential clients. Currently, the Memory Training Center is implementing a project co-financed from the public funds of the Technology Agency of the Czech Republic, which examines the possibilities of a remote method of memory training and its advantages and disadvantages compared to the physical method when providing the aforementioned social services to clients. The preliminary results show that the remote method of memory training for clients is possible, but has a number of different buts. One of the main disadvantages is the unclear benefit for the client, which depends on the type of client's illness and the limited satisfaction of clients with this way of providing the mentioned social services. We can also mention the relatively expensive financial aspect of starting to provide services remotely, which is related to the expensive acquisition of digital technologies and making them available to clients in combination with the physical availability of the service by the staff of the Memory Training Center to clients. The high financial burden in providing remote methods of cognitive rehabilitation in traditional organizations financed primarily from public sources is due to their unpreparedness for this type of service provision. The remote method of introducing the service, at least in the first phase, cannot be done without additional funds for the purchase of equipment, new technology, training of existing employees and clients, service of equipment and technologies, and regular updating and security of sensitive data obtained from participating clients.

However, an important finding is that the remote method of providing the mentioned social services of cognitive rehabilitation is possible, at least for some types of clients, it depends, among other things, on the age of the clients and their experience in using modern communication tools, which can include, for example, smart phones, tablets, laptops and classic PCs with a connection to a high-quality Internet connection.

From the network of social services of the Moravian-Silesian Region, it was found that outpatient and outreach services for people with neurological and mental illnesses within the territory of the Moravian-Silesian Region are provided by a total of 7 entities that do not compete with each other spatially. The majority of providers are established in a non-profit legal form by a private founder or a church and are thus always at least partially dependent on publicly redistributed financial resources from the budget of the Moravian-Silesian Region and the state, which are allocated for the social sector. The largest range of these services is provided in the cities of Ostrava and Opava, where some providers potentially compete with each other, but this cannot be said about the rest of the territory of the Moravian-Silesian Region, where there is usually one entity operating in large cities providing outpatient and field services to clients with mental and neurological diseases.

Šámalová and Tomeš (2018), Tomeš (2010), Matoušek and Koldinská (2007) state in the literature that effective social policy occurs when services and benefits are linked, rather than if only one service or benefit is provided. Horváthová and Abrhám (2017) state that a single definition cannot be applied to social policy, especially for reasons that arise in connection with new social situations that need to be addressed in the territory. In practice, social policy in the state is represented by various concepts and programs of participating parties, through the use of social technologies in a specific place and at a specific moment. Various types of social services can be hidden under the term social policy, the goal of which is to achieve social well-being and improve the quality of life of citizens. Key entities at the medium level in the Czech Republic are the regions, while at the micro level the municipalities. At the individual level of individuals, the family plays an equally important role. The state should therefore define activities to ensure the prerequisites for life and the related conditions for securing an optimal social infrastructure. Repková (2012) states that in the social field it is a systematic, planned, organized and purposeful effort of social subjects who, using various methods and tools, try to maintain and function or to change the social system in the state. Tomeš (2010) states that social services are part of the social policy of every democratically governed state. In conclusion, it can be stated that the aging of the population in the Czech Republic and the Moravian-Silesian Region will sooner or later affect not only the allocation of resources, but will also be reflected in the approach and experience of social service providers and potential clients to modern technologies.

This allows for an optimistic outlook for a whole range of new technologies and digital ways of communication, not just in the field of cognitive rehabilitation services.

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Appendix

Providers of outpatient and outreach social services for persons with chronic mental illness in the Moravian-Silesian Region (17. 7. 2023)

Name of the provider	ID number	Place of provision of the service	Recalculated working hours in direct care
ANIMA VIVA z.s.	26591014	Opava	5,5
Association Trigon, o.p.s.	27027686	Ostrava	10,5
FOKUS – Opava, z.s.	26990881	Opava	10,4
Charity Frýdek-Místek	45235201	Frýdek-Místek	2,6
MENS SANA, z. ú.	65469003	Ostrava	11,5
Psychiatric Hospital in Opava	00844004	Opava	4,0
Slezská diakonie	65468562	Karviná	3,7
		Třinec	4,7
		Český Těšín	2,5
		Bruntál	4,7
		Krnov	5,6
		Bohumín	2,7
		Havířov	4,0
Spirála Ostrava, z.ú.	29451736	Ostrava	6,5

Source: Regional Network of Social Services of the Moravian-Silesian Region, cit. 20/07/2023, Available at: https://www.msk.cz/cs/temata/socialni/krajska-sit-socialnich-sluzeb-v-moravskoslezskem-kraji-1306/

The impact of openness public administration on the management of public finances – case study of Slovak cities

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Abstract: The main goal of our contribution is to determine the degree of influence of the openness of a specific part of the public administration on its level of management. We obtained the necessary partial data through the Transparency International Slovakia and INEKO databases. In total, the analysis of primary data consists of a dataset of 1716 data belonging to the research framework of the years 2010-2022. The research sample consists of thirteen, the largest by population, "non-regional" Slovak cities. We found that the resulting values of both openness and economy in specific years show significant dynamics and significant disparities appear between cities. In the long term, the average degree of openness and economy of the analyzed group of cities is growing. Through our research, we found that the correlation coefficient between openness and economy is at the level of 0.2156, which represents a weak mutual correlation. Of the sub-areas of openness, Access to Information Policy achieved the highest direct linear dependence, the height of which indicates a strong degree of correlation with economy.

1 Introduction

Public administration management research is not in the center of attention of experts, politicians, media or the public. There are also no long-term and in-depth analyzes of the openness of public administration or local self-government in Slovakia. From this point of view, we see the great benefit of our work, which connects openness with economy.

There are more or less only atomized researches, where we include, for example, work with the aim of mapping the degree of awareness and provision of information by municipalities (Mihaliková, Koreňová, 2021) or research into the financial planning of municipal residents in Slovakia (Morvai, et al. 2022) and the partial connection of the economic framework with transparency and openness (Cíbik, 2022; Cíbik, Mikuš, 2022). Of the older studies, the work from 2004 focused on transparent local self-government (Sičáková-Beblavá, Pirošík, 2004) cannot be omitted.

At the same time, there is gradual pressure to bring decision-making closer to citizens through New Public Management and multi-level governance. This increases the role and activity of citizens, from whom public power is derived. Thus, the need to provide relevant, correct and credible information to policy makers - citizens is growing significantly. Our research is focused on the level of openness of public administration (Slovak cities) and the possibility for citizens to respond to specific situations or plan long-term development goals in this way. Because only such an institution of public power can be considered trustworthy, which can convey all relevant, up-to-date and required information to citizens. From an international point of view, an important source of information on the transparency of public authority is the study by Androniceanu (2021), which measured the degree of transparency in the case of the Romanian central state administration. We consider the work of Erkkilä (2020) to be a summarizing point of research on transparency and openness of public administration. In his contribution, creates an overview study of international research on openness, transparency and access to information in public administration. Another important summarizing study is the work of the authors Cuadrado-Ballesteros, Ríos, Guillamón, (2023), who analyze 956 articles for the period 1991–2021 in the field of transparency in public administration. Also worthy of attention is a recent case study carried out by a team of authors from Transparency International Slovakia, who focused on an international comparison of access to information in 26 cities across Europe (Zajac, Šípoš, Piško, 2019.). Older research studies show a connection between a higher quality of public government and a higher degree of openness or transparency (e.g. Bugaric, 2004; Jashari, Pepaj, 2018; Meijer, 2013, Etzioni, 2014). That is why we decided to investigate this common

stereotype and to monitor the proven phenomenon also in connection with the efficiency of public administration components in Slovakia.

2 Material and Methods

The main goal of our contribution is to determine the degree of influence of the openness of a specific part of the public administration on its level of management. Through research, we linked two areas in public administration - openness and economy.

When quantifying openness, we methodologically based our analysis on the setting of the transparency measurement of territorial self-government compiled by Transparency International Slovakia (TIS). In principle, it concerns monitoring the development of the level of self-government transparency through a multi-component indicator. We based our research on the total values of the openness rate, which represent the sum of the points awarded in the eleven partial areas where we measure openness. These are eleven secondary areas in which the monitored Slovak cities could receive a total of a maximum of 100 points based on how they meet the individual conditions of openness. This is a modification of the original procedure established by TIS, with the aim of more clearly and summarizing the development of relevant data for our research. An approximation of the monitored areas of openness and the maximum number of points in a specific area is captured in the following table.

Table 1 – Analyzed areas of openness

Variable unit	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.
Openness	Access to Information Policy	Public Participation Policy	Public Procurement Policy	Public Property Sales and Lease Policy	Budgeting and Public Contracts	Grants Policy	Housing and Social Services	Human Resources	Professional Ethics and Conflict of Interests	Land Use Planning and Construction Policy	Municipal Businesses and Investments
Points	21	15	11	9	13	7	6	5	5	4	4

Source: own processing based on TIS

The work procedure consisted of finding out the number of points of a specific city in the given area, and we were able to assign a total point rating to their sum. It was true that the higher the total number of points the city achieved, the more open it was. The maximum possible number of points for all secondary areas of openness was 100 points.

The second monitored area was the economy of Slovak cities. To quantify it, we constructed a multi-component indicator that captures various aspects of financial management, financial situation and economic health of cities. The final comprehensive indicator is the result of the sum of points awarded as part of the quantification of the financial situation of cities in eleven areas. Specific sub-areas of economy are constructed on the basis of INEKO data and methodology. Our task was to select, summarize and properly modify them into a form that could be mutually linked to openness research. For this reason, we decided to select 11 secondary research areas of economy (the same number as in the case of openness), in which cities could receive a maximum of 100 points in total (the same number as in the case of economy). Specifically monitored areas of economy with the maximum number of points in them. Captures the following table.

Table 2 – Analyzed areas of economic

Variable unit	I.	II.	III.	IV.	V.	VI.	VII.	VIII	IX.	X.	XI.
Economics	Total Debt	Debt Service	Current Account Balance	Past Due Liabilities in Proportion to Current Income	Liabilities Outstanding 60 or More Days Past Due to Current	Basic Balance	Investment Intensity	Net Worth	Instant Liquidity	Prompt Liquidity	Loans from ŠFRB in Proportion to Income
Points	9	9	9	9	9	10	9	9	9	9	9

Source: own processing based on INEKO

Even in the case of economic evaluation, the rule applies that if a specific city achieved a better value, it was awarded a higher number of points. The higher the total number of points, the better a particular city manages and also achieves better results in the monitored secondary indicators of economy. Together, the city could receive a maximum of 100 points for all secondary areas of economy in a specific year. In the case of both research areas (Openness, Economics), we proceeded similarly. The resulting number of points is the sum of points obtained in all 11 sub-areas. We proceeded according to the following formula:

Total number of points $^{O, E}$ =

= number of points obtained in variable unit I.$^{O, E}$ +...+ number of points obtained in variable unit XI.$^{O, E}$ (1)

Legend: **O** - Openness, **E** – Economics

We obtained the necessary partial data through the Transparency International Slovakia and INEKO databases. In the interest of capturing openness and economy as flow variables, we implemented data collection from the base year 2010 to 2022. The resulting total values of specific cities represent average values for this period.

We based our research on a targeted selection of the largest cities by population in Slovakia, which are not the seat of the region. This selective selection is based on the impossibility of capturing relevantly the overall values of openness and economy in cities that consist of several city districts. The task of determining the level of economic efficiency would also be problematic, because in the case of Košice and Bratislava, other sources of income are established for the municipality and city districts.

The research sample consists of thirteen, the largest by population, "non-regional" Slovak cities. The monitored research sample consists of the cities of Martin, Poprad, Prievidza, Zvolen, Považská Bystrica, Nové Zámky, Michalovce, Spišská Nová Ves, Komárno, Levice, Humenné, Bardejov and Liptovský Mikuláš. Another common feature is that, in terms of population, they are in the group of (Slovak) larger cities, whose population in 2022 was in the range from 51,139 (Martin) to 30,162 (Liptovský Mikuláš). The individual investigated cities are relatively proportionally distributed within the territory of the Slovak Republic and their specific geographic location is captured in the following figure.

Figure 1 – Distribution of the research sample

Source: own processing

By obtaining data and creating a database on partial and total values of variables in openness and economy, we were able to derive long-term development trends as well as determine average values for a specific year/specific city or for the entire group of analyzed cities in a given period. In order to fulfill the set goal of our research, we had to proceed with the implementation of correlation analysis and monitoring/quantification of the relationship between the overall average values of the analyzed cities in the area of openness and economy. We will interpret the resulting correlation coefficient according to the obtained data and it will be able to acquire a value within <-1; 1>. Negative values of the correlation coefficient will mean indirect linear dependence of both variables, and positive values will mean direct linear dependence. The closer the correlation coefficient is to zero, the weaker the interdependence will be between the variables. Our evaluation of the correlation coefficient will be set as follows:

Table 3 – Interpretations of the correlation coefficient according to Hinkle et al. (2003)

Coefficient value	Interpretation
<from 1 to 0.9> and <from -1 to -0.9>	Very strong correlation
<from 0.9 to 0.7> and <from -0.9 to -0.7>	Strong correlation
<from 0.7 to 0.5> and <from -0.7 to -0.5>	Moderate correlation
<from 0.5 to 0.2> and <from -0.5 to -0.2>	Weak correlation
Less than 0.2 and – 0.2	Very weak correlation

Source: own processing

In total, the analysis of primary data consists of a dataset of 1716 data (13 cities x 11 areas of openness x 6 years + 13 cities x 11 areas of economy x 6 years), by processing which we obtained the necessary data for comparison, secondary calculations of averages and determination of the correlation coefficient. The presented results are presented in the form of the number of points. Given the total maximum number of points in both monitored areas (100), we can also consider them as a percentile, i.e. a relative indicator.

3 Results and Discussion

The main goal of our contribution is to determine the degree of influence of the openness of a specific part of the public administration on its level of management. Therefore, in the first research step, we decided to quantify the degree of openness in the examined group of Slovak cities. We found that the resulting values of openness in specific years show significant dynamics and significant disparities appear between cities. By statistically averaging the partial values of cities, we were able to identify a clear long-term development trend of openness in the monitored group of cities since 2010. More detailed results are captured in figure 2.

The presented data informs us that during the years 2010-2022, the average rate of openness of the monitored cities shows a long-term increase. With the exception of 2014, the average value of city openness always reached higher year-on-year values, which was also reflected in the positive link of the overall trend. This also corresponds to the shift in partial values of cities, when we generally recorded the lowest values in the period of 2010-2014 and the highest during the years 2018-2022.

Partial values of the openness of cities over time create significant disparities and shifts in the graphic display. Overall, we can state that the city of Martin and Prievidza show the highest level of openness for a long time at the level of approximately 66.4 points (percent). The shift of Prievidza, which in the base year of the research was among the cities with the lowest rate of openness and in 2022, clearly achieved the highest rate of openness among the monitored cities, is particularly noteworthy. We found a significantly below-average level of openness during the years 2010-2022 in the cities of Komárno (41.8) and Humenné (40.5). It is interesting for these cities that their hypothetically better results are penalized especially by the years 2010-2016. Even in the case of these cities, however, we are already noticing a very sharp increase in the rate of openness since 2018.

Figure 2 – Openness rate
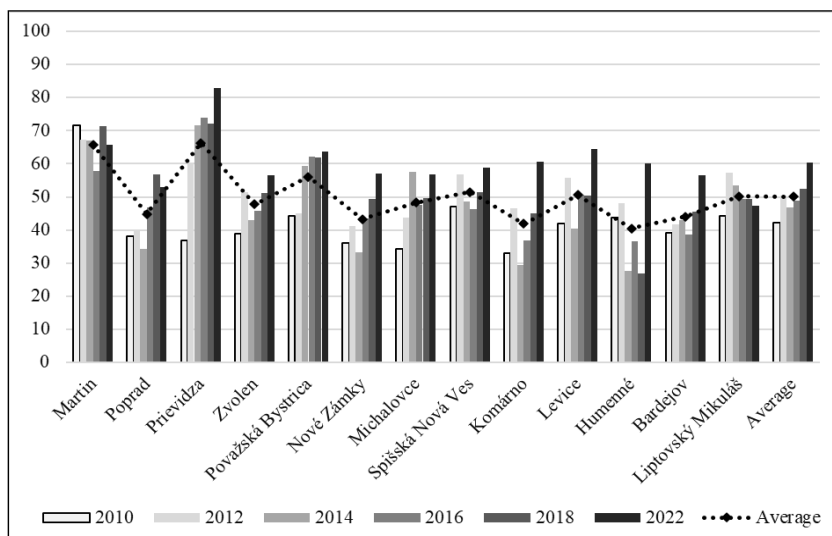
Source: own processing

The second monitored area of our research was economy. The resulting captured and presented values of the efficiency rate reflect the resulting sum of points (or also the percentile) for the sub-areas of efficiency. Overall, we can conclude that the economy of the monitored group of cities is developing relatively dynamically, and significant disparities between cities also arise when comparing results over time. The development of the economy of the monitored group of thirteen Slovak cities is captured in the following figure 3.

Based on the results of our research, we can confirm that, in the long term, the average rate of economy of the investigated cities has a growing tendency. However, compared to transparency, it is significantly reduced, it reached its peak in 2016 and has been decreasing ever since. Economic development in the following period will further deepen this negative trend due to the unexpected financial burden on cities in the form of higher energy costs, rising inflation and an increase in other expenses of municipalities (e.g. for wages). As an interesting fact, we can mark the situation since 2016, when there is a significant decrease between the threshold values of the achieved economic efficiency of cities, and in 2021 it represents half the values of the first year of our research.

The economic development of the cities analyzed is not uniform and straightforward. When generalizing the results for specific cities, we could identify that the city of Poprad achieved the highest long-term efficiency rate (more than 82.2). The cities of Zvolen, Levice, Prievidza and Spišská Nová Ves follow with a significant distance. Less than the average values of efficiency in the long-term horizon of the monitored set of cities were recorded in a total of six cities. We measured the lowest long-term efficiency rate in the cities of Nové Zámky (63.5) and Bardejov (63.4). Their average long-term results were mainly affected by a very low rate of economy in the first three monitored years. In the next period, it increased, stabilized and oscillated around the average.

Figure 3 – Economic rate
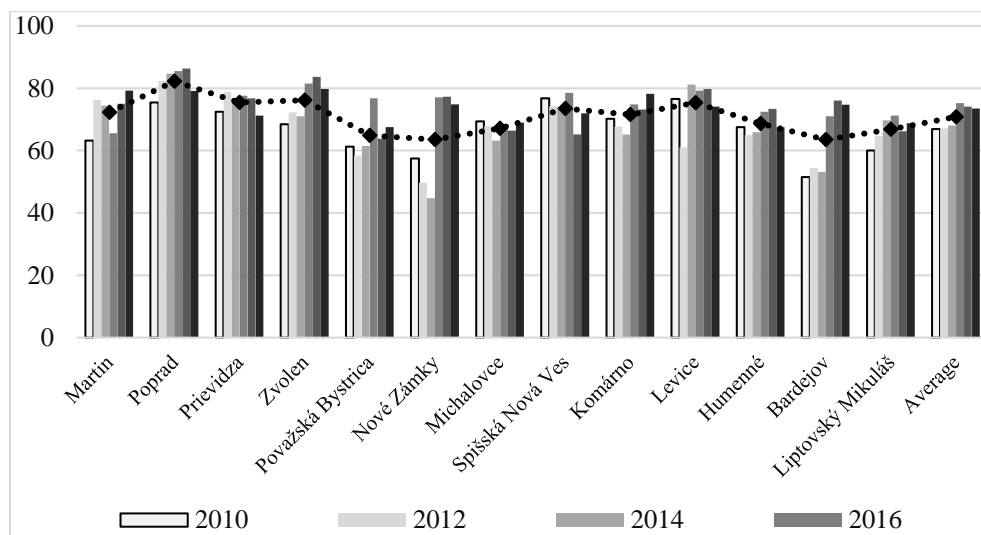
Source: own processing

By connecting both areas, we were able to quantify the correlation relationship and degree of mutual causality between openness and economy in the case of thirteen Slovak cities during the years 2010-2022. By monitoring the rate of the average rate of openness and the average rate of economy in a specific year for the entire monitored group of cities, we were able to calculate the rate of the correlation coefficient, which represents a value of 0.2156. This value expresses a positive and direct relationship between the variables. The height of the correlation coefficient tells us that, according to the mentioned methodology, we can consider the mutual relationship between openness and economy in the case of the monitored group of cities to be only weak.

Subsequently, our research dealt with the analysis of individual components of openness and their impact on economy. The analysis is based on the quantification of the correlation coefficient and tracking its height for all eleven areas of openness and their impact on economy. Specific values are captured in the following table and figure.

Table 4 – Correlation coefficient of sub-areas of openness and economy

Variable unit	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.
Openness	Access to Information Policy	Public Participation Policy	Public Procurement Policy	Public Property Sales and Lease Policy	Budgeting and Public Contracts	Grants Policy	Housing and Social Services	Human Resources	Professional Ethics and Conflict of Interests	Land Use Planning and Construction Policy	Municipal Businesses and Investments
Correlation coefficient	0,64	0,29	0,04	0,41	0,10	0,05	-0,31	0,08	0,33	-0,42	0,05

Source: own processing

Figure 4 – Correlation coefficient of openness components and economy
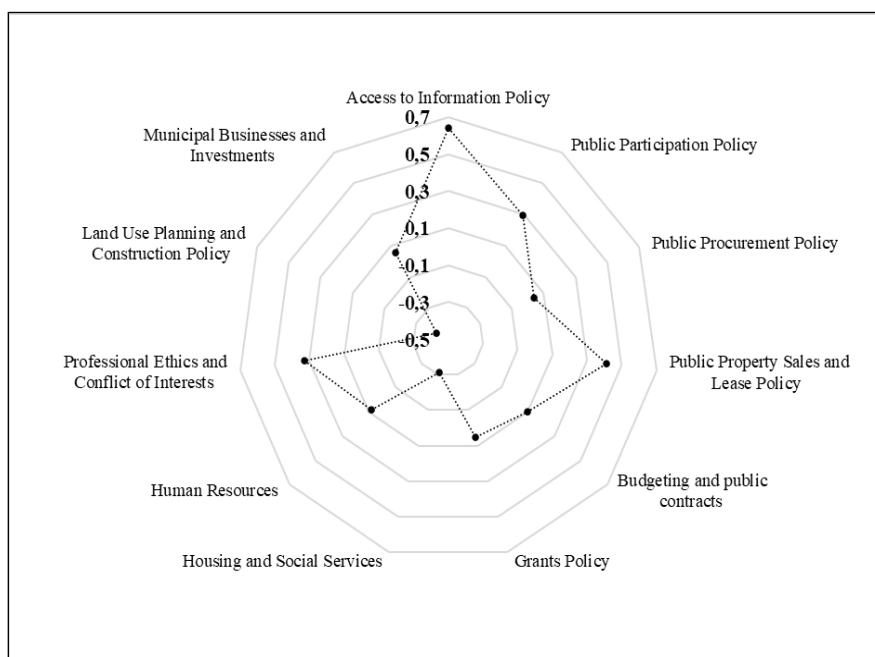
Source: own processing

Research into sub-areas of openness and their impact on economy yields interesting findings. The first is that some secondary areas of openness achieved a negative correlation coefficient in relation to economy. This proved an indirect (linear) relationship between and two areas of openness (Housing and Social Services and Land Use Planning and Construction Policy) and economy. The area of Access to Information Policy clearly achieved the highest positive rate of correlation with economy. The mutual correlation coefficient with the economy of the monitored cities reached a strong degree of correlation and linear dependence. Our research shows that it is this area that correlates the most and determines the economic level of the monitored cities. The areas of Public Property Sales and Lease Policy, Professional Ethics and Conflict of Interests and Public Participation Policy also create a positive relationship between openness and economy. However, their impact on economy can only be characterized as weak based on the high correlation coefficient. Other sub-areas of openness had only a negligible impact on the overall rate of economy.

It is noteworthy that in relation to the economy of cities, the measured economic areas of openness (Budgeting and Public Contracts, Grants Policy, Municipal Businesses and Investments) do not play an important role. The degree of correlation between these sub-areas of openness and city economy is very low to negligible. For us, this represents a rather unexpected finding that can be subjected to more extensive research. Considering the obtained results, we see a lot of room for identifying specific areas of Access to Information Policy that are most correlated with economy. According to the preliminary and general conclusion, our results indicate the fact that if the studied cities sufficiently and in-depth inform their residents and the public about internal

processes, measures, contacts and publish their intentions in detail, this automatically has an impact on the better state of their public finances. As a reason, we can mark available information for citizens, e.g. about the amount of rewards, qualified answers to requests for information or contacts to members of the council, which create another layer of external control (not only) of the city's financial and budget documents. For this reason, the city's actions in the field of management are under stronger control and higher demands are placed on financial decisions, which is reflected in a better financial situation of a specific city.

When interpreting the achieved results, it is necessary to keep in mind that this is a specifically designed case study of a selected group of Slovak cities. Its results certainly cannot be generalized to all Slovak cities or Slovak regional governments. Our results demonstrate some degree of causality in the research sample. Therefore, in the future, it would be appropriate to extend the research intention to a larger set of cities, in which the mutual relationship between openness and economy would be quantified. As already indicated in the introduction, this is a unique intersection of two scientific areas (openness/transparency research and economic indicators), which are not normally connected. For this reason, our work can be considered preliminary research, where we checked the methodology and scientific procedures for the upcoming large-scale research.

4 Conclusion

The main goal of our contribution was to determine the degree of influence of the openness of thirteen Slovak cities on the level of their economy. Therefore, in the first research step, we decided to quantify the degree of openness in the examined group of Slovak cities. We found that the resulting values of both openness and economy in specific years show significant dynamics and significant disparities appear between cities. In the long term, the average degree of openness and economy of the analyzed group of cities is growing. Through our research, we found that the correlation coefficient between openness and economy is at the level of 0.2156. This value expresses a positive and direct relationship between the variables. The height of the correlation coefficient tells us that, according to the mentioned methodology, we can consider the mutual relationship between openness and economy in the case of the monitored group of cities to be only weak. Of the sub-areas of openness, Access to Information Policy achieved the highest direct linear dependence, the height of which indicates a strong degree of correlation with economy.

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Kindergartens in Bratislava – Is there room for more value?

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Abstract: The aim of our paper is to find out, through a (pilot) survey, how parents perceive the implementation of pre-primary education policy through their own experience, and thus whether the way it is implemented in the city of Bratislava provides sufficient benefits to its consumers. We are based on the philosophy of *public service logic*, which in the production of public services also considers the wider context from the point of view of the service user, not only its economic and material side. In Bratislava, the competence of pre-primary education is in the hands of 17 city districts and not the municipality, which makes it difficult to satisfy the needs of consumers of this service - children and their parents, due to the intra-city and extra-city commuting. Parents' experiences and attitudes were collected through an electronic questionnaire. We subsequently supplemented the answers with an analysis of the current state of process implementation and suggested possible improvements. The main findings include the need to change the perception of benefits for parents and children, the willingness of parents to pay extra for additional services, the possibility of significantly simplifying the process of registering a child, and prospectively changing the financing of pre-primary education.

Keywords: Kindergartens, value, process optimisation

JEL Classification: H44, I22, I31, J13

1 Introduction

Demographic development plays a significant role in predicting state spending on public services. While e.g., the aging of the population portends increased costs for healthcare or social services, positive trends related to the increase in the number of pre-school children may raise concerns related to the availability of relevant public services (e.g., education) or the sufficiency of resources to cover them. However, the provision of many public services does not rest solely on the shoulders of the state, but the state delegates responsibility for their coverage at an adequate quantitative as well as qualitative level to regional or local self-government. Pre-primary education also belongs to one of the competences entrusted to the self-government.

This made the local government one of the main executors of the pre-primary education policy. In the case of Bratislava, however, the situation is somewhat more complicated. Not only are pre-school facilities the responsibility of individual districts, which makes their mutual coordination difficult, Bratislava, as the capital, is also exposed to increased demand due to the growth of suburbia and the transfer of demand for kindergartens from the place of permanent residence to the place of employment of the parent. The increased number of children in the population years and the migration crisis caused by the war in Ukraine have strengthened these trends. The biggest challenge, however, is the fulfilment of the obligations arising from the other amendment to the Education Act (Act No. 245/2008 Coll. on Education and Training (Education Act) and on Amendments and Supplements to Certain Acts), which from the 2025/2026 school year introduces the right to admission to pre-primary education for children from 3 years old.

In addition to the different ways of submitting applications for children, the delegation of competences to the districts is also reflected in the motivation to prioritize the children of residents (in addition to taxpayers and voters) of the given district, regardless of the real needs of parents and children who are residents of other districts of Bratislava. Economic reasons also play an equally important role in the decision to adopt a child. Pre-primary education belongs to the so-called original competences of self-government. This means that municipalities and cities finance the operation of kindergartens primarily from their own resources. These are mostly made up of the share of personal income tax and real estate taxes. Both revenues are closely linked to the number of residents due to the method of redistribution of share taxes.

The aim of our paper is to find out, through a (pilot) survey, how parents perceive the implementation of pre-primary education policy through their own experience, and thus whether the way it is implemented in the city of Bratislava provides sufficient benefits to its consumers. We are based on the philosophy of public service logic,

which in the production of public services also considers the wider context from the point of view of the service user, not only its economic and material side. In the survey, we therefore also focus on elements related to the service (pre-primary education), which complete it (method of registration, additional services - extracurricular activities, and "emotional" perceptions - method of communication, perception of cleanliness, etc.) and affect the overall satisfaction associated with it and not for the service itself (educational program).

Due to its focus (service production), the contribution does not address the impact that the expansion of this service would bring - from improving children's results in future studies and thus employment, to improving the position of women on the labour market, to quantifying the impact on the budgets of individual municipalities.

1.1 Legal framework

The basic legal standard for pre-primary education is Act No. 245/2008 on education and training (School Act) and on amendments to certain laws.

As we mentioned above, from the school year 2025/26, children at the age of 3 will have a statutory right to admission to pre-primary education. Currently, pre-school education is compulsory for children aged 5 who will start compulsory school attendance the following school year. Since there is already a problem with the placement of all children, a transitional period until the 2025/2026 school year has been introduced to apply for admission to pre-primary education. During this period, the age will be lowered every school year, during which younger children will always be entitled to admission to kindergarten - in the current school year 2023/2024 it will be 5-year-old children, in 2024/2025 it will be 4-year-old children and in the school year in 2025/26 it will be 3-year-old children. The aim of this measure was to achieve and long-term maintenance of at least 95% enrolment of children in kindergartens, which the Slovak Republic committed to in the Recovery and Resilience Plan.

For children covered by compulsory pre-primary education, the so-called the catchment kindergarten is determined. This for children with permanent residence in the municipality is determined by the municipality in a generally binding regulation (in accordance with § 6 of Act No. 369/1990 Coll. on Municipal Establishment, as amended, as well as in accordance with § 8a of Act No. 596/2003 Coll. z. on State Administration in Education and School Self-Government and on Amendments and Supplements to Certain Acts). If the municipality is the founder of several kindergartens, it determines the relevant part of the territory (usually a list of streets) for each catchment kindergarten by means of a generally binding regulation.

Determining the catchment kindergarten is important both for checking compliance with the provisions of the Act on Compulsory Pre-Primary Education and at the same time for the possibility of granting a contribution for pre-primary education if it cannot be provided in the catchment kindergarten.

If a parent has registered a child in a kindergarten other than the one in the catchment area, or if the child attended a kindergarten other than the catchment area even before he is supposed to complete compulsory pre-primary education, the director of this kindergarten must inform the director of the catchment kindergarten. If the catchment kindergarten is unable to ensure the fulfilment of compulsory pre-primary education due to capacity reasons, the state contributes according to. Act No. 571/2009 on parental allowance by parental allowance in the amount of €301 (status in 2023). If the parent did not receive maternity leave, the amount of the contribution is even €412.60.

The method of accepting children as well as other requirements (e.g., criteria for evaluating submitted applications) are regulated by individual municipalities through generally binding regulations.

1.2 Framework of public service production

Governance is the administrative theory to which the city districts and the municipality of the capital apply their activities. Boviard and Löffler (2009:6) perceive "*public governance in the sense of how an organization together with its partners, stakeholders and networks works to influence the outcomes of public policies*". According to their findings, public sector organizations cooperate with key stakeholders to improve the services and outputs provided. This means that public sector organizations must: "*co-design*" their services and policies together with their users and other key stakeholders; "*co-manage*" their resources together with other partners; "*co-deliver*" their services with users and their communities and "*co-assess*" their services with their key stakeholders" (Boviard and Löffler, 2009:225).

Public sector services, like public policies, are no longer created only by authorities, but are co-produced by their users. This is the main benefit of governance in comparison with the previously frequently applied approach of public management, which focused primarily on the "anonymous" production of public services by authorities.

Along with how the concept of governance is being promoted, the view of the way in which public services are produced and what value they bring (provide) is also changing.

From the point of view of our paper, however, the following aspect is more important, which the concept of governance made possible in the production of public services, and that is the change of perspective on the theory of the production of public services. It highlights the specificity of service compared to goods and the resulting consequences for management. The basic theoretical definition was addressed by Osborne, Randor & Nasi (2013). Since most public goods are of a public service nature and are thus intangible compared to a "product", built on processes, and based on the promise of what will be delivered. The service thus consists of separate processes that determine its content and reason, as well as the user's own experience with the service. As Osborne, Randor & Nasi (2013) say, "*influencing and understanding the user's expectations of a service is fundamental to their experience and satisfaction with that service - and that experience then has a very fundamental impact on the effectiveness and impact of that service*". In addition, compared to the consumer of goods, the consumer of the service is also its co-producer. However, this co-production is not just an "*addition to the service*", but it's essential feature (Osborne & Strokosch, 2013).

From the above, 2 concepts are important for further direction - value and co-production. The concept of co-production developed together with the concept of *Public Service Logic*, whose predecessor (*Public service dominant approach*) we described above.

Osborne (2018) takes a closer look at the ability of public sector organizations to participate in value creation through co-production and co-creation. The difference between co-production and co-creation is as follows: co-production assumes a process where the public sector organization is dominant and the logic is linear, built on product-dominant concepts of production. Co-creation assumes an interactive and dynamic relationship where value is created in the context of interaction. The value for the user of the service and the organization of the public sector does not arise from linear production, but rather from this interaction appearing within the context of the user's wider life experience (Grönroos, 2011).

An important knowledge is that the value can only be created by the user of the service. A service organization cannot provide value, but only the value promise for the user and/or the resources for creating value for the service user (Grönroos, 2011).

This significantly changes the perception of "performance" as the key measure of public service success and focuses on "value" - and the true nature of such a service. The creation of value thus shifts to co-production by involving the user and co-creation – the mutual interaction of the user and the public sector organization. At the same time, this changes the hitherto valid paradigm that the public sector organization creates value through its performance. *The role of the public sector organization is to create a service offer and help the value creation process.*

2 Material and Methods

In the first step, we devoted ourselves to the analysis of generally binding regulations of selected urban districts of Bratislava. From them, we found out the way in which children are enrolled in kindergartens. Subsequently, through interviews, we found out the procedure for evaluating applications.

Based on this information, we then compiled a questionnaire, which we shared in electronic form on social networks and distributed via e-mails. For the distribution of the questionnaire, we chose "snowball sampling[1]". Snowball sampling is a method that involves selecting samples using "insider" knowledge and chains of referrals between subjects that share common characteristics of research interest. It is especially suitable for creating samples that may be difficult to obtain in random sampling[2]. In our case, it is a specific group of respondents - parents of children in kindergartens.

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[1] is a non-probability sampling technique where existing study subjects recruit future subjects from among their acquaintances.

[2] A good example of the use of "snowball sampling" is the article by Kaplan, Korf and Sterk (1987), who collected responses from heroin users in 2 Dutch cities.

The electronic questionnaire was created in the Google Forms application. The collection took place in a period of 3 weeks from 19.4.2023 to 9.5.2023. During this period, we received 140[3] responses, while only 128 of them met the condition of "attending kindergarten in Bratislava and contained information about the district of residence and the district in which the kindergarten attended by the child is located." After cleaning the data, we continued to work with 128 responses.

3 Results and Discussion

3.1 Admission process

The process of accepting a child begins from the parent's point of view with the submission of an application. The deadlines as well as the method of submitting the application are fully in the hands of the city districts and are regulated in the relevant generally binding regulations. Municipal districts inform about registration dates through various communication channels (websites of kindergartens and municipal districts, local newspapers, television).

Because based on § 5 par. 14 of Act no. 596/2003 Coll. the kindergarten director decides on admission, it is necessary to deliver the application to his hands. The way in which this happens varies across the city districts.

For example, the district of Ružinov allows you to apply in several ways (classical by mail, e-mail, in person at a kindergarten or through an electronic application on the website of the kindergarten). In the case of kindergartens within the scope of establishment of Petržalka, Bratislava's largest district, a child can only be registered by delivering an application for admission ("application") to the director of the kindergarten. The Staré Mesto district allows the application (application) to be submitted in person, by post or courier, by e-mail or by means of an electronic document authorized by a qualified electronic signature. A medical certificate about the health of the child is also an essential part, the price of which is €5.

Since e.g., in the city district of Ružinov, they have been recording a higher demand than they can satisfy for a long time, they are evaluating the requests based on adopted rules modified in the generally binding regulation (Ružinov, VZN 2/2019). The criteria consider the age of the child, the proximity of the residence to the kindergarten, the social situation and employment of the parents or information about siblings. In total, the child can get 22 points, 10 of which are linked to permanent residence.

Since parents can submit a theoretically unlimited number of applications (requests for admission), these are subsequently processed at the district level. This happens at the meeting of kindergarten directors, where multiple submissions are sought, and the total numbers of "unique" applicants are determined. These are subsequently classified according to the available capacities of individual kindergartens. After this process, decisions are sent to parents. If the decision contains a negative opinion, the parent can wait until a place becomes available, e.g., enrolling accepted children in city schools in other city districts.

3.2 Results of a questionnaire survey

The goal of our research is to find out what benefit the pre-primary education policy implemented by individual city districts provides and what benefit it brings. In the previous section, we saw that the basis for providing pre-primary education services is tied to the city district in which children and parents are residents. Table 1 presents the "origin-destination" matrix, in which we can see the flows of children between the urban areas in which they live and in which they attend kindergarten. Out of 128 children, 82 (sum of values on the diagonal) attend kindergarten in their district and 46 outside it. To confirm the "relevance" of the answers in relation to self-government, we state that out of 128 children, 115 attend a public kindergarten, 11 attend a private kindergarten, and 2 children attend a forest club.

Out of 44 parents of children who do not attend kindergarten in their district, 41 stated that they were rejected due to lack of space as the reason for not attending kindergarten in their district. In the case of children attending a kindergarten in their district, 39 out of 82 were rejected due to lack of space.

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[3] The total number of children in preschool age (3 to 5 years old) was 16,366 in Bratislava on 31/12/2022. The number of valid answers (128) thus represents 0.78% of the maximum possible set of respondents. The sample required to achieve the standard 95% confidence interval (CI) and 5% confidence level (CL) is 376 respondents, in the case of 90% CI and 10% CL, a sample size of 68 respondents is required. In the case of 128 answers from a population of 16366, we can talk about a CL of 8.63% with a CI of 95%.

Of the 128 parents questioned, 74 said that their child does not attend a catch kindergarten. 33 of them indicated that the reason was "they didn't have a place in the kindergarten", 19 that it was closer to work for them, and 28 parents could not get to work on time due to the opening hours[4].

Table 1 – Commute flows between urban areas of residence and kindergarten headquarters

City district residence \ City district kindergarten	Čunovo	Devín	Devínska Nová Ves	Dúbravka	Karlova Ves	Lamač	Nové Mesto	Petržalka	Podunajské Biskupice	Rača	Ružinov	Staré Mesto	Vajnory	Vrakuňa	Záhorská Bystrica	*spolu*
Čunovo	1	1						1								*3*
Devín		1	1			1		1						1		*5*
Devínska Nová Ves			1					1				2		1		*5*
Dúbravka							1	1				1	1			*4*
Karlova Ves					17											*17*
Lamač					1	2		1								*4*
Nové Mesto		2					17	2			1	1	2			*25*
Petržalka				1			2	18			2	1			1	*25*
Podunajské Biskupice			1						1							*2*
Rača							1			2						*3*
Ružinov					1		1				8			1		*11*
Staré mesto												14			1	*15*
Vajnory		1			1						1					*3*
Vrakuňa		1		2							3					*6*
Záhorská Bystrica																*0*
spolu	*1*	*6*	*3*	*3*	*20*	*3*	*22*	*25*	*1*	*2*	*15*	*19*	*3*	*3*	*2*	*128*

Source: authors

How do parents retrospectively assess their feelings when looking for a place in a kindergarten? 85 parents (66.4%) answered that "they were glad to get a place", 21 (16.4%) of them could choose from several options and 22 (17.2%) did not feel any limitations when choosing a kindergarten.

Despite the dominance of the statement about the limited possibility of real choice, the respondents had the opportunity to evaluate selected factors (such as cleanliness, offer of extracurricular activities, foreign language lessons or additional services) that influenced their choice. The results are shown in Figure 1.

As we can see from the Figure 1, the choice of kindergarten was most influenced by the distance from the residence (65), then the cleanliness of the kindergarten (63), tuition fees (44) and only then the distance of the kindergarten from the job (43). On the other hand, the factor that had the least influence on the choice of a kindergarten was the kindergarten's website (56), additional services (arrangement of a hairdresser who cuts children's hair in the kindergarten, a visit to the dentist, or provision of a swimming course; 49), a visit to the kindergarten during the search (40) and tuition fees (33).

Other factors that did not have a significant influence on the choice include the offer of clubs, the educational program and regular assessment of the child's progress. Those that were able to convince parents included reviews and recommendations and a healthy diet.

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[4] In the case of this question, it was possible to mark several answers

Figure 1 – The influence of selected factors on the choice of kindergarten
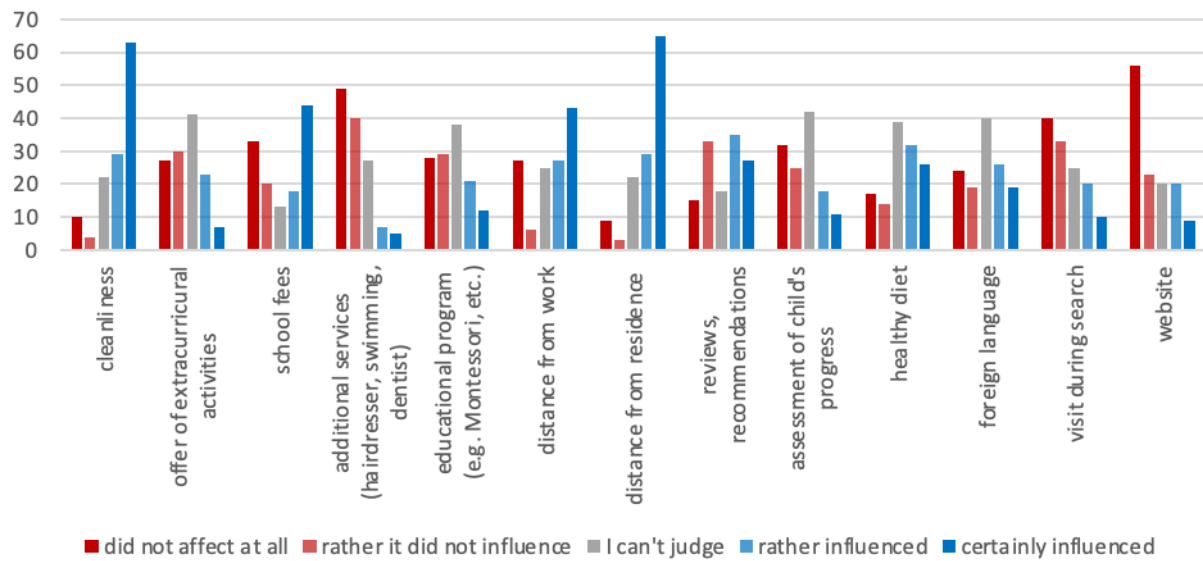
Source: authors

Figure 2 – Supply and demand for kindergarten services
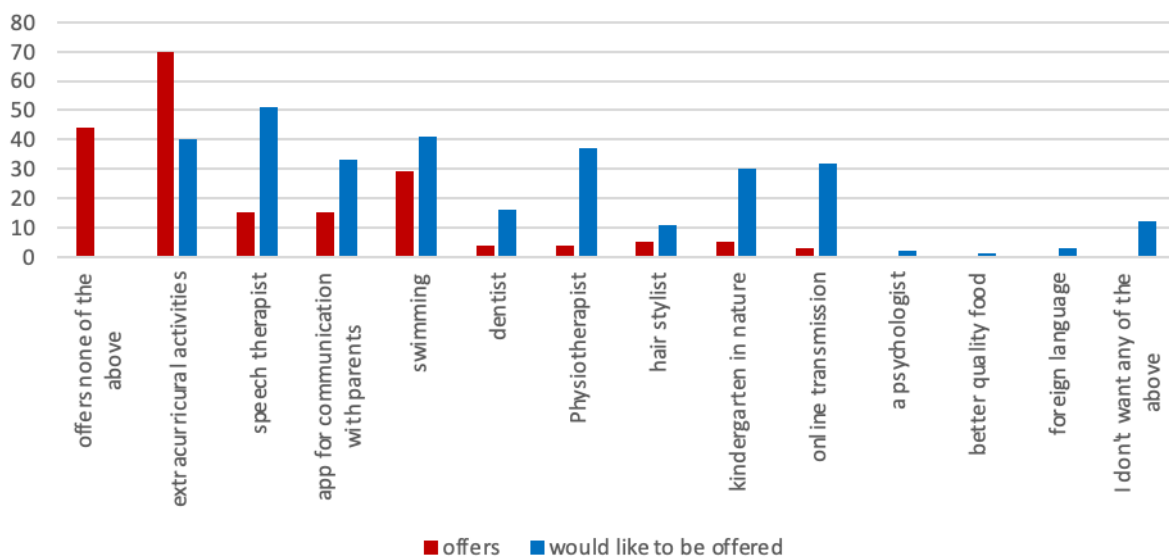
Source: authors

Figure 2 shows the range of services or activities available to parents in kindergarten for their child (red) or which they would like to have (blue). Even in this case, parents could mark several options. In 44 cases, parents did not have the option of choosing additional activities/services in the kindergarten. 70 parents could choose from extracurricular activities and 40 would like to choose them. The most requested service is a speech therapist (51), followed by activities related to movement (swimming 41, physiotherapist 37 or kindergarten in nature 30). The demand for a dedicated app for communication with parents (33) is interesting. The high demand for online transmission from kindergarten (32) is surprising. 12 parents are not interested in any additional service. 3 parents would welcome the teaching of a foreign language, 2 would welcome the services of a psychologist, and 1 parent would welcome better food. In total, 150 "units" of services are provided and 297 are "inquired".

The positive news for the founder is that most parents are willing to pay for additional services. The amount of the fee ranges from €10 to more than €100 per month. Unfortunately, the amount of the fee offered did not always match the scope of the required services. However, when we asked the parents about the specific amount, they would be willing to pay for 1 hour of class (movement activities, science, cooking, etc.), their answers were more

realistic (see Figure 3). More than half of the parents are willing to pay 5-10 € for 1 hour of extracurricular activities.

Figure 3 – Offered reward for 1h extracurricular activities (histogram)
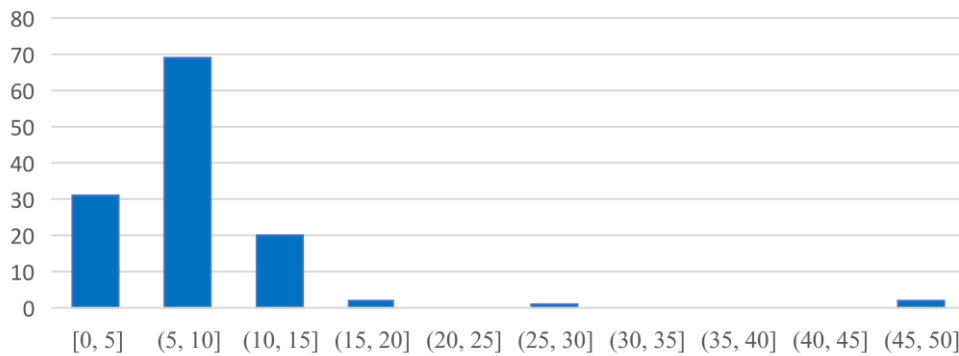
Source: authors

The last chart - Figure 4 shows the evaluations of kindergartens by parents. In this case, we received only 117 responses. From the chart, it is clear at first glance that most parents evaluate their kindergarten with the best mark (1) in every single criterion. We can see a high degree of satisfaction with the cleanliness of the kindergartens. However, the staff also won second place both in the number of positive and negative evaluations. Parents are not that much satisfied with the equipment of kindergartens. However, the most negative evaluations appear in the "communication" category. These results help illuminate the high demand for a dedicated app for communication and online streaming.

Figure 4 – Evaluation of kindergartens
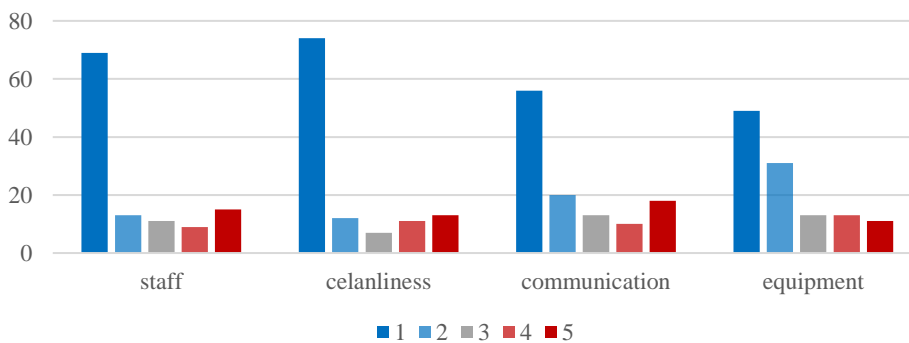
Source: authors

3.3 Discussion

Creation of a unified enrolment system and clearing centre at the city (municipality) level

Until there is a change in funding to a normative one (or in the context of municipal reform to municipalization), it would be advisable to create a clearing centre between individual city districts so that parents can enrol their child in any kindergarten in the city of Bratislava without any problems. As we have shown, the current system of placing children in kindergartens in the territory of the city of Bratislava is relatively complicated, user-unfriendly and does not allow maximizing the benefit through the service provided.

By creating a simple information system at the city level, through which parents could fill in information about their child in one place, as well as select preferred kindergartens across the city districts and sort them according to preference, it would create the prerequisites for achieving a higher level of usefulness both for parents and children and for the founders themselves. The decision on the placement of the child would then not take place "in isolation" within the individual city districts, but across the entire city. If the system also displayed information about the current number of registered children along with the degree of preference, parents who have not yet registered their child could adjust their decision and immediately choose another kindergarten in their preference list. At the same time, such an information system could provide comprehensive information about the services

that each kindergarten offers, collect the experiences of parents, etc. Parents would thus get more information, based on which they would be able to choose the kindergarten that best suits them and their children, conveniently and in one place. 103 respondents (90.3%) of our survey out of 114 who answered this question spoke in favour of creating such a system.

As our pilot survey showed, there are potential cases of children from city district A attending kindergarten in city district B and children from city district B attending kindergarten in city district A. On the contrary, this situation can (from the parents' point of view) be an optimal solution if their kindergarten is in another district to prefer a solution in the case of a sub-optimal solution, if parents were forced to accept a place in a kindergarten in another district only because there was no place available in their district. If information (and parents) were shared, such suboptimal conditions might not occur.

At the same time, the outputs of this system would serve to an effective "clearing" of costs between individual city districts, or to create a different financing mechanism for pre-primary education in the territory of Bratislava, which would respect the needs of the city's residents from the spatial[5] point of view of providing this public service.

Changing the method of financing pre-school education

As we mentioned above, preschool education and thus kindergartens are financed directly from the budgets of local governments.

Our proposal consists in the introduction of *normative financing of pre-primary education*, like the case of primary and secondary schools. Such a method would be fair to parents who cannot use the pre-primary education services provided by their municipality or urban area. There can be several reasons. From the lack of free places or the simple non-existence of a kindergarten to the inconsistency with the working rhythm of the parents or the place of employment (commuting for work). The resources needed to finance these services would be taken out of the share of income tax that is remitted to the local government[6]. Although at first glance it may seem that the income of the municipality would be significantly reduced, this is not true. The municipality can apply for this money as a service producer, that is, if it provides kindergarten services today, it will receive a comparable income as before the change in funding. The obvious beneficiaries would be parents whose "home" municipality does not offer these services, who work in another city or are not satisfied with the quality of the service provided by the municipality and choose a private provider. In the case of non-residents, the change in funding would increase their chance of getting a place in a kindergarten in the place where they need it, in the case of parents with children in private kindergartens, they would be compensated for part of the costs associated with providing pre-primary education for their children. Another benefit of such a change would be the creation of competition between individual providers (including public ones) and thus pressure to increase the quality of the services provided. Finally, it is necessary to mention the ability of private providers to react more agilely to increased demand and thus their ability to create additional capacities in a relatively short time in those cities (and places) where there is a demand for kindergartens. Normative financing would also allow parents who are willing to pay extra for their children's education, but do not have the full amount to finance a stay in a private facility, to change the provider from a public to a private one, thereby freeing up a place in a public kindergarten for those parents who cannot afford such an extra payment and for insufficient capacity (or other reason) their child was not enrolled to the public facility.

Service redesign

The results showed a relatively wide spectrum of needs preferences that parents consider or would like to consider when choosing a kindergarten. Despite the prevailing feeling that "they were glad to get a place", they are looking for the "best possible" solutions that could satisfy their needs in the limited offer. From proximity to residence or

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[5] Also considering the data from the pilot survey, we assume that the demand for places in kindergartens does not copy the distribution of the population, and thus there may be an increased concentration in urban areas where the function of work prevails over housing.

[6] If we assume monthly costs of €300 per month (the same as the amount of the contribution set by the state; similar to the figure given by the mayor of the Bratislava - Ružinov district and only €70 less than a private provider in Bratislava - which can be considered a profit that the public sector does not have to generate) we receive annual costs for one kindergartener in the amount of €3,600. With a population year of approximately 50,000 children and three concurrent years, the annual costs would amount to 540 million. €. Just for comparison - the annual cost of primary education is 900 million. €.

employment, opening hours or additional services. This shows that their needs are different from the needs of the city districts, which, due to the exceeding demand, are forced to take such measures (emphasis on the residency of children and parents) that will enable them to provide a service of at least some quality to those residents to whom public services are supposed to deliver (residents of the given city district).

The results also showed parents' dissatisfaction with communication with the preschool as well as their need to be informed about what is happening in the kindergarten, which was reflected in the demand for online cameras. Reducing the level of uncertainty and mistrust through better communication can create sufficient space for longer-term work on changing the parameters of this service so that it is more oriented to the needs of the consumer.

4 Conclusion

The way in which public sector organizations produce public services to achieve maximum value for the user has undergone significant changes in recent years. The first significant change was the change in the perception of the benefit for the end user (citizen) and not the producer (public sector). The second was the investigation of factors affecting the perceived quality (and therefore value) of the service provided.

Changes in demography, legislation and suburbanization put the urban districts of Bratislava in front of a difficult problem - how to ensure the satisfaction of legal requirements for the provision of pre-primary education with limited resources and a short period of time. Part of the solution is optimizing the process of accepting children. Not only would the introduction of a unified electronic form significantly increase the comfort of parents, local governments (including the municipality) could also obtain a new type of information (e.g., about the real preference of parents), through which they would be able to make better decisions about placing children in kindergartens. At the same time, the results indicate the need for a redesign of the service - from today's standard "I provide a place in a kindergarten" to "I want my clients to receive the best possible service and bring them the maximum benefit possible". This will require moving the management of the service to a city-wide platform and a lot of work with staff and parents.

A "quick fix" that would help increase the value of the service provided is the launch of a dedicated application for communication with parents. Such an application provides a space for effective sharing of information about the child's life in the kindergarten, two-way communication (announcements, polls from the kindergarten management and e.g., submission of apologies from the parents). At the same time, as our survey showed, most parents would be willing to pay extra for such a service. An equally positive finding is the willingness of parents to pay for rings for children if they were provided directly by the kindergarten. In this, we see the potential both for the development of children and the possibility for a relatively simple increase in the incomes of kindergarten employees without additional costs for the municipality.

Changing the method of financing in this case is not in the hands of the local government. Its introduction would make it possible to quickly increase the capacities of private providers, which would free up the capacities of local governments. A wide group of residents would benefit from such a measure - not only those who would pay extra for care at a private provider, but also those whose children would join the freed capacities. The proposal to introduce normative financing appears in pre-election political debates, but it is not currently a topic of public debate.

Because this was a pilot survey, we are aware of the limitations of the interpretation, which are caused by the insufficient sample size to meet the usual confidence standard of CI 95% and CL 5%. These can be manifested especially in the areas that were covered by the questionnaire (satisfaction with kindergarten services, willingness to pay for additional services or the intensity of attendance flows between city districts). What is not affected by the sample size is the design of the service itself - policy setting by the boroughs that does not respect the real needs of the residents (in a broader sense), "outdated" way of registering that does not take into account technological progress or the state in the field of funding (need for systemic change).

The results of the pilot survey among parents as well as the conclusions of the article will be forwarded to the representatives of the Metropolitan Institute of Bratislava, who expressed interest in improving the public policy in question, even if it does not fit the agenda of the municipality.

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Capacity of municipalities with extended powers to administer regional education and its relation to the level of support to schools

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Abstract: The aim of the paper is to understand the relationship between municipal staffing capacities and the level of their provision of operational support to schools. This paper presents findings from online survey on municipalities with extended powers (MEPs) which has been conducted in 2021. Around 80% of MEPs participated in the survey. The results show that larger MEPs employ more staff dedicated to the school policy agenda, but neither support nor willingness to provide it are correlated with the number of these staff or the size of the MEP. Thus, support of MEPs, albeit of varying sizes, appears to be driven by other characteristics than the differently measured size of the MEP, but we find indications that only significantly larger MEPs with more project staff and a high number of the directorate of the school facilities may be more active in supporting their schools, which should be the subject of further research.

1 Introduction

Principals of Czech primary schools devote on average 40 to 50% of their working time to school operational tasks and approximately 15% to pedagogical matters (Boudová et al. 2019; Kleskeň and Podpiera 2010), while the ratio should be at least reversed for successful implementation of educational policy reforms (Federičová 2019; MacNeill et al. 2003; Clarke 2000), implying the need to focus on relieving Czech principals of administrative tasks (Prokop 2020; Pazour et al. 2019). The role of principals as pedagogical leaders is essential to ensure quality of education (Behbahani 2011; Sammons et al. 2011), but we must first create space for principals in the Czech Republic to perform this role.

The key partner of schools that can effectively relieve them are the founders, in the Czech context mainly municipalities. Therefore, in order to map and understand founders activities, a survey among municipalities was conducted.

This paper presents findings on municipalities with extended powers (MEPs), which are the most significant group of founders – 456,000 pupils (50%) in 1,014 schools (28%) founded by 205 MEPs (8% of municipal founders). At the same time, given that they are the largest municipalities with the most robust administrative staff, MEPs can also be expected to have the largest staff capacities for school administration in the national context (Hargreaves 2011; Spillane and Thompson 1997), which, given the very different size of MEPs, are likely to vary significantly, and hence it will be possible to look for relationships between variables and draw conclusions in relation to capacity and size.

Therefore the aim of this paper is to describe the staff capacities of the MEPs that are dedicated to the school agenda (including direct support and relief for schools) and to understand their relationship to the level of provision of operational support to schools, especially in the context of debates about the need for consolidation of Czech municipalities and the impact of consolidation on the ability of municipalities to fulfil the role of the middle tier, basically the relief role (Gargulák et al. 2023).

The research questions are therefore:

1. How many full-time employees are dedicated to the education agenda in the municipal offices of the MEPs?
2. What is the relationship between the number of MEP staff dedicated to the school agenda and the level of support that MEP reports providing to their schools?
3. What is the relationship between other MEPs characteristics and the level of support that MEPs report providing to their schools?

The Theoretical Section describes the current state of knowledge of MEPs staff capacities, the Practical Section presents the outputs of the questionnaire survey in more detail, and the Conclusion presents the methodology including the operationalisation of the indexes and a discussion of the results including conclusions and implications for further research.

2 The current state of knowledge

According to unpublished data provided by the Ministry of the Interior, MEPs employed 42,202 full-time equivalent persons in 2021. Unfortunately, it is not clear from the data whether this includes municipal councillor and mayors or workers on an agreement to complete a job. As already pointed out by Jüptner and Masopustová (2019), data on the number of employees of municipalities are unreliable and a look at the databases of the Czech Statistical Office, the Ministry of the Interior and the Ministry of Finance reveals significant differences and inconsistent methodology.

The number of municipal employees working on the school agenda is not tracked by the public administration at all, and there is no known research that has surveyed this issue on an ad hoc basis. There is a study examining the number of municipal officials, noting that it is not feasible to divide them by agenda, even if only self-government and delegated competences (Masopustová and Jüptner 2019). The Annual Report on the State of Public Administration (Ministry of the Interior 2022) only provides information on the total number of employees, and the data provided by the Ministry of the Interior shows that even the gradually expanded method of performance funding for delegated competences of municipalities is not helpful in determining the number of municipal employees who are dedicated to school agenda, since the school sector is not performance funded and performance funding takes into account the number of performances but does not track the number of full-time employees who perform them.

Better information can be found on the number and characteristics of civil servants (Bouchal and Janský 2014), especially in the government sector (Chaloupka et al. 2022), where, in addition to the studies and annual reports mentioned above, one can work directly with the state budget, the final accounts and the approved systematisation.

As a framework, it would be possible to base estimates of the number of employees working on the education agenda in municipal offices on the number of municipal officials who have passed the special professional competence examination in the field of education (Decree No.512/2002 Coll.) and are still employed by municipalities, but their actual number is probably not centrally recorded.

However, even if the number of these officials is determined, we do not get an answer to the research question because the number of MEPs officials is smaller than the number of MEPs employees. In fact, only employees who perform administrative tasks are classified as officials, while the definition of administrative tasks is unclear, especially in the case of self-government (Ministry of the Interior, undated), which, among other things, is the reason for the unreliability of data on their number (Masopustová and Jüptner 2019). The research question, however, targets the total number of full-time employees of persons working on the school agenda (FTEEs), not only in the unit dedicated to education and not only in the area of administrative tasks, but also in the area of direct, e.g. operational support.

3 Methodology

Online questionnaire survey was conducted from 7 April to 28 May 2021 and then was complemented from 16 August to 28 September 2021.

Full responses to questions on operational support for schools were obtained from 162 of the 205 MEPs (79% of the population). Responses to questions on the amount of FTEEs were obtained from 169 out of 205 MEPs (82 % of the population). The reported amount of FTEEs does not include elected municipal councillors, but includes employees on agreement to complete a job, including project-funded staff (e.g. FTEs whose are financed in the framework of the implementation of a Local Action Plan if the municipality is the implementer).

The claim of statistical significance of the relationships is based on Spearman's correlation coefficient at the 5% significance level. Claims marked with an asterisk (*)) are statistically significant at the 1% significance level.

In the questionnaire, in addition to the number of FTEs, municipal representatives were asked whether and how often they provide support to their schools in the defined activities. Unless otherwise stated, the FTEs are listed in aggregate without distinguishing their type, location in the municipal department or source of funding.

Questions about school support were answered by the heads or other relevant staff of the department of the MEP office responsible for school agenda, and questions about staffing were answered by the secretaries or their delegates.

Areas relevant to the field of school operational support were legal advice and interpretation (e.g. training), legal services (e.g. drafting of contracts), personnel management (HR, selection procedures, administration...), ICT administration (internet network, software, PC and other hardware), maintenance of the school building (or other facilities), bookkeeping, processing of project applications, drafting of project documentation, administration of public procurement and central procurement (e.g. PCs, commodities...).

Respondents were always asked whether the MEP provides this type of support to at least one of its schools, either on its own or through the provision of services by third parties. At the same time, respondents were asked to choose the answer that corresponded to the higher level of provided support if they were undecided. In this case, the questions in the questionnaire were closed-ended and only one answer could be chosen from (1) "yes, on a regular basis, the school does not have to take care of it"; (2) "yes, on a occasional basis, when the school asks"; (3) "no, but if the school was interested we could provide it"; (4) "no, unfortunately we cannot, even if the school was interested"; and (5) "no, it is not the role of the municipality".

Depending on the number of responses chosen in a given level of support, indexes were created that summarily tell us about the level of support actually provided ["real school operational support index"; responses (1) and (2)], the willingness to provide it if the school asks ["conditional school operational support index"; responses (1), (2) and (3)] the potential willingness to provide support if unspecified barriers were overcome, ["potential school operational support index"; responses (1), (2), (3) and (4)] and the extent to which respondents believe that it is not the role of the municipality to provide support ["disinterest in school operational support index"; response (5) – reverse of the potential school operational support index]. The number of relevant responses was divided by the maximum number of responses (ten) to obtain the index value.

Demographic data on municipalities not collected through the questionnaire survey comes from a combination of unpublished statistical data from the Ministry of the Interior and Directorate Reports for the Ministry of Education, Youth and Sports.

4 Findings from the survey

The first part presents the results on the number of full-time employees (FTEE) and full-time education employees (FTEE) in MEPs and the second part presents the results of the survey on the support provided by MEPs to their schools.

4.1 Number of MEPs full-time education employees (FTEEs)

The increasing number of MEP FTEEs is statistically significantly positively correlated*) with the population of the municipality (see Figure 1) and the total number of employees in the municipality.

As shown in more detail in Appendix 1, 205 MEPs are 95% likely to employ between 572 and 796 FTEEs (95% confidence interval for the full sample). From the mean values in each size category, the number can be estimated to be 707, but from the mean of the full sample (3.33), only 683; if we exclude the 5% outliers, the mean is 2.8, and the estimate of FTEEs is therefore 574.

The median number of FTEEs increases from 1.2 FTEEs for MEP with up to 10,000 inhabitants to 4.6 FTEEs for MEP in the size category of 20,000 to 89,999 inhabitants and increases significantly to 15.3 FTEEs for MEP with 90,000 or more inhabitants. The minimum reported number FTEEs is 0.3 and more than ten FTEEs are found only in a few MEPs in the category of 20 thousand and more inhabitants.

Figure 1 – Figure of the number of FTEEs, divided by the size of the MEPs
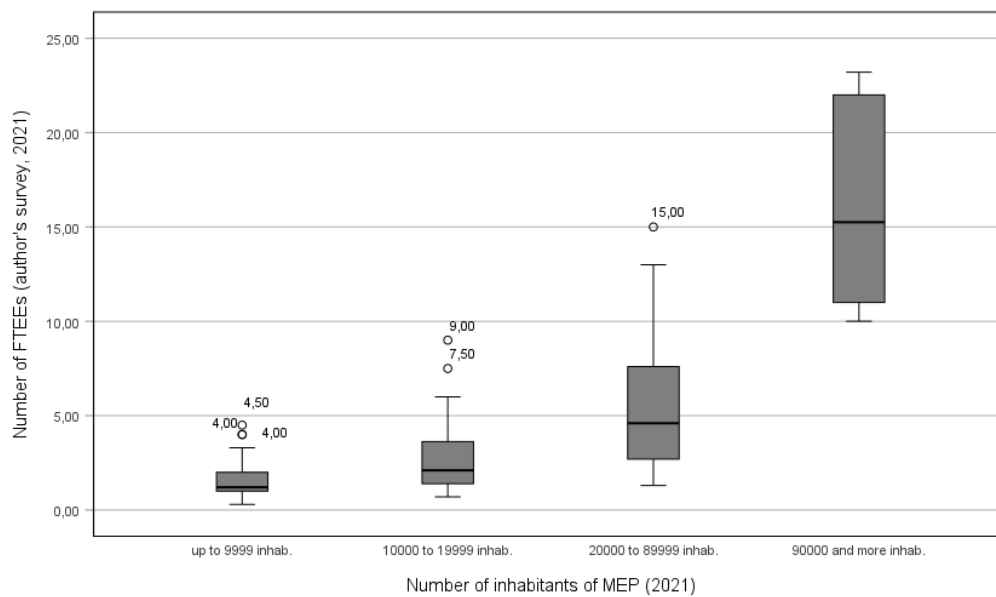
Source: Author's own survey of nursery and primary and secondary school founders and data on the number of municipalities and their population provided by the Ministry of the Interior (2021)

MEPs with up to 20,000 inhabitants do not employ project FTEEs in more than four-fifths of cases, while MEPs with 20,000 inhabitants or more declare project-paid FTEEs in about half of the cases. As Figure 2 shows, the difference is statistically significant. In general, the number of project-paid FTEEs increases statistically significantly*) with the size of the MEP.

Figure 2 – Figure of the amount of project FTEEs, divided by the size of the MEP
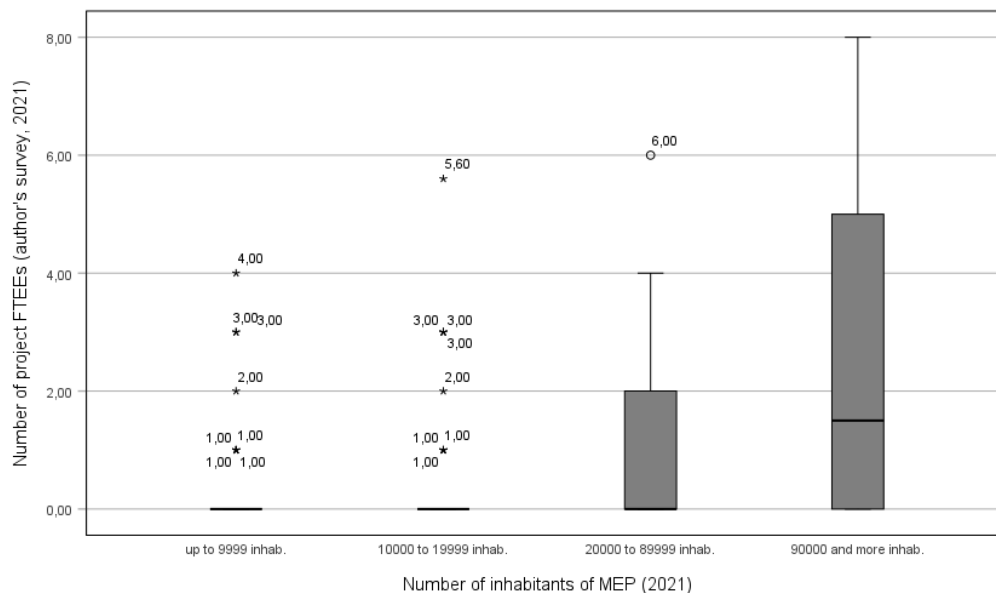
Source: Author's own survey of nursery and primary and secondary school founders and data on the number of municipalities and their population provided by the Ministry of the Interior (2021)

4.2 MEPs support to their schools (See Annex 2)

The average value of the real school operational support index for MEP is 0.51, the median value is 0.5 and the most common value is 0.6. Thus, the typical MEP is most likely to provide at least occasional operational support to its schools in five or six of the defined areas.

52% of MEPs provide at least occasional operational support to their schools in none to five of the defined areas. 3% of MEPs provide no support in any area, while 2% of MEPs provide support in all defined areas. MEPs that do not provide support in any of the areas can be found in every size category except the largest – MEPs with 90,000 or more inhabitants. MEPs that responded that they provide support in all areas can be found in the smallest and largest size category.

The index of conditional school operational support reaches an average value of 0.72 and the most common and median value of 0.8. Most MEPs can provide on-demand support to their schools in more than half of the defined areas, and are most likely to do so in eight, and similarly likely in seven to all areas. A third of MEPs can provide support in more than eight of the defined areas. Only two MEPs indicated that they are unable to provide support in any of the areas, even if requested (both MEPs are in the smallest size category), but in contrast 17% of the MEPs are able to provide support in all areas.

The index of potential school support has an average value of 0.84 and a median value of 0.9, but the most frequently occurring value is one. Inversely, the corresponding values for the index of disinterest in school operational support reaches values of 0.16 (mean), 0.1 (median) and 0 (mode), indicating that the typical MEP believes that in all of the defined areas of operational support, support is the role of the municipality.

Figure 3 – Figure of the value of the real school operational support index, divided by the existence of project-funded FTEEs in the MEP
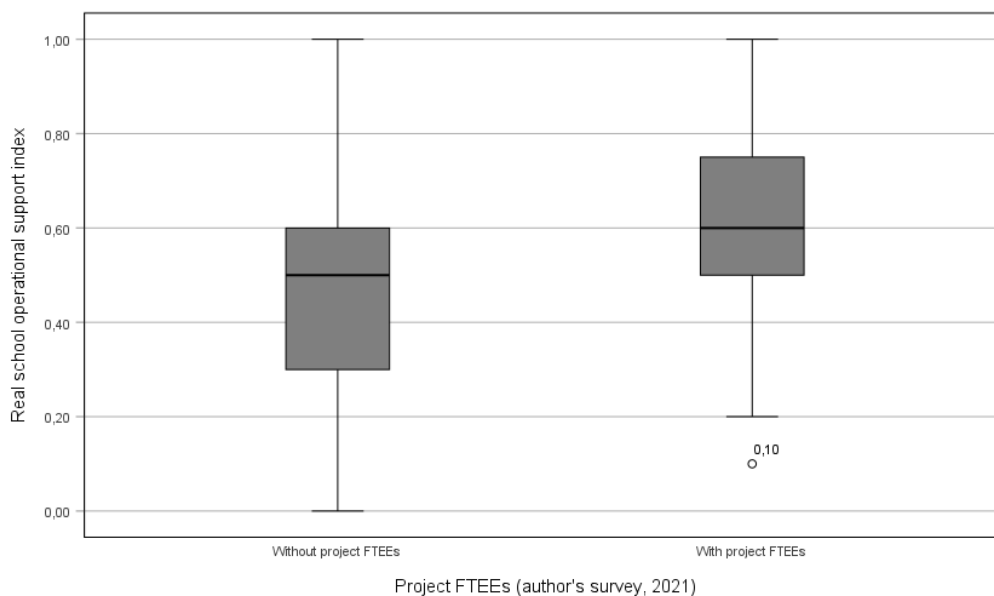
Source: Author's own survey of nursery and primary and secondary school founders (2021)

As shown in Figure 3, the number of project-funded FTEEs is statistically significantly correlated with the value of the real school operational support index. If a MEP has no project staff, the average value of the real school operational support index is 0.46, while if it has project staff, the average value of the index is 0.6.

Neither the number of FTEEs (nor the total number of staff) nor the number of project FTEEs are related to the other indexes. The population of the MEP is not statistically significantly related to the value of any of the indexes.

The index of real school operational support is also statistically significantly related to the number of directorates for school facilities that the MEP directly founds (see Figure 4). While for MEPs founding one to three directorates, the average real school operational support index for schools is 0.41, for MEPs with more than three directorates it averages around 0.55 (both in the category of four to six directorates and in the category of MEPs with seven or more directorates).

The average of the conditional school operating support index is 0.72 without taking into account the characteristics of the MEP and the average of the potential school operational support inxes is 0.84. The index of disinterest in school operational support is below 0.2 in all categories of MEPs and reaches an average of 0.16 without taking into account the characteristics of the MEP.

Figure 4 – Figure of the value of the index of school operational support, divided by the number of directorates of school facilities founded by the MEPs
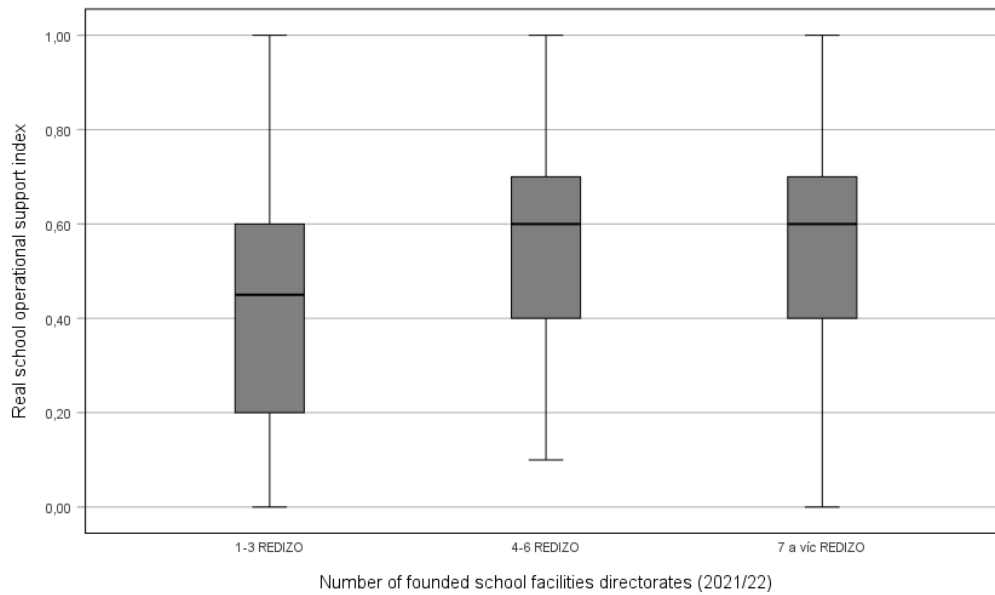
Source: Author's own survey of nursery and primary and secondary school founders and data from the School Directorate Report provided by the Ministry of Education, Youth and Sports (2021)

5 Summary and conclusion

In the MEPs, there is a 95% probability that between 572 and 796 full-time employees are dedicated to the school agenda, and it can be estimated that the actual value will be rather close to the lower limit of the confidence interval (see Annex 1). At the same time, larger than smaller municipalities are more likely to employ project-funded FTEEs (see Figure 2), with larger municipalities also generally employing more FTEEs (see Figure 1).

MEPs typically provide support to their schools in five to six defined areas of operational issues. Almost all MEPs can provide support in at least five of the defined areas of operational support if requested, and 40% of MEPs are potentially willing to provide support in all defined areas. (See Appendix 2.)

If an MEP employs project FTEEs, it also probably provides support to its schools in more defined areas (see Figure 3). The same is true for MEPs that found more school facilities (see Figure 4). Other characteristics do not have a statistically significant effect on the value of any of the observed indexes. Number of MEP FTEEs has a statistically significant effect neither on the amount of support actually provided nor the willingness to provide support.

Thus, while larger MEPs typically employ more FTEEs, the support for their schools and the willingness to provide it does not change. Thus, in the context of debates about municipal consolidation, it appears that support of MEPs, albeit of varying sizes (sizes vary from the higher thousands to the lower hundreds of thousands of inhabitants), is based on characteristics other than the variously measured size of the MEP, although we find indications that the largest municipalities in particular (MEPs with more school facilities and MEPs with more project-funded FTEEs) are more active in supporting their schools, and we are probably talking about MEPs with more than 20,000 inhabitants.

Finding other characteristics of MEPs that affect the provision of operational support to schools and a more detailed analysis of specific areas of operational support should be the subject of further investigation.

Acknowledgements

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The analysis of China new energy vehicle industry-based on Nio, Li and Xpeng companies

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Abstract: The China's new energy vehicle developed quickly; the subsidy policy plays an important role. This article first introduces the situation of China's new energy vehicle industry and then analyse the subsidy policies for China's new energy vehicle industry. Then the article selects the three new force car brands-Nio, LI and Xpeng for analysis because these three companies only focus manufacturing pure electric vehicle. On the basis of understanding their development status, the paper mainly adopts the Harvard analysis framework. It includes strategic analysis, accounting analysis, financial analysis and prospect analysis. The article mainly chooses financial analysis to deeply understand the three companies. By analysing these three companies, we can understand the development process of China's new energy vehicle industry.

Keywords: Subsidy Policy, New Energy Vehicle, Finance Analysis

JEL Classification: H, H3, H32

1 Current situation of China's new energy vehicle industry

1.1 Overall development status

The development of the new energy vehicle industry is an important direction to accelerate the construction of an automobile power and an effective means to break the constraints of energy and environment, which is of great strategic significance. In 2009, the wave of international electrification was in its infancy, and China seized the strategic opportunity, listed new energy vehicles as a strategic emerging industry, and gradually established a comprehensive support policy system. From the perspective of policy stage, from 2009 to 2015, China gradually established a subsidy policy system from small-scale pilot to large-scale promotion, and initially formed a complete industrial chain. From 2016 to 2020, through the "double credit" management and tax incentives, the development of new energy vehicles was promoted from both the supply and demand ends. At the same time, through measures such as raising the threshold of key technical indicators and establishing a sound regulatory system, a subsidy mechanism was formed to further support the excellent and strong company, and product technology was significantly improved. China's new energy vehicle market has transformed from policy-driven to market-driven, and the industry had experienced an embryonic period and a preliminary exploration period, and has entered a period of rapid growth since 2021.

From the perspective of market size, China has become the world's largest new energy vehicle market, in 2022 the production and sales of new energy vehicles in China reached 6.84 million 2022, accounting for 60% of global new energy vehicle sales. From the perspective of technical level, China has basically overcome the key core technologies of mainstream electrification such as power batteries, drive motors, and vehicle control systems, and established a well-structured, independent and controllable internal cycle industrial system. From the perspective of brand development, China's traditional automobile enterprises have successively launched new electric vehicle brands to attack the new energy vehicle market; the industry entered a stage of rapid growth.

1.2 China's new energy vehicle competition landscape

China's new energy vehicle market has formed a pattern in which two giants, four traditional car companies and three new forcer car companies jointly invest in construction and compete with each other. Two giants are BYD and Tesla, Traditional car companies are mainly SAIC Motor Corporation, Guangzhou Automobile Group, Chery Automobile and Changan Automobile; new force car companies are NIO, LI and Xpeng. From January to December 2021, among the top ten new energy passenger vehicle companies, benefiting from the hot sales of Wuling Hongguang MiniEV, BYD Han, Model 3 and other models, BYD, SAIC-GM-Wuling, and Tesla all sold more than 100,000 cars, ranking the top three with a large advantage, but the new car companies Xpeng, LI and

NIO also showed good result. This article will focus on the analysis of these three new force car companies, using the Harvard analysis framework, focusing on their accounting and financial analysis, analyzing the development of these three companies, and then understanding another aspect of the development of China's new energy vehicle companies.

Figure 1 – Sales of new energy vehicle brands in China 2021
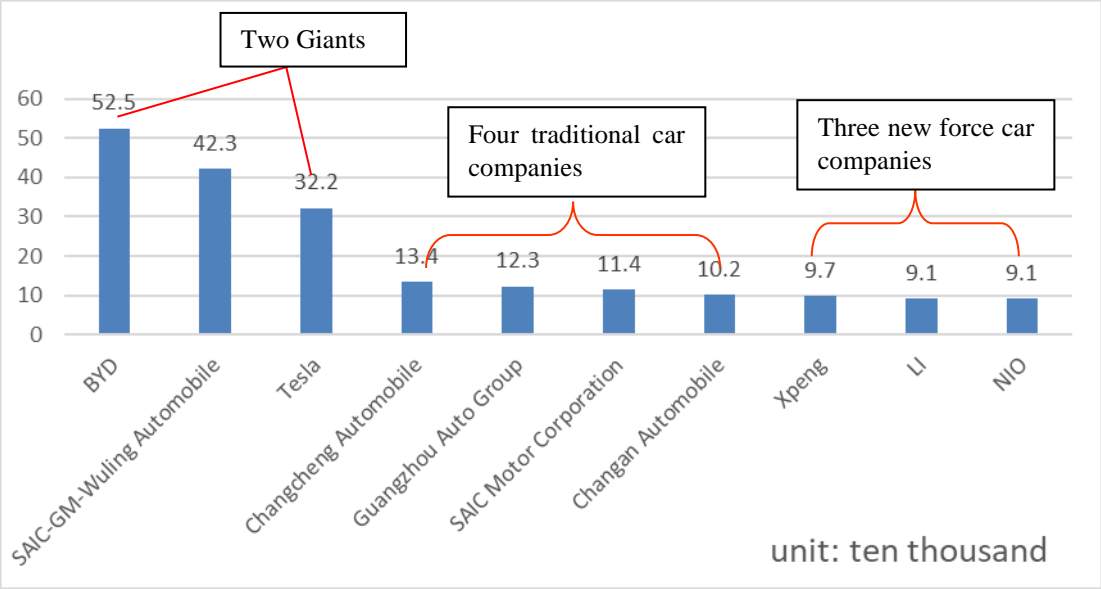
Source: [Wind Database]

2 Literature Review

In 2004, three professors at Harvard University, Krishna G. Palepu, Paul M. Hesly, and Victor L. Bernard proposed the Harvard Analysis Framework, which includes four dimensions: strategic analysis, financial analysis, accounting analysis and prospect analysis. They believe that financial analysis should not only rely on data analysis, but should also analyse the business status of enterprises from a strategic perspective. Analysis should combine with financial information and non-financial information, and transform the perspective of managers from the business status of enterprises to the sustainable development of enterprises[1]. Cao Yuping (2019) proposed that the Harvard analysis framework not only helps enterprises make major strategic decisions at the strategic level, but also provides a basis for enterprises to test the implementation effect of strategic decisions[2]. Lan Honghua (2019) believes that the Harvard analytical framework is an organic combination of qualitative and quantitative analysis, strategic analysis and financial analysis, financial information analysis and non-financial information analysis, which comprehensively shows the business conditions and development prospects of enterprises [3].

Till, Stephen & Zhenhong et al. (2018) conducted a market diffusion model study of more than 40 electric vehicles, showing that the development of the electric vehicle market is more closely related to purchase prices, operating costs, energy prices, and charging infrastructure [4]. Yao Zaoli et al. (2022) proved that the subsidy policy moderates the relationship between the public's perception of EV attributes and EV sales and from a practical perspective, by understanding the public perception of EV attributes, government policy makers and EV marketers can appropriately adjust and change their existing policies and marketing strategies for promoting EVs[5].

3 Methodology and Data

This article will analyse three representative new energy vehicle companies in China on the basis of introducing China's policies to promote the development of the new energy vehicle industry in recent years, so as to have a preliminary understanding of the development process of the entire Chinese new energy vehicle industry.

This article will use the Harvard analysis framework to analyses the three companies. The Harvard analysis framework is an overall analysis that integrates strategy, accounting, finance, and prospect forecasting into one in the middle and late 20th century. It aims to fully understand the competitive position of the enterprise, to identify the authenticity of the enterprise's financial statement data and to judge the future development of the enterprise.

This analysis framework includes the financial and non-financial factors of the enterprise. Starting from a strategic perspective, it deeply discusses the allocation of internal resources of the enterprise, and uses important accounting subjects to ensure the authenticity of accounting information. Financial analysis which is on the basis of strategy and accounting, reflect solvency, operation ability, profitability and development ability of the enterprise[3].

The data in this article is mainly derived from the official website of the Chinese government, the financial statements of the three companies Li, NIO and Xpeng, and the Wind database.

4 Analysis of Subsidy Policies for China's New Energy Vehicle Industry

4.1 Types of subsidies for new energy vehicles in China

In January 2009, the Chinese government began implementing subsidy measures to subsidize the new energy vehicle industry in various aspects, launching a demonstration operation project for new energy vehicles. Subsequently, governments and enterprises at all levels responded to the national call. The subsidy targets for the new energy vehicle industry have gradually expanded from the initial vehicle selling price to the entire new energy vehicle industry chain. The actual subsidies for new energy vehicles can be divided into three types from the perspective of the value chain: production end, consumer end, and supporting facility end.

Table 1 – Main categories of New energy subsidy policies

Production end	Consumer end	Supporting Facility end
R&D investment subsidy	Price subsidy	Construction of Charging station
Establishment of research and development base	tax break	Establishment of Battery recycling system
Reward intellectual property rights	Loose purchasing policy	
	Electricity subsidy	

Source: Own

4.2 Production end

The subsidies for the production end of the new energy vehicle industry are mainly used in the stage of enterprise R&D and innovation of vehicles. The government promotes technology R&D and innovation of new energy vehicle enterprises by providing monetary or non monetary assets to enterprises free of charge. New energy vehicle enterprises that meet the subsidy conditions can apply for financial R&D subsidies in many fields such as technological transformation, project research, technological innovation and patent application. Subsidies will focus on supporting the research and innovation of key components and the production of complete vehicles. In 2001, China began to carry out the research and development of new energy vehicles. For example, the 863 Program included new energy vehicle projects. The project strategy was to gradually transform from gasoline power to hydrogen power. During the 11th Five Year Plan period, energy-saving new energy vehicles were also proposed, and the country actively guided the transformation and development of the industry from a policy perspective.

After the implementation of a series of policies, the new energy vehicle industry has had an immediate effect. New energy vehicle enterprises have made a qualitative leap in independent research and innovation technology, and enterprise risks and product costs have significantly decreased. These positive effects make new energy vehicle enterprises more willing to choose research and development technology innovation as a breakthrough for enterprises to expand their brand market competitiveness.

4.3 Consumer end

The subsidies for the consumption of new energy vehicles are mainly used in the process of market promotion. Under this subsidy policy, consumers' willingness to purchase new energy vehicles will be greatly improved, and the sales and market share of new energy vehicles will also be greatly increased. This is mainly because after the government subsidizes new energy vehicles, consumers will not only focus on fuel vehicles as before, but will gradually pay attention to and consider new energy vehicles. In addition, with the support of price subsidies, the cost-effectiveness of new energy vehicles has greatly improved, and consumers will be more inclined to choose products with subsidy policies. According to government policies, subsidies for new energy vehicles can be divided into two parts: one is to subsidize the cost of purchasing cars for consumers, and the other is to subsidize new energy vehicle manufacturers.

In September 2010, the four central ministries and commissions jointly issued the Notice on Conducting the Pilot Subsidy for Private Purchase of New Energy Vehicles, which proposed for the first time that the central finance should subsidize the purchase of new energy vehicles nationwide, including a maximum subsidy of 60000 yuan/vehicle for private purchase of pure electric vehicles (EV) and 50000 yuan/vehicle for Plug-in hybrid (PHEV).The following table shows the change of the subsidy from 2016 to 2019.

Table 2 - Central subsidy standard for pure electric passenger vehicles in 2016-2019 (ten thousand yuan/per car)

Distance to empty (R) / Year	$100 \leq R < 200$		$200 \leq R < 300$		$R \geq 300$	
2016	2.5		4.5		5.5	
2017	2		3.6		4.4	
2018 Transition Period	1.4		2.52		3.08	

Distance to empty (R) / Year	$100 \leq R < 150$	$150 \leq R < 200$	$200 \leq R < 250$	$250 \leq R < 300$	$300 \leq R < 400$	$R \geq 400$
After the 2018 transition period	–	1.5	2.4	3.4	4.5	5
2019 Transition Period (substandard)	–	0.15	0.24	0.34	0.45	0.5
2019 Transition Period (standard)	–	0.9	1.44	2.04	2.7	3

Source: http://www.mof.gov.cn/index.htm

4.4 Supporting facility end

In terms of supporting the construction of new energy vehicle infrastructure such as charging, the central government has introduced financial and tax incentive policies to support infrastructure construction from various aspects such as infrastructure construction incentive policies and electricity price policies.

In 2015, relevant departments issued guiding documents such as the "Guiding Opinions on Accelerating the Construction of Electric Vehicle Charging Infrastructure" and the "Guidelines for the Development of Electric Vehicle Charging Infrastructure" for the development of charging infrastructure. On this basis, the four ministries and commissions issued the "Notice on the Incentive Policy for Charging Infrastructure of New Energy Vehicles during the 13th Five Year Plan and Strengthening the Promotion and Application of New Energy Vehicles" in 2016, granting charging infrastructure construction rewards of 3000 yuan per vehicle to regions that meet the specified conditions; In terms of electricity pricing support, in 2014, the National Development and Reform Commission issued a notice on issues related to electricity pricing policies for electric vehicles, stipulating the implementation of supportive electricity pricing policies for electric vehicle charging. Local governments have also responded to the call of the central guidance document from multiple aspects. As of the end of 2016, more than 30 regions have introduced subsidy policies for charging facility construction, with a maximum of 30% of the total equipment investment. A few regions also encourage the use of PPP for infrastructure construction; 24 provinces and cities have issued local new energy vehicle charging electricity pricing policies and provided subsidies for charging infrastructure construction.

5 Introduction of China's new car companies-NIO, LI and Xpeng

5. 1 Overall development status

Among the new energy vehicle companies, the new force car companies which concentrated around 2015 have become a force that cannot be ignored, and after experiencing cruel competition, they have now formed three leading companies listed on the US stock market: NIO, Xpeng and LI. From the table, we can see that the sales of these three companies have all achieved rapid growth from 2019 to 2022, basically tripling.

Figure 2 – Sales of NIO, LI and Xpeng from 2020 to2020
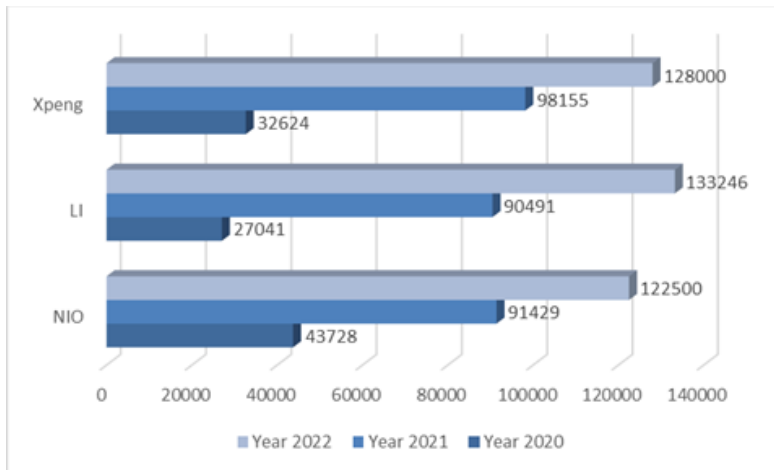
Source: [Finance Report]

This article will focus on NIO, Xpeng and LI, three car companies currently listed on NASDAQ, and conduct a detailed analysis of the three companies to understand the current development status and development trend of China's new energy automobile industry.

5.2 Introduction of NIO

Nio was founded in November 2014. It can design, exploit, manufacture and sell new energy vehicle and want to create an integration of production and marketing of high-end intelligent electric vehicles. It aims at promoting a new generation of technological innovation in automatic driving, digital technology, electric Powertrain and batteries. According to statistics, by the end of 2021, the assets of Nio had reached 54.642 billion yuan, and it won the first prize for scientific and technological progress of the "Science and Technology Award of China's Automobile Industry" in 2021.

In terms of technology, NIO pays attention to the research and development innovation of integrating "smart life" and green energy, focusing on creating high-end intelligent electric vehicles in the industry, such as ES8 and ES6. NIO has also established an extensive charging and battery exchange network, allowing car owners to rent batteries and offering free charging functionality to all car owners.

In terms of capital accumulation, NIO went initial public in the United States in 2018 and raised $1.151.8 billion. Since its listing, Nio has raised funds through equity, bonds and loans, and becomes one of the electric vehicle companies with a diversified capital structure in the Chinese market.

5.3 Introduction of LI

LI Automobile Company is a Chinese new energy automobile manufacturing company founded in July 2015. The founder is Li Xiang. The company was listed on the NASDAQ stock market in the United States on July 30, 2020, On August 12, 2021, LI was listed on the main board of the Hong Kong Stock Exchange for the second time. LI is committed to building cars for families, developing exclusive LI apps, and building a quality and respectful lifestyle community for users through online and offline joint efforts.

LI positioned as Extended-Range Electric Vehicles (EREV), by combining the advantages of electric and fuel vehicles. The internal combustion engine and generator are combined into a power generation unit, which automatically and intermittently generates electricity under system control under the optimal fuel consumption (most energy-saving) working conditions, providing power for electric vehicle driving, auxiliary equipment and batteries. At the same time, it is mainly based on family cars, and the concept of "home" humanizes the design of intelligent cockpits for users. In terms of equipment information transmission, the "senseless entry" function subverts the tradition, the vehicle automatically opens when the user is close, and it can be used immediately on board, and the APP has completed remote control functions. Although the monthly sales of the leading automakers of the new automakers have different levels, the LI has maintained the top three position for a long time, and the product portfolio of LI has only one boutique car, while the product portfolio of NIO, or Xpeng consists of three or more main models, so the sales explosiveness of LI's single model is significantly better than that of other car companies.

5.4 Introduction of Xpeng

Xpeng is currently one of the leading smart cars in China, and manufacturing new smart cars is its core task. At present, Xpeng has been listed on the American Stock Exchange and the Hong Kong Stock Exchange. Since its establishment in 2014, the global layout of Xpeng has been gradually set up. Its R&D headquarters is located in Guangzhou, other R&D centres are established in Beijing, Shenzhen, Shanghai and overseas in Silicon Valley and San Diego, and production bases are built in Guangzhou and Wuhan.

Xpeng's smart electric vehicles are popular with consumers in China. The current product lineup includes four pure electric smart cars, namely the smart sports SUV G3, the smart coupe P7, the world's first mass-produced lidar car P5 and the new smart flagship SUV G9. Xpeng not only has an attractive exterior design and superb performance, but also has excellent safety and reliability. At the end of 2021, Xpeng Motors has still reached 98,155 delivered vehicles despite the lack of chips in the entire industry. This fully demonstrates that Xpeng Motors has been recognized by consumers and has a strong momentum of development.

6 The financial analysis of NIO, LI and Xpeng -Based on Harvard Analysis Framework

6.1 Basic financial information of three companies

Table 3 –Financial information of three companies from 2019-2002

Important Indicators	NIO				LI				Xpeng			
Year	2019	2020	2021	2022	2019	2020	2021	2022	2019	2020	2021	2022
Total revenue (Billion Yuan)	7.82	16.25	36.13	49.26	0.28	9.45	27.01	45.29	2.32	5.84	20.98	26.85
Car sales revenue (Billion Yuan)	7.36	15.18	33.17	45.51	0.28	9.28	26.12	44.10	2.17	5.54	20.04	24.84
Net income attributable to the parent company (Billion Yuan)	-11.41	-5.61	-10.57	-14.56	-2.43	-0.15	-0.32	-2.01	-3.69	-27.32	-4.86	-9.13
Gross Margin	-15.3%	11.52%	18.90%	13.70%	-0.03%	16.38%	21.33%	19.41%	-24.0%	4.6%	12.5%	11.5%
R&D expense (Billion Yuan)	4.43	2.48	4.59	10.83	1.16	1.10	3.28	6.78	2.07	1.72	4.11	5.21
Net cash flow (Billion Yuan)	-2.23	37.55	-20.17	4.78	1.34	8.73	20.32	9.92	0.77	29.13	-19.90	3.07

Source: Wind Database

It can be seen from this table that the gross profit of NIO has begun to turn positive, and the gross profit rate in 2021 was as high as 18.9%. There are two reasons for this sharp increase in gross profit: (1) The delivery volume of vehicles has increased significantly, and the scale effect has brought about cost reduction; (2) The sales model has been optimized, and the average sales price of each vehicle has increased by about 15,000 yuan. The revenue data of Xpeng has increased significantly. The main reason is that Xpeng has gradually secured its position as the top seller of new force car manufacturers, and competition barriers in the intelligent industry have gradually formed. In the second half of 2022, Xpeng will launch the high-end SUV model G9, which will compete with NIO and LI for the first time. Based on NIO's current problems, the different competitiveness with LI, Xpeng is expected to further expand its business receive. The gross profit margin of LI continues to grow positively, reflecting its supply chain cost control and excellent cash flow management. The second new car was launched in 2022, and the revenue growth rate got further increase.

6.2 The financial analysis of three companies

6.2.1 The Analysis of Solvency

Solvency is the basic index to evaluate the ability of enterprises to repay debts. Specifically, it includes short-term solvency indicators and long-term solvency indicators: short-term one is the ability of enterprises to repay current liabilities, and its strength depends on the current assets. Liquidity; long-term one refers to the ability of enterprises to bear debts and guarantee the ability to repay debts.

The strength of solvency reflects a company's ability to bear due debts. The stronger the solvency is, the more favoured it will be by investors. In terms of solvency indicators, this article mainly selects current ratio and quick ratio as short-term solvency indicators, and asset-liability ratio as long-term solvency indicators.

Table 4 – Short-term solvency of three companies from 2019-2022

Company	Short-term Liquidity	2019	2020	2021	2022
NIO	Current Ratio	51.9	330.6	218	129
	Quick Ratio	42.5	322.9	210.9	111
LI	Current Ratio	108.3	728.5	256.3	245
	Quick Ratio	97.2	704.1	432.6	220
Xpeng	Current Ratio	150.4	506.3	271.1	180
	Quick Ratio	136.7	489.2	256.3	162

Source: Wind Database

Table 5 – Long-term solvency of three companies from 2019-2022

Company	Long-term Liquidity	2019	2020	2021	2022
NIO	Debt Asset ratio	143.1%	50.3%	54.1%	71.28%
LI	Debt Asset ratio	159.6%	18.1%	33.6%	47.78%
Xpeng	Debt Asset ratio	173.8%	23%	35.8%	48.37%

Source: Wind Database

It can be seen from the table that NIO's current ratio and quick ratio are at the lower level among the three, indicating that NIO has minimized the flow of current assets in quick assets, so even if a debt dispute occurs, the company can also pay your debts immediately. The current ratio and quick ratio of LI are at the highest level between the three, and the debt assent ratio is at a relatively low level. The current ratio and quick ratio began to grow rapidly in 2020, and then remained at a relatively high level, indicating that LI has a strong short-term solvency. The debt asset ratio of the three companies showed a large downward trend, among which the assets and liabilities of LI and Xpeng first fell to a very low level, and then recovered slightly, reflecting the sufficient funds of the two companies and their strong long-term solvency. The LI was listed the second time in 2020, so it raised a lot of capital. Xpeng Motors was listed on the New York Stock Exchange in 2020, so it received strong financial support, so its current ratio, quick ratio and debt asset ratio fluctuated greatly around 2020.

6.2.2 The Analysis of Operating capacity

Operating capacity refers to the operating ability of the enterprise, in specific, it is the measurement of the efficiency and benefit of the use of operating assets. Efficiency can reflect whether a company uses assets adequately and effectively, and is often measured by various turnover rates. Benefit should be linked to output or profit, that is, the ability to use assets to obtain income, but more revenue does not mean good benefits, and should be judged according to the relationship between output and input. The stronger the operating capacity of the enterprise, the higher the utilization rate of the enterprise's assets.

Table 6 – Operating capacity of three companies from 2019-2022

Company	Indicators	2019	2020	2021	2022
NIO	Total Asset Turnover	0.4682	0.4697	0.5255	0.5500
	Inventory Turnover	7.6	15.1	18.9	8.61
	Receivables Turnover Ratio	7.5024	13.4992	18.7213	12.4741
LI	Total Asset Turnover	0.0372	0.4122	0.5500	0.6104
	Inventory Turnover	1.1	10.3	16.1	8.67
	Receivables Turnover Ratio	16.1	152.7082	228.8092	536.1861
Xpeng	Total Asset Turnover	0.2743	0.2166	0.3804	0.3916
	Inventory Turnover	9.2	6.3	9.3	6.61
	Receivables Turnover Ratio	8.0376	7.0072	11.0395	8.2046

Source: Wind Database

In the previous accounting analysis, we can see that the inventory and accounts receivable of the three companies are increasing year by year, but the inventory turnover rate and accounts receivable turnover rate of the three companies are fluctuating, indicating that the inventory volume began to increase. It is likely that the three companies overestimated the expected sales volume, resulting in an increase in inventory. Among the three companies, Xpeng' inventory turnover rate was the lowest in 2020 and 2021, indicating that the company may sell cars for a long time, and there may be a backlog of inventory. The three turnover indicators of NIO show an upward trend, indicating that the company's assets can be quickly converted into cash, and the inventory turnover rate is increasing year by year. Combined with the table, it can be seen that the receivable turnover rate of LI is the highest, indicating that its asset liquidity is relatively good.

NIO's receivable turnover rate from 2019 to 2022 showed an upward trend, which is different from the fluctuation state of Xpeng, indicating that NIO has strengthened the management of inventory and receivable, and achieved obvious results. The NIO's receivable turnover ratio is the highest, indicating that its assets are liquid. What's more its inventory turnover rate is gradually increasing and reaching a high level, mainly due to the increase in sales brought about by brand awareness and product quality.

6.2.3 The Analysis of Profitability

Profitability refers to the ability of an enterprise to obtain profits, and it can be assessed how much and level of income an enterprise obtains within a certain period of time. The main indicators selected for the profitability analysis of the three companies are: net profit margin, cost of sales ratio and return on capital.

Table 7 – Profitability of three companies from 2019-2022

Company	Indicators	2019	2020	2021	2022
NIO	Net Profit Margin	-144.36%	-32.63%	-11.12%	-29.30%
	Ratio of Sales to Cost	115.32%	88.48%	81.12%	89.56%
	ROA	-66.28%	-14.56%	-6.18%	-17.20%
LI	Net Profit Margin	-857.53%	-1.60%	-1.19%	-4.49%
	Ratio of Sales to Cost	100.03%	83.61%	78.67%	80.59%
	ROA	-30.92%	-0.71%	-1.69%	-4.08%
Xpeng	Net Profit Margin	-159.04%	-46.74%	-23.17%	-34.03%
	Ratio of Sales to Cost	124.05%	95.45%	81.12%	88.50%
	ROA	-44.30%	-10.53%	-10.01%	-14.65%

Source: Wind Database

From the perspective of profitability, the net profit margin of the three companies is negative, and they have been in a state of continuous loss in recent years, but the loss is decreasing year by year, of which the largest increase in net profit margin is LI, and the increase in Xpeng and NIO is similar. In the ratio of cost to sales, all three companies have gradually fallen to less than 100%, of which NIO is in the middle level. In terms of ROA, the best performer is LI, followed by Xpeng and NIO is at the bottom. Overall, the profitability of LI is relatively good, while NIO's profitability is at a relatively low level.

6.2.4 The Analysis of Development ability

The examination of development ability is oriented to the future development of the enterprise, which evaluates the growth ability of the enterprise from the development trend and potential of the future operation of the enterprise. Through a detailed analysis of the development ability, the company's future growth can be predicted,

and the overall value of the company can be evaluated, providing a reference for investors' investment activities and the management direction of business managers. The financial measures selected in this article include the revenue growth rate, total assets growth rate, net profit growth rate.

Table 8 – Development Ability of three companies from 2019-2002

Company	Indicators	2019	2020	2021	2022
NIO	Revenue Growth rate	58.04%	107.77%	122.27%	36.34%
	Total Assets Growth rate	-22.61%	274.72%	51.60%	16.14%
	Net Profit Growth rate	51.08%	50.84%	-88.43%	-37.71%
LI	Revenue Growth rate	/	3225.49%	185.62%	67.67%
	Total Assets Growth rate	64.57%	282.34%	70.04%	39.92%
	Net Profit Growth rate	-59.14%	93.78%	-111.96%	-525.97%
Xpeng	Revenue Growth rate	23815.30%	151.78%	259.12%	27.95%
	Total Assets Growth rate	20.57%	383.25%	46.85%	8.9%
	Net Profit Growth rate	-163.91%	26%	-78.01%	-87.93%

Source: Wind Database

The total asset growth rate of the three companies peaked in 2020 and then gradually declined, mainly because the three companies listed or second listed in 2020, resulting in a relatively large increase in total assets. Xpeng's revenue growth rate was as high as more than 200 times in 2019, mainly because the orders in 2018 and in the first quarter of 2019 were concentrated in the second quarter of 2019, so the overall delivery of orders in 2019 was large, and the revenue growth rate was also high. The net profit growth rate of the three companies was negative in 2021-2022, indicating that the current losses of the three companies have shown a trend of expansion. Although the revenue of the three companies has increased, the loss is also increasing, indicating that the three companies have the problem of general cost control and low gross profit margin of the whole vehicle. How to achieve further growth in revenue and narrow the loss range by controlling costs, improving profit levels, and narrowing the loss range under the background of continuous growth in delivery volume is a problem that three companies need to think about and solve.

7 Conclusion

In recent years, based on the vigorous promotion of China's new energy vehicles and the government's continuous subsidies for new energy vehicles, the sales of new energy vehicles have continued to rise, and these three companies have seized the opportunity, taken the lead in deploying new energy, seized the first-mover advantage, and greatly increased sales volume, forming a certain brand influence and popularity; At the same time, the market positioning of the three enterprises is clear, Xpeng has an intelligent layout, NIO pays attention to service experience, that is, user ecological socialization, LI focus on practicality, emphasizing large space and long mileage. In the process of development, all three companies have chosen overseas listings to obtain further financial support.

After 2016, subsidies for new energy vehicles gradually began to decrease, and by 2019, there had been a significant reduction and change in subsidies. However, after analysing the financial data of three companies, we found that their car sales still maintained a trend of annual growth. This indicates that with the development of the industry in the early stage and government subsidies, a good foundation has been laid for the development of the entire industry.

Next, the government should strengthen subsidy supervision and balance the scope of subsidies to ensure that enterprises make reasonable use of subsidy funds and achieve the goal of promoting financial performance of enterprises; New energy enterprises can optimize their capital structure, improve their debt paying ability, and allocate subsidy funds reasonably to enhance their competitiveness [5]. Through the above measures, it will ultimately promote the healthy and rapid development of China's new energy vehicle industry

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Bibliographic Analysis of Public Private Partnerships Research in the Czech Republic, Poland and with regard to Sustainable Development

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Abstract: Public-private partnerships play a crucial role in advancing the achievement of Sustainable Development Goals. By combining the resources, expertise, and networks of both the business and public sectors, public-private partnerships leverage collective efforts to address complex societal challenges. They enable the mobilization of financial and technical resources, facilitate knowledge sharing, and promote innovative solutions. Through these partnerships, governments can tap into private sector efficiency, while businesses gain access to new markets and social legitimacy, ultimately leading to accelerated progress towards sustainable development goals. The main objective of this paper is to investigate the current state of the art of research of public-private partnership initiatives in the Czech Republic, Poland and also their relation to sustainable development goals. Authors employed systematic literature review method using specialized software to find relations within keywords and authors of published articles from the Clarivate Web of Science database. It was found that there are clear differences between research of public-private partnership in the Czech Republic and Poland and that there are significant research gaps in relation to sustainable development namely in integration of social sustainability, long-term impact assessment, stakeholder engagement, governance and accountability mechanisms, cross-sectoral collaborations, regional and global perspectives, financing mechanisms and innovative models.

Keywords: Cooperation, public-private partnership, SDG goals, sustainability, PPP projects

JEL Classification: H54, L33, M14, P43, P52

1 Introduction

Public-private partnerships (PPPs) have a long history, dating back thousands of years. Concessions, the most common form of PPPs, were used in ancient Rome for road construction, public baths, and market operations. Such projects were in use in medieval Europe granting concessions that allowed to charge fees for goods transported on the Rhine (Hodge and Greve, 2022). These partnerships were also prevalent in America, China, and Japan, where infrastructure projects were privately funded under concession contracts.

The term "Private-Public Partnership" or PPP gained popularity in the 1970s when neoliberal ideas emerged, questioning the role of the state in poor economic performance. PPPs were proposed as alternatives to bureaucratic public services and inefficient state-owned enterprises, aiming to downsize the state, enhance administrative efficiency, and reverse the perceived crowding out of the private sector (Gomes, 1990). The concept expanded beyond urban construction projects, and in the 1980s, the modern version of PPPs emerged in the UK. This new approach involved the government paying the private company, enabling infrastructure development within strict borrowing limits and fiscal rules to address rising public debt (Cavelty and Sute 2009). This model became known as the private finance initiative (PFI). Over time, PPPs encompassed various sectors, including technology, ecology, education, health services, and prison incarceration, making the concept heterogeneous (Vaillancourt, 2000; Hodge and Greve, 2022). Critics (e.g. Linder, 1999) argue that PPPs have become a catch-all label for any collaboration between the public administration and the private sector. Similarly, some unbiased economics perspective can be found in e.g. Vinogradov and Shadrina (2022). However, PPPs remain significant for leveraging private sector resources and expertise to address public infrastructure and service needs. They offer potential solutions for achieving economic, social, and environmental objectives.

Overall, the objective of public-private partnerships (PPPs) is to leverage the joint innovative use of resources and management knowledge, achieving optimal goals that would be difficult to attain without the involvement of all parties (Jomo et al., 2016). However, there is a lack of consensus on the definition of PPPs, as different international organizations, private sector entities, and academics have varying interpretations. The term "PPP" is used to describe a range of arrangements, leading to confusion. Different institutions and countries have their own definitions in national laws and policies, resulting in a lack of uniformity. The literature on PPPs reveals numerous

types, with up to 25 different classifications identified according to Romero (2015, p. 12). The lack of clarity stems from PPPs occupying a space between traditional government projects and full privatization, including various forms like management contracts, outsourcing contracts, concession contracts, and joint ventures. The specific definition of PPPs depends on factors such as asset ownership and the extent of capital expenditure by the private partner.

From a perspective of public policy, the primary goal of a public-private partnership (PPP) is to enhance the quality and efficiency of a specific service provided to citizens. Simultaneously, it aims to attract private resources into public services, allowing public funds to be allocated to other critical areas and alleviating long-term pressures on public finances. However, as highlighted in this section, these anticipated benefits have not always been realized, and the performance and viability of PPPs differ significantly across sectors and activities. To ensure that PPPs effectively deliver important services like infrastructure, it is crucial for countries to possess institutional capacity in creating, managing, and evaluating PPPs, particularly in comparison to alternative funding sources. For many developing nations, achieving this capacity would require assistance from the international community in the form of technical support and capacity building. As the trend in PPP projects was rising it obviously caught attention of researchers specialize in public economics and business. This sparked creation of body of literature that is still getting bigger even as the overall number of PPP projects stagnates (especially in infrastructure, see PPI 2022 Annual Report by World Bank (WORLDBANK, 2022)). On the other hand, the pressure to achieve the sustainable development goals (SDGs) is pushing the private and public sector to join forces together to produce solutions that can be beneficial to both parties.

There are several studies focuses on reviewing specific aspects of public-private partnerships namely on risk factors (Karim, 2011), critical success factors (Osei-Kyei and Chan, 2015), infrastructure projects (Cui et al., 2018), social infrastructure (Oktavianus, Mahani and Meifrinaldi, 2018) as well as holistic literature review performed by Ma et al. (2019) or reviews focused on particular country (e.g. Hashim, Che-Ani and Ismail, 2017). Reviews and reports are also performed by institutions such as The World Bank or European Court of Auditors. So far, no specific review on relation towards Czech Republic or Poland was performed as well as in relation to current problems regarding sustainability and SDGs.

Thus, the goal of this paper is to investigate the state of the art of PPPs related research in Czech Republic, Poland and also its relation to sustainability, SGDs and ESG initiatives. Results should help researchers to focus on uncovered research gaps and also show how the research of this phenomenon has developed in recent decades. This paper should find answers to following research questions:

- RQ1: What specific PPP issues are investigated in research articles dealing with PPP projects in the Czech Republic?
- RQ2: What specific PPP issues are investigated in research articles dealing with PPP projects in Poland?
- RQ3: Are there any potentially significant differences among research articles focused on PPP in the Czech Republic and Poland?
- RQ4: What specific topics related to sustainability and SDG are researched in the area of PPP projects worldwide?

The structure of this paper is as follows. The introduction is focused on the importance of PPP and its research. Second section will focus on data collection, structure and method of analysis. Third section will include presentation of results and discussion. In the last section some conclusions, further research suggestions and limitations are presented.

2 Methods and Data Analysis

2.1 Applied methods

Given the nature of this paper we will elaborate on the most important and relevant literature regarding the public-private partnerships and relying on research mainly published in journals and proceedings indexed by the Clarivate Web of Science (WoS) database. This will assure that higher quality papers will be included in this bibliographic analysis. Bibliographic analysis is a research method that involves examining and evaluating bibliographic data, such as citations and references, to gain insights into patterns, trends, and relationships within a specific field of study. It helps researchers understand the scholarly landscape, identify key works, and assess the influence and impact of publications (Polanco and Grivel, 1995; De Bellis, 2009). In recent years researchers in social sciences begun to use bibliometrics as a way of assessing the state of the art of specific research fields and domains (De Bakker, Groenewegen, and Den Hond, 2005; Podsakoff et al., 2008). This method is getting more popular and

practical with the use of specific software for example the VOSviewer (Zema and Sulich, 2022; Kozar and Sulich, 2023).

2.2 Data and their structure

In this paper we relied on visual bibliographic analysis of papers indexed in the Clarivate Web of Science (WoS) database using following queries:

- (AB=(czech)) AND (TI=(public private partnership) OR TI=(PPP) OR TI=(public-private partnership) OR AB=(public private partnership) OR AB=(PPP) OR AB=(public-private partnership) OR KP=(public private partnership) OR KP=(PPP) OR KP=(public-private partnership)). This search performed in June 2023 has produced 76 results where 26 results were considered for further investigation. Figure 1 shows cluster of keywords based on this sample. This diagram was developed using VOSviewer software.
- (AB=(poland)) AND (TI=(public private partnership) OR TI=(PPP) OR TI=(public-private partnership) OR AB=(public private partnership) OR AB=(PPP) OR AB=(public-private partnership) OR KP=(public private partnership) OR KP=(PPP) OR KP=(public-private partnership)). This search performed in June 2023 has produced 106 results where 39 results were considered for further investigation. Figure 2 shows cluster of keywords based on this sample. This diagram was developed using VOSviewer software.
- (AB=(SDG) OR AB=(ESG) OR AB=(sustainability)) AND (TI=(public private partnership) OR TI=(PPP) OR TI=("public-private partnership") OR AB=("public private partnership") OR AB=(PPP) OR AB=("public-private partnership") OR KP=("public private partnership") OR KP=(PPP) OR KP=("public-private partnership") OR TI=("public/private partnership") OR AB=("public/private partnership")) NOT AB=(parity) NOT AB=(positioning) NOT AB=(capita) NOT AB=(prescription). This search performed in June 2023 has produced 455 results, which were all considered for further investigation. Figure 3 shows cluster of keywords based on this sample. This diagram was developed using VOSviewer software.

All results from these search queries were downloaded with the full record to investigate occurrence of keywords and concepts within the title, abstract and keywords as well as the links between particular authors and their publications.

3 Results and Discussion

The goal of this paper is to find what research gaps and directions can be derived from our analysis of literature regarding PPP projects in the Czech Republic and Poland as well as regarding important issues of sustainability and SGD.

3.1 Data analysis and presentation of results

In this section we will focus on analysis of research papers that focus on PPP projects in Czech, Polish and sustainability context. Based on results of this analysis we will identify possible research gaps and opportunities for future research.

3.1.1 Research oriented on PPP projects in the Czech Republic

Following Figure 1 shows a network with clusters of keywords that were gathered form research papers dealing with PPP projects in the Czech Republic (CZ). We can see four main clusters and their relationships using different colors.

This list of research paper titles covers a range of issues related to public-private partnerships (PPPs). The papers discuss topics such as evaluating PPP projects in the Czech Republic, waste management in the Czech Republic, regeneration of brownfields, alternative financing for PPPs, employment of PPPs in transport infrastructure, European infrastructure procurement, water sector reforms, obstacles faced by NGOs in EU cohesion policy, PPP in R&D, cultural heritage appreciation, resilience evaluation of critical infrastructure, national cyber crisis management, municipal waste management costs, implementation of the Critical Infrastructure Directive, university-industry cooperation and innovation, partnership for territorial development, social entrepreneurship, public sector contracting-out, effectiveness of PPPs in regional development, university-industry collaboration and firm performance, PPPs at the regional level, and education in local action groups. Main clusters of keywords are public-private partnerships, performance, sector and EU. Furthermore, these clusters consist of other keywords suggesting the research focus of analysed papers.

Figure 1 – Cluster of keywords for research papers dealing with PPP projects in the Czech Republic
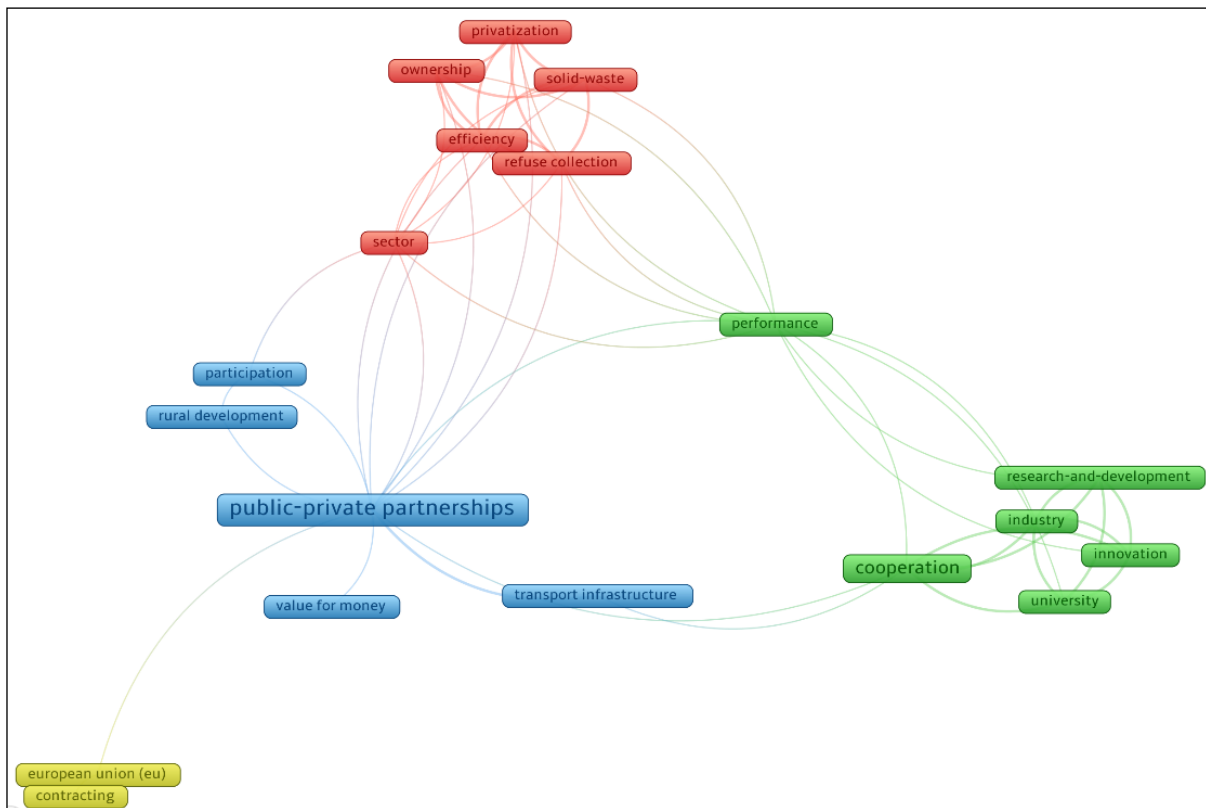
Source: own elaboration based on WoS database and VOSViewer

Based on the results analysed above we can answer the first research question RQ1. We can suggest that research of PPP projects in CZ is focused on important PPP success factors and their main goals (improvement of infrastructure, cooperation with universities, support of innovation, rural development). Also, the research focused on PPP performance is related to R&D, industry and cooperation. There is also a strong link to efficiency and waste management. From the perspective of time the research focus also slightly changes with past interest on EU, transport infrastructure and current interest in efficiency, waste management and ownership issues. This shift suggest some more interest in topics related to PPP in issues related to sustainability.

3.1.2 Research oriented on PPP projects in Poland

Following Figure 2 shows a network with clusters of keywords that were gathered form research papers dealing with PPP projects in Poland (PL). Analyzed research papers explore various aspects of public-private partnerships (PPPs) in Poland. Topics covered include cooperation models between public employment services and private stakeholders, barriers to business cooperation with public administration, e-government project financing, sustainable development implementation, international tourism analysis, public and local program financing, urban revitalization projects, regionalization processes, ICT network access, motorways as spaces of neoliberalism, water sector reforms, experience impact on PPP performance, infrastructure endowment and financial constraints, critical success factors for PPP projects, regional development agencies, legal cooperation of PPP projects, PPP in transport and telecommunications, revitalization projects, financing urban processes, public sector cooperation with consultants, inland waterways development, transport infrastructure critical success factors, regional economic development, healthcare sector PPP opportunities, stakeholder analysis, thermo-modernization projects, research trends, fiscal and political determinants of local government involvement in PPPs, risk sharing determinants, PPP in cultural heritage, alternative financing of public tasks, and PPP financing principles based on Polish experience.

Based on the results analysed above we can answer the first research question RQ2. We can see one main cluster and five other smaller ones with their relationships using different colors. Thus, it can be suggested that the research focus of analyzed papers is oriented on regional PPP projects, infrastructure and the development and cooperation. From the perspective of time the focus of analysed papers has shifted towards cooperation with local government

from the previous focus on the EU and development. Some current papers deal with revitalization and infrastructure.

Figure 2 – Cluster of keywords for research papers dealing with PPP projects in Poland

Source: own elaboration based on WoS database and VOSViewer

In comparison with research paper dealing with PPP in the Czech Republic context, we can see clear distinction in more local focus and issues related to local PPP projects rather than problems related to efficiency, performance and sustainability. Thus, the answer to the research question RQ3 is that we can see that research focus of papers oriented on PPP projects in the Czech Republic and Poland clearly differs.

3.1.3 Research oriented sustainability and sustainable development in PPP projects

Following Figure 3 shows a network with clusters of keywords that were gathered form research papers dealing with PPP projects (PL). Analyzed research papers address important issues related to sustainability and the Sustainable Development Goals (SDGs) in the context of public-private partnership (PPP) projects. The papers investigate a wide range of topics, including improving sustainability performance in PPP projects, factors influencing the sustainability of water environment treatment projects, integrating sustainability issues into PPP business models, the impact of the public sector on PPP sustainability, relational governance and its role in enhancing sustainability, sustainability evaluation of PPP microgrid projects, contract flexibility and its effect on sustainability performance, and the role of PPPs in driving sustainable development. Other topics covered include capital structure and its impact on sustainability, policy implementation and its influence on PPP sustainability, the development of sustainability indices for transnational PPP projects, infrastructure investment and fiscal expenditure from a sustainability perspective, stakeholder perceptions of critical success factors, collective insights on PPP impacts and sustainability, and the role of big data in disaster resilience for sustainability. These papers also examine the challenges and factors affecting the sustainability of PPP projects, such as risk allocation, stakeholder involvement, financial sustainability, governance practices, social sustainability, and the integration of sustainability principles into policy-making. Furthermore, they delve into specific sectors, including healthcare, education, transportation, waste management, cultural heritage, telecommunication, energy, and agriculture, and investigate the role of PPPs in achieving the SDGs and promoting sustainable development at regional and global levels.

To answer the research question RQ4 we can suggest that overall these papers contribute to the understanding and advancement of sustainable practices in PPP projects, providing valuable insights for policymakers, practitioners, and researchers. When looking into the network of clusters using analysis of keywords we can see that there is a strong relationship between sustainability and critical success factors and indicators. Also, it is evident that PPPs are mostly concerned with infrastructure. Furthermore, it is important to note that there is a vast body of research papers focused on PPPs in developing countries and large countries like India and China. Other important issues raised by these papers reveal need for improved frameworks and policies.

Figure 3 – Cluster of keywords for research papers dealing with PPP projects related to sustainability and SDGs

Source: own elaboration based on WoS database and VOSViewer

From the perspective of time the issues regarding sustainability and sustainable development date back to years before 2020. Current papers (post 2020) are mostly concerned with critical success factors and overall impact of PPP projects as well as their sustainability.

3.1.4 Important authors and scholars that publish papers on sustainability issues in PPP projects

It can be said that the body of knowledge on PPP is vast and does not consist only of research papers but there is number of NGOs and governmental institutions that deal with PPP and publish reports and working papers. Also, such diversity of actors influences the concentration of authors. The clusters of authors dealing with sustainability topics in PPP projects can be seen in Figure 4.

Figure 4 – Clusters of authors of research papers dealing with PPP projects
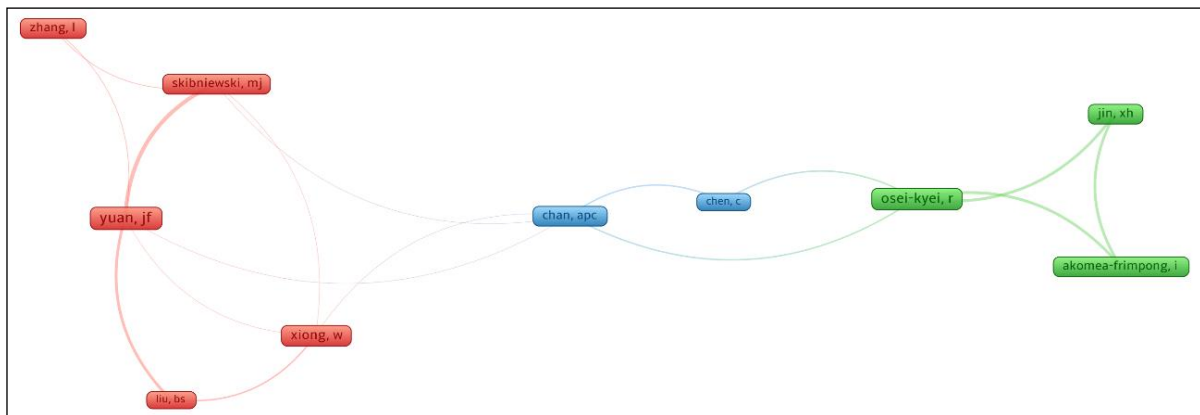
Source: own elaboration based on WoS database and VOSViewer

From the research based on WoS papers, we can identify three main clusters of authors or author collectives: Chan, Albert P.C. (e.g. Chan and Osei-Kyei, 2015; Chan et al., 2004; Chan et al., 2010); Chen, C (e.g. Yu, Chan et al., 2018); Osei-Kyei, R (Osei-Kyei et. al., 2017a; Osei-Kyei and Chan, 2017b), Jin X.H. (e.g. Jin and Zhang, 2011), Akomea-Frimpong, I (e.g. Akomea-Frimpong et al., 2023; Akomea-Frimpong et al., 2021); Yuan, J.F. and Skibniewski M.J. (e.g. Yuan et al., 2012; Yuan et al., 2010; Yuan et al., 2009) and Liu B.S. (e.g. Liu et al., 2022; Xue et al., 2022).

3.2 Direction of research in the Czech Republic and Poland

Papers dealing with PPP projects in Poland discuss cooperation models, barriers, financing, revitalization projects, critical success factors, infrastructure development, regional economic development, healthcare sector evaluation, cultural heritage, and public-private partnership financing principles. Similarly, the papers regarding the PPP projects in CZ cover topics such as evaluation methods, waste management, brownfield regeneration, alternative financing, transportation infrastructure, cooperation between universities and industries, territorial development, employment policy, contracting-out, regional development, university-industry collaboration, and education. Both lists also touch on broader themes like European infrastructure procurement, water sector reforms, cyber crisis management, critical infrastructure evaluation, and the role of non-governmental organizations. Overall, these papers contribute to the understanding of PPPs in Poland and the Czech Republic, providing insights into various sectors and highlighting the importance of collaboration, innovation, sustainability, and territorial development in the context of public-private partnerships.

From the analysis of research papers performed in the section 3.1, we can see some clear distinction between papers dealing with PPP projects in the CZ and PL. Whereas the papers concerning the PPP projects in CZ are related to issues covering their overall performance, comparison and cooperation with universities there is a lack of research about particular projects and their regional impact. Thus, in comparison with research on PPP projects in Poland the research gap can be found in investigation of local PPP project impact and their critical success factors. From the perspective of research of PPP projects in Poland we can see some lack of literature dealing with PPP in cooperation with universities and focus on efficiency, sustainability and waste management.

3.3 Direction of research in the scope of sustainability and sustainable development

Based on the analysis of research papers performed in the section 3.1, some research gaps and potential research directions related to sustainability and SDGs in public-private partnership (PPP) projects can be identified. These gaps include:

- Integration of social sustainability: while several papers address environmental sustainability, there is a need for more research on incorporating social dimensions of sustainability, such as inclusivity, equity, and social justice, into PPP projects.
- Long-term impact assessment: many papers focus on the initial stages or short-term impacts of PPP projects. Research should explore the long-term sustainability outcomes, including the post-project phases and their influence on communities, infrastructure, and the environment.
- Stakeholder engagement and participation: there is space to investigate effective strategies for engaging and involving stakeholders, including local communities, in PPP projects to ensure their active participation and influence on sustainability outcomes.

- Governance and accountability mechanisms: there is a need to examine governance structures, transparency, and accountability mechanisms within PPP projects to enhance sustainability and address potential challenges related to decision-making, resource allocation, and project performance.
- Cross-sectoral collaborations: more research could explore the potential for cross-sectoral partnerships in PPP projects to address complex sustainability challenges, including those related to health, education, poverty alleviation, and climate change.
- Regional and global perspectives: While some papers focus on specific countries or regions, comparative studies across different contexts could provide valuable insights into the effectiveness of PPPs in achieving sustainability goals and addressing regional or global challenges.
- Financing mechanisms and innovative models: further research is needed to explore innovative financing mechanisms and models that promote sustainability in PPP projects, including green financing, impact investment, and blended finance approaches.

By addressing these research gaps and exploring the suggested research directions, scholars and practitioners can enhance the understanding and implementation of sustainable PPP projects aligned with the SDGs. This should be also supported by journal special issues and conferences (at least sections or tracks) that would help to promote such research initiatives.

4 Conclusion

The goal of this paper was to find what research gaps and directions can be derived from our analysis of literature regarding public-private partnership projects in the Czech Republic and Poland as well as regarding important issues of sustainability and sustainable development goals. The analysis of research papers on public-private partnership projects in the Czech Republic and Poland highlights several research gaps and potential directions for future research. In the context of public-private partnership projects in the Czech Republic, there is a need for more research on the regional impact of specific projects and their critical success factors. This area has received less attention compared to the overall performance of public-private partnerships and collaboration with universities. In Poland, a research gap exists in terms of studying public private partnership projects in cooperation with universities and focusing on efficiency, sustainability, and waste management.

When assessing four defined research questions, we can suggest that chosen approach of the systematic literature review using VOSviewer software shown what topics were covered in research papers published about public-private partnerships in the Czech Republic, Poland and their apparent differences. Regarding sustainability and sustainable development goals in public-private partnership projects, the analysis reveals several research gaps and directions. These include integrating social sustainability dimensions, conducting long-term impact assessments, exploring effective stakeholder engagement strategies, examining governance and accountability mechanisms, promoting cross-sectoral collaborations, adopting regional and global perspectives, and exploring innovative financing mechanisms and models. Scholars and practitioners are encouraged to address these research gaps and explore the suggested directions to enhance the understanding and implementation of sustainable public private partnership projects aligned with the sustainable development goals. Journal special issues and conferences focusing on public private partnership projects and sustainability can provide platforms for promoting research initiatives in this field.

There are some limitations to the research performed in this paper. Authors used dataset that consists only of papers indexed in the Clarivate Web of Science database. There is more published material focused on public-private partnership that is not indexed for example by some governmental and non-governmental institutions.

Further research can be done by extending the database of papers by those indexed in Scopus and published by highly rated institutional publishers. Also, the research focus can be shifted towards more detailed look at papers with topics focused on specific sustainable development goals oriented public-private partnership projects.

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Analysis of the quality of services at the department of civil and travel documents at the municipality of the city of Ostrava

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Abstract: The municipality of the statutory city of Ostrava recently conducted an assessment of the quality of administrative services related to identity cards and travel documents. The goal was to find out how clients are satisfied with the services provided and how the number of administrative tasks developed. A partial goal was to compare the differences in satisfaction when issuing individual types of documents. The results of this evaluation show that the Municipality of Ostrava provides quality services. A questionnaire survey among clients confirmed satisfaction with selected administrative services. From the point of view of the analysis of the performance of administrative acts, in 2016, the most applications for the issuance of identity cards were received, and the most cards were issued in 2017. For travel documents, the highest number of received applications and issued documents was recorded in 2017. The highest number of lost documents was recorded in 2019. The average number of received travel documents was around 18 thousand pieces, while the average number of issued documents was one thousand less than the number applications received. The lowest average number was recorded for lost travel documents. It follows from the sub-goal that people prefer to issue an ID card rather than a travel document. The main reason is that the borders of Europe are expanding and people are processing fewer requests for a travel document, as it is enough for them to simply process an identity card, which is also due to the smaller number of issued travel documents than identity cards in the monitored period. Overall, it can be said that the Municipality of the Statutory City of Ostrava successfully fulfills its role and provides quality administrative services.

Keywords: ID cards and passports, Ostrava City Hall, quality, state administration

JEL Classification: C61, H50, H75

1 Introduction

The client satisfaction survey in public administration is an important tool for evaluating the quality of services. In the Czech Republic, this issue of quality management and performance evaluation of public administration is reflected in the national quality policy and sectoral policies. As part of this issue, an assessment of the quality of administrative services related to identity cards and travel documents was carried out at the level of a municipality with extended scope, specifically at the Municipality of the City of Ostrava.

The contribution Analysis of the quality of services at the Department of Citizenship and Travel Documents at the Municipality of Ostrava is part of a bachelor's thesis entitled "Evaluation of the quality of selected administrative services at the Municipality of Ostrava". The main goal of the contribution is to evaluate the satisfaction of clients

of the ID and travel documents department and to analyze the development of the number of selected administrative actions in the period 2016-2021. A partial goal is to compare the differences in satisfaction when issuing individual types of documents. The paper differs from the bachelor's thesis precisely in that partial goal and intention, which could be a further improvement of the functioning of the Municipality.

In this contribution, the methodology for evaluating the quality of public services and conducting a questionnaire survey with the aim of determining the satisfaction of respondents in the given department was described. The calculation of time series dynamics was also used to evaluate the performance, and the types of quantitative data collection methods were described. Furthermore, a discussion was added with the aim of improving the functioning of the department at the Municipality and at the same time comparing the differences in satisfaction with issuing documents. In the end, the results of the respondents were presented and recommendations for improving the quality of administrative agendas were proposed. As part of the post, two attachments were attached to supplement the content. Overall, the survey of client satisfaction and the assessment of the quality of administrative services in the Municipality of Ostrava is an important step towards effective and client-oriented management in public administration.

1.1 Public administration and the importance of indirect state administration

Public administration is a key element of any functioning state and has a significant impact on the lives of citizens (Sladeček, 2019). In general, management can be understood as an activity that aims to achieve a certain goal. In the context of businesses, administration is associated with leadership and management, with the resulting term being administration. Public administration deals with the conduct of common affairs in the interest of the public and the private sector focuses on individual interests, Public administration includes a wide range of activities which include administration, organizational activities, control, planning and regulatory measures. (Hendrych, 2014)

We distinguish different forms of public administration depending on the nature of the bearer of public authority. State administration, local government and other public administration are three main categories that differ in their powers and responsibilities. State administration includes both direct and indirect forms according to the competence of the subject's bodies. (Sládeček, 2019)

The state administration represents a key component of the executive power, which has the task of organizing and protecting the interests of the state for the benefit of society. Its characteristics include executive, statutory and regulatory character. Its organization is linked to the executive power and territorial self-government. The central bodies of state administration are government bodies, and the main goal is to protect the internal and external functions of the state. In addition to these bodies, it is also performed by public corporations (municipalities, regions) and other entities. Tasks are carried out by the authorities of municipalities and regions under delegated powers (e.g. administration of elections, offences, transport, environment or fee administration). (Vrabková, 2016; Pomahač, 2011)

Indirect performance of state administration on the territory of the Czech Republic is implemented through municipalities and regions. This performance model was created on the basis of the public administration reform in 2002, which combined separate and transferred responsibilities at the level of regions, the capital city of Prague and municipalities. The state balances the expenses of the territorial self-government in the form of a contribution for the performance of the transferred authority, which is regulated annually by the Act on the State Budget. (Vrabková, 2016; Ministry of The Interior CR, online, 2020b; Ministry of The Interior CR, online, 2021a)

According to the Annual Report on the State of Public Administration (2021), it can be claimed that in 2021 a proposal was prepared for the allowance for the performance of the state administration for 2022. As part of the transferred performance of the state administration, efforts are being made to ensure that the allowance is paid as a partial reimbursement of costs and that municipalities and regions (e.g. issuing personal and travel documents) in accordance with Act No. 57/2022 Coll., on the state budget of the Czech Republic for 2022. The change occurred in 2021 and involved an increase in the contribution by CZK 83 million within the regions, but at the level of most municipalities, the amount of the contribution remained the same as compared to the previous year. In some municipalities, the contribution was reduced due to the decrease in population. To improve the redistribution of the contribution, the state contributed to the introduction of a more efficient method, namely that the contributions are provided by address. In 2021, according to statistics in the Czech Republic, a contribution of CZK 10,251.7 million was provided for municipalities, CZK 1,660.6 million for regions and CZK 1,210.5 million for Prague, for a total of CZK 13,122.8 million CZK. (Ministry of the Interior, online, 2021d; Vodáková, 2014; Mykytyuk, 2021; KOCAOGLU, 2022) (see appendix 2)

In connection with this, there are municipalities with extended competences (ORP) that carry out state administration in the broadest scope of delegated competences (Vrabková, 2016). To this extent, the Municipality of Ostrava fulfills its function. The most frequent cases of agendas of administrative activities of municipalities within the mentioned municipality are, for example, processing of personal and travel documents; driver's licenses and vehicle register and registration agenda. (Ministry of The Interior CR, online, 2020)

1.2 Department of identity cards and travel documents of the Municipality of Ostrava

The municipality of the city of Ostrava is one of the bodies of the statutory city of Ostrava. This body provides agendas in a separate and delegated capacity. The municipality is divided into departments, one of which is the Department of Internal Affairs. It is further divided into departments, such as the department of identity cards and travel documents. (Statutory city of Ostrava, online, 2022; Statutory city of Ostrava, online, 2022c)

1.2.1 Importance of separation of identity cards and travel documents

At the Department of Civil and Travel Documents, you can deal with matters related to these documents (submitting an application, issuing a document, dealing with the loss of documents or obtaining information about the production of documents. (Statutory city of Ostrava, online, 2021)

The ID card is a public document proving identity. The application for a license is submitted at the application point in front of an official person using the form of the Ministry of The Interior and the data is entered into the information system. When applying for the first time, a citizen must present a birth certificate or passport. To apply for an ID card, you need to have another public document to prove your identity, such as a previous ID card, passport, driver's license, birth certificate or firearms license. A current ID card may contain a contactless electronic chip (eCitizen) that enables biometric identification (fingerprints or facial comparison). (Law No. 269 of 1 July 2021 on identity cards; Ministry of The Interior CR, online, 2021c; Statutory city of Ostrava, online, 2021g))

A travel document is a public written document with details of the holder that can be checked by machine. It is used for traveling abroad and is recognized in all countries. Contains machine-readable data such as face and fingerprints (for persons under the age of 12, face is used instead of fingerprints). The processed data can be found on the data page, and the document also contains security elements according to European Community regulations. However, there are several types of documents and these include passport, replacement EU travel document, diplomatic passport, travel card, official passport, international treaty passport. The administrative fee for processing a passport within 30 days for a person older than 15 years is CZK 600. (Act No. 329 of 30 November 1999 on travel documents and amending; Ministry of The Interior CR, online, 2021b)

2 Materials and methods

Evaluation of the satisfaction of clients of the department of identity cards and travel documents and the development of administrative operations at the Municipality of Ostrava was carried out with the aim of improving the quality of the services provided.

The methodology included interviewing direct clients, structuring the questionnaire (see Appendix) and statistical data analysis. As part of the evaluation of satisfaction with the quality of the provided selected administrative services, information was obtained from the respondents on their satisfaction with the Department of Identity Cards and Travel Documents based on a questionnaire survey.

At the same time, an evaluation of the development of the number of selected administrative actions for the period 2016-2021 was carried out based on the obtained internal data of the Municipality of the City of Ostrava. At the same time, an analysis of the statistics of administrative actions was carried out, such as the number of received and issued documents. These internal data were obtained directly from the Municipality of the City of Ostrava. Data were evaluated using time series measures, namely average absolute growth and average growth coefficient. Statistical quantities such as minimum, maximum and mean were also calculated.

The results of this evaluation provided important information about client satisfaction and the development of administrative actions in the given period. This analysis is a key tool for increasing the quality of services and streamlining the work process at the City Hall of Ostrava.

2.1 Methodology

This practical part of the post is divided into three parts. First, the issue of the perception of the quality of public services is covered here, and following that, the progress of the respondents' assessment of the quality of selected administrative services within the Ostrava City Municipality is presented, which is supported by a questionnaire survey. The third part contains an analysis of the evaluation of the development of the number of selected administrative actions for the period 2016-2021 from the internal data of the Municipality, and accordingly, the dynamics of the time series is created here.

2.1.1 Issues of quality assessment of public services

Quality in public administration is a key factor in customer satisfaction. There are many different definitions of quality that include meeting customer requirements, service reliability, and emotional experience. Quality is measured using various methods such as customer surveys and data analysis.

Public administration in the Czech Republic defines quality as the fulfillment of client requirements for public sector services and improving the quality of life of citizens. There is also the theory of attractive quality, which focuses on customer value and excellence of a product or service. Overall, quality assessment in public administration is based on citizens' satisfaction with services. Communication and access to information are key to achieving overall satisfaction and service quality. (Vrabková, 2012)

2.1.2 Description of the survey and evaluation of client satisfaction

A satisfaction survey was conducted at the Department of Identity Cards and Travel Documents within the Department of Internal Affairs of the Municipality of the City of Ostrava. The survey began on October 18, 2021 at the address Gorkého 3037/2 in the vestibule of the stairs of the second floor of building G. The survey was carried out in cooperation with the students of the University of Mining and the Municipality of Ostrava. The questionnaire survey took place in the field for three days from Monday to Wednesday in time intervals from 9 am to 12:15 pm. and also from 12.30 – 3 p.m., when groups of students took turns of two to three students at the mentioned intervals. In total, approximately 140 respondents of various ages were approached, who came to the Municipality to process the document(s). VŠB students together with the respondents who came to process the document(s) filled out printed questionnaires (PAPI technique). (see appendix 1)

The data collection itself took place using the mentioned PAPI technique, which is one of the quantitative methods of data collection, whereby the interviewer fills in a printed standardized questionnaire with the help of the respondent. The standardized questionnaire is based on open and closed questions, where the respondent has several answers to choose from. Data collection itself can take place anywhere in the field, as minimal equipment is required. Then the questionnaire and answers are converted into electronic form. (SC&C, spol. s r. o., online, 2023)

The questionnaire contained sixteen questions, three of which related to the gender, age and education of the respondents. Other questions included closed-ended multiple-choice questions, five-point Likert satisfaction questions, and open-ended opinion questions.

The first part of the questionnaire was focused on the identification of respondents, while the second part was focused on client satisfaction with the services of the ID and travel documents department. Respondents rated various aspects, such as availability of information or office hours, using a Likert scale with a range of 1–5 (Friedrich, 2017). The questionnaire took less than three minutes to complete.

The questionnaire also contained branched questions regarding the handling of matters related to travel documents and questions regarding client satisfaction with the service provided at the Department of Citizenship and Travel Documents. The results of the questionnaire survey were evaluated using statistical analysis and the results were presented based on the collected data.

From the point of view of the evaluation of the questionnaire survey, **certain statistics flow**. The questionnaire first contained three questions to identify the respondents. A total of 139 respondents participated in the survey. In terms of the distribution of the number of respondents, more women (64.7%) participated than men (33.1%), and the most respondents were aged 25-64 (70.29%), followed by those aged 65+ (17.39%), and the third in order were aged 18-24 (12.32%). In terms of education, respondents with secondary education with a high school diploma prevailed here (40.58%), followed by those with secondary education without a high school diploma (24.64%), and in third place were those with a university education (22.46%).

Figure 1 – The structure of respondents' education
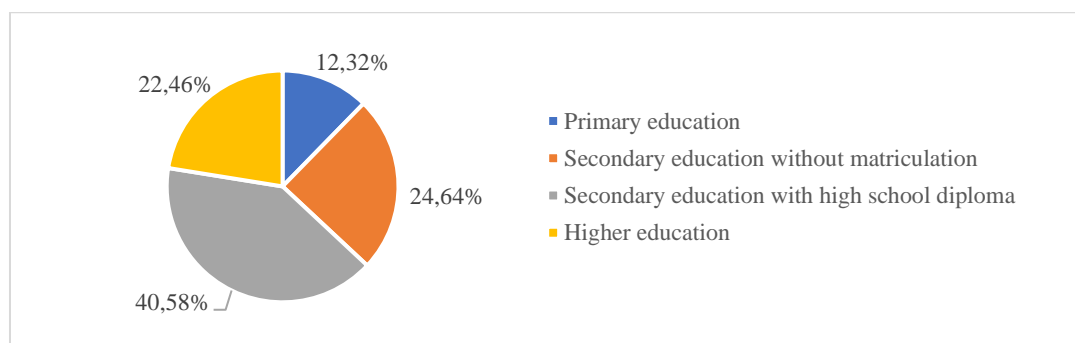
Source: Own processing

However, the aspects evaluated by the respondents regarding satisfaction with the activities and environment of the Department of Identity Cards and Travel Documents of the City of Ostrava and additional suggestions by the respondents (see conclusion) are important. The graph shows that the aspects of speed of processing matters (93.5%) and dealing with the official (93.5%) were the best rated. On the contrary, aspects related to traffic service (1.4%) and satisfaction with the environment and equipment of the department (1.4%) were rated the worst.

Figure 2 - Summary of overall satisfaction with individual aspects of the department visit
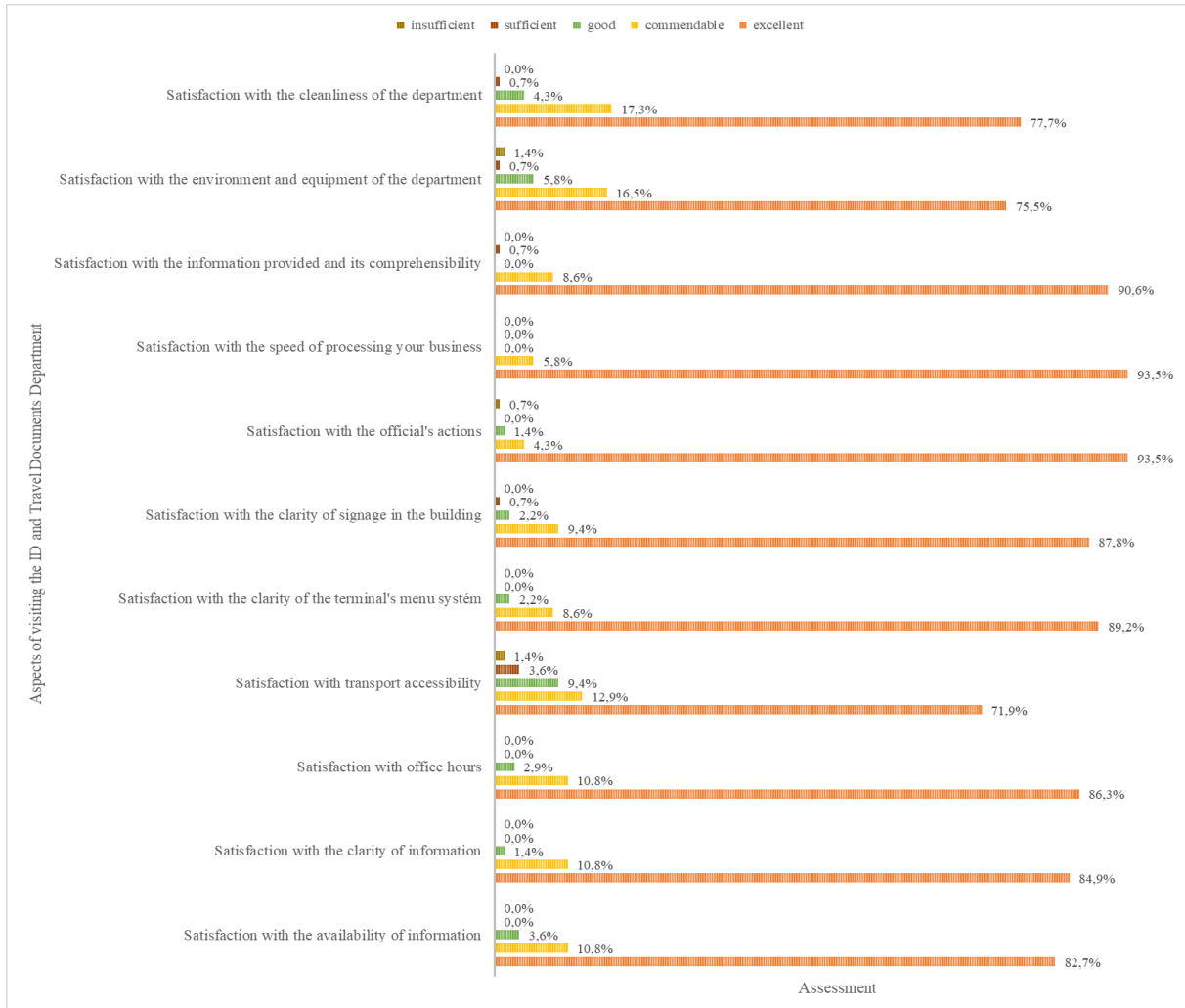
Source: Own processing

2.1.3 Dynamics of time series

The paper describes the method of time series dynamics, which is used to evaluate the performance and effectiveness of provided administrative services. This method focuses on detecting changes in time series and uses criteria to compile these changes. A measure of **absolute growth dynamics (Δyt)** is used to measure changes in value over time.

$$\Delta yt = y_t - y_{t-1} \tag{1}$$

Differentiating the absolute profit formula allows you to obtain the **average absolute profit (Δ),** which is an important factor in finding the trend function.

$$\Delta = y_T - y_1 / (T-1) \tag{2}$$

The essence of differentiation consists in constructing a time series trend to find the correct trend line function. Another indicator is the **average growth coefficient (k),** which is used to measure the dynamics of time series using growth coefficients, for example, the geometric mean. This method is useful in evaluating developments and changes in time series. (Artl, 2002)

$$\bar{k} = \sqrt[T-1]{\frac{y_T}{y_1}}$$

(3)

Data statistics from the Department of Identity Cards and Travel Documents of the Municipality of Ostrava provide an interesting insight into the number of transactions in the period 2016-2021. These statistics relate to the receipt, issue and loss of identity cards and travel documents.

Table 1 – Rates of dynamics of the time series of actions of selected administrative services for the period 2016-2021

	2016	2017	2018	2019	2020	2021	An absolute addition	Average absolute increase	Average growth rate
Identity cards									
income	54 582	52 850	42 934	36 186	30 988	38 235	-16 347	-2725	0,942
issue	52 968	53 662	43 167	35 622	29 591	37 685	-15 283	-2547	0,945
losses	13 280	12 991	11 859	11 095	8 271	7 944	-5 336	-889	0,918
Travel documents									
income	21 646	25 718	21 562	18 976	8 706	13 724	-7 922	-1320	0,927
issue	20 924	25 279	20 664	18 433	8 176	12 809	-8 115	-1353	0,921
losses	1 734	2 477	2 505	2 855	1 156	1 529	-205	-34	0,979

Source: Internal data provided by the Municipality of the City of Ostrava (2022). Own modification

In Table 1 shows the number of actions (income, expenditure, losses) in connection with this, absolute decreases are calculated here, which show the total changes for the given period (**absolute decrease**) and, on the other hand, partial changes in actions record changes during individual years (**average absolute decrease**). The largest decrease over time was recorded for accepted applications for identity cards (-16,347) and at the same time for the average absolute decrease (-2725). From the calculation of the average growth coefficient, it can be concluded that all activities have a negative index (a decrease is indicated by a value below 1.0, which is 100%) and as a result, it can be characterized as a below-average performance of administrative activities. As a result, it can be added that the biggest increase was shown for lost travel documents (0.979) and for issued identity cards (0.945). On the other hand, the largest decrease was recorded for issued travel documents (0.921) and for lost identity cards (0.918).

Figure 3 – Number of acts of identity cards in the mentioned period 2016-2021
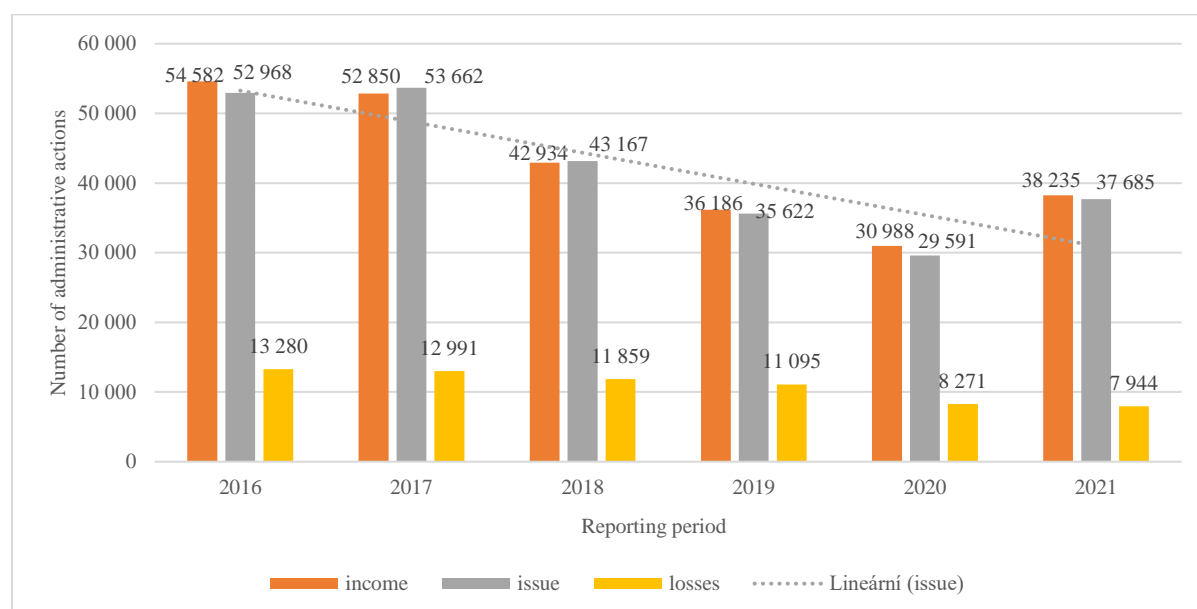
Source: Internal data provided by the Municipality of the City of Ostrava (2022). Own processing

In general, it can be said from figure 3 that the number of identity cards in the given period had a slightly decreasing trend except for the last year (2021), when the number increased by approximately 8 thousand pieces. The average number of applications received and ID cards issued was around 42,000 pieces. At the same time, the loss of ID

cards was much lower and was around 11,000 pieces during the monitored period. The largest number of received ID applications (54,582 pieces) was recorded in 2016, and the largest number of issued ID cards (53,662 pieces) occurred in 2017. As for the loss of ID cards, the largest number was shown in the same year when the number of received applications was the largest.

Figure 4 - Number of travel document transactions in the period 2016-2021
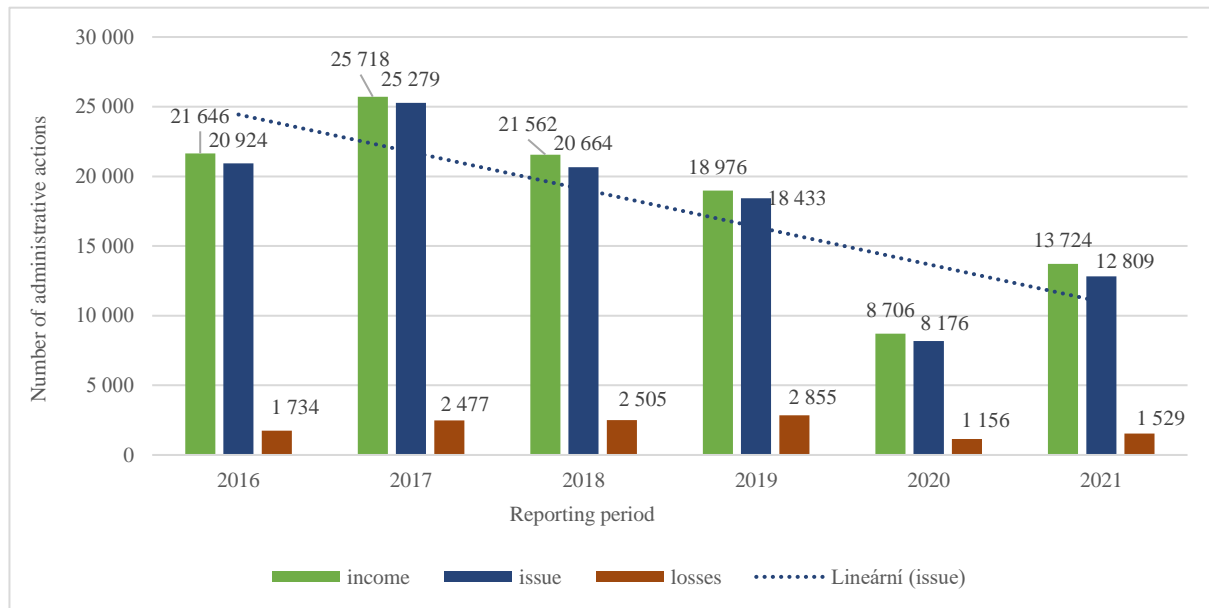
Source: Internal data provided by the Municipality of Ostrava (2022). Own processing

Figure 4 shows that again a slightly decreasing trend of travel documents for the monitored period is recorded here. The largest number of received applications for travel documents was shown in 2017, in the number of 25,718 pieces. On the contrary, the smallest number of applications was recorded in 2020, in the amount of 8,706 pieces. The largest number of issued travel documents (25,279 pieces) was also shown in 2017, which was 439 pieces fewer than the number of applications received in the same year. The biggest difference between the number of applications received and the number of documents issued was shown in 2018, with a difference of 898 pieces. The largest number of lost documents occurred in 2019, in the amount of 2,855 pieces, and on the contrary, the least in 2020, in the amount of 1,156 pieces.

2.1.4 Types of quantitative data collection methods

There are several different types of questionnaire survey methods, but due to the nature and type of output requirement, the PAPI method was chosen. The PAPI method is a quantitative method of data collection, whereby the interviewer completes a printed standardized questionnaire (open and closed questions) with the help of the respondent. The advantage of this survey is better explanation, higher accuracy, sample models to understand the questions. Disadvantages are the cost of shipping, printing, and time consuming.

Another similar method can be the so-called CAPI method, when a questionnaire survey is carried out using computers and tablets. The advantage of this investigation is saving time and saving printing costs. On the other hand, the disadvantages are the high cost of creating a computer system. A higher number of respondents when filling in questionnaires can be a problem, as the speed will then slow down and sufficient returns may not be ensured.

A third example can be a survey method in which respondents receive questionnaires via email, which they fill out and send back to the organization. The advantages of this method are low costs, easy organization of data collection and a clear structure, easy to understand questions in the questionnaire (from the simplest questions to more complex ones), and it is a faster way of communication. The disadvantage is the low return due to e.g. the length of the questionnaire, the quality of the database, there is also a higher pressure to create the questionnaire, it is unsuitable for investigating more complex problems. However, these similar methods were not chosen. If they were elected, they would bring different results. (Šrámek, 2009; SC&C, spol. s r. o., online, 2023)

3 Results and discussion

The main goal of the contribution is to evaluate the satisfaction of the clients of the Department of Identity Cards and Travel Documents and to analyze the development of the number of processed administrative actions in the period 2016-2021. A partial goal was to compare the differences in satisfaction when issuing individual types of documents.

Some issues are problematic to resolve. There are various restrictions that cannot be influenced either by the authority or by the respondents. From the point of view of funding, it is also necessary to perceive the expenditure of the volume of funds by the Ministry of the Interior, which is the provider of the guarantee of issuing documents. To ensure the efficiency, economy and effectiveness of funds for this agenda, it could be the duty of the Ministry of the Interior to require that all ORP offices be evaluated according to client satisfaction with the given office. Client satisfaction would be evaluated according to evaluated aspects of service quality, for example through electronic questionnaires. In the future, the funding of individual offices could thus depend on it.

To achieve the main goal, a questionnaire survey was conducted among clients regarding the reasons for their visit, satisfaction with the environment and overall satisfaction. The results of the questionnaire survey, in which 139 respondents took part, show that clients were satisfied above all with the speed and efficiency of the ordering and summoning system, officials and understandable information for handling their affairs. Most aspects were evaluated positively, but there were also a few comments related to traffic accessibility (less parking space at the Municipality), the behavior of officials (sometimes inappropriate behavior of workers - reluctance, arrogance or poor communication) and the quality of the working environment and facilities (poorly washed windows, outdated environment, and therefore suggestions were provided by the respondents to improve the environment, e.g. putting wallpaper on the walls or hanging pictures).

In connection with this, the respondents had reservations about the relatively narrow entrance doors, which prevent convenient access for clients in wheelchairs. The question may be how to ensure extended barrier-free access for disabled people in wheelchairs, e.g. if it is not/appropriate to deal with the matter with a disabled person before entering the building at the discretion of the official, if the office does not have a sufficiently equipped entrance for these people due to a lack of funds, or if the office will have to apply for a building permit, as it will seem undignified and uncomfortable to the client. In the event that the client does not mind solving the matter before entering the building, it would not be out of the question for the office to provide such clients with easy-to-find contacts (information) on the door, directly on the building or on the website, so that they can easily and effectively deal with such a situation. Information should be sufficiently secured and clear for everyone on websites, e-mail or in newspapers and thus be easy to find. They are often easy to implement and cheap in practice, and at the same time this would eliminate some comments. At the same time, citizens could be better informed about processing documents at other workplaces, such as ORP offices in the outskirts of Ostrava, which respondents did not know much about, so that there would be no shortage of parking spaces at the Municipality (department of internal affairs).

Another group of respondents would prefer a more modern appearance of the interior of the building or the installation of air conditioning for a more pleasant and comfortable stay in the office premises. In connection with the stimulus of a more modern appearance of the building, it is difficult to say from which point of view to look at this reminder. Either some respondents mean that the City Hall building needs to be repaired for the reason that the building is historical and less attractive. In this case, it would be more difficult to repair it to a new one, because a new project would have to be devised, and above all to have financial resources, etc. In connection with the new building project, it would be difficult to take into account the expansion of the installation of a massive elevator in the City Hall building, which was already difficult to think about in the past, so that nowadays the entrance to the elevator could be expanded. At the same time, it can only be about the environment of the department itself, how it affects the given client, which would solve the problem, e.g. hiring a cleaning service more often to wash windows, mop floors, take out bins or clean toilets. The most frequently mentioned problem is the installation of more air conditioning equipment, as the building is older, less ventilated, and in a full waiting room on hot days, the equipment is often sought after. In case of a longer wait, it is advisable to provide a larger number of water barrels in the waiting rooms. Another suggestion for clients who would come with children would be to provide them with a children's corner so that the children can have fun while waiting for a long time, and perhaps more updated programs on the screens in the waiting rooms, which could diversify the waiting for both adults and children instead of only perceiving waiting lists of numbers. In addition, clients would appreciate softer and larger seats or more personal space in the waiting room.

Certain results, suggestions and comments emerged from the questionnaire survey. It is important that surveys are carried out more regularly, for example every six months, and perhaps focus more on aspects of how respondents would perceive the quality of services in relation to the financial resources that would have to be spent on the given measures. In fact, it might turn out that certain measures could not be implemented for a certain amount of funds. The advantage of this comparison between surveys could be to find out how effective the offices are in terms of client satisfaction with the office's services. However, the disadvantage could be the matter of investigating without the presence of an independent body whether clients are not/satisfied with the quality of service provision at the given office. After such an investigation, certain facts would emerge. If the wording of the questions were changed, the survey would again turn out differently, because each method has certain advantages and disadvantages, for example the aforementioned PAPI method, which was used to conduct the survey (see methodology). As a result, authorities should tend to have the best possible ratings so that they are entitled to more funding.

The second part of the survey focused on the volume of received and issued identity cards and travel documents. It was found that during the years 2016-2021 there was a decrease in both income and expenditure of these documents. The largest number of applications for identity cards received occurred in 2016, in the number of 54,582, and for travel documents in 2017, in the number of 25,718 (about 36% lower than for OP). On the contrary, in 2017, the largest number of identity cards were issued (53,662 pcs.) and documents issued at the same time (25,279 pcs.). Although the assumption should be that the number of documents should increase over time, the opposite can be seen, namely that interest in new documents is decreasing. The reduction is likely due to residents being able to use other locations to process these documents, as well as being affected by the COVID-19 pandemic situation, which has slowed down public administration and travel.

4 Conclusion

Quality in public administration depends on meeting the requirements and expectations of clients. Public administration must be in accordance with the law and cannot be changed arbitrarily. Client satisfaction and service quality assessment can be determined through communication or questionnaire surveys. Clients' satisfaction with the quality of services at the Municipality's department was determined through a questionnaire survey that was implemented using the quantitative data collection method known as PAPI (see methodology).

Based on recommendations to improve client satisfaction, it was proposed to increase the space in the elevator for wheelchair users, modernize the equipment and appearance of the building, improve the behavior of the staff, and increase the capacity of parking spaces in the building of the Department of Internal Affairs. It is also important to increase the awareness of citizens about the possibilities of obtaining a national identity card or travel document at various workplaces. In addition to the Ostrava City Hall, there are other workplaces in the outskirts of Ostrava and in other municipalities such as Opava, Karviná, Bohumín, Orlová and Havířov. This would reduce the necessity of commuting and improve the occupancy of parking spaces in the center of Ostrava. Another recommendation is a regular survey of the municipality's client satisfaction and the use of various tools and techniques for the quality of services provided, such as online questionnaires, the Mystery shopping method, Mystery calling, cards with comments and recommendations, analysis of praise and recommendations, complaints. (SC&C, spol. s r. o., online, 2023) Regular surveys of client satisfaction and the use of various tools to improve the services provided can be recommended. The need for citizens to be informed about the possibilities of processing documents at various workplaces and solving the occupancy of parking spaces at the central workplace is also emphasized. (Havránek, 2015; Lipentsev, 2022)

To complement the assessment of the performance of the Municipality, a performance analysis was carried out focusing on the period 2016-2021, from which it follows that in the field of identity cards and passports, their income and expenditure has been decreasing in the administrative district of Ostrava due to the recorded average decrease both in income and in the issue of citizenship and travel documents. The reason for the downward trend was noted in the fact that currently residents can also use other places to process citizenship and travel documents than in their administrative districts, or that there was not a year when a large part of the population suddenly changed their identity cards or travel documents, and there were also years affected by the Covid-19 pandemic situation, when as a result the activities of public administration and people's travel abroad were dampened.

The sub-goal shows that the volume of issued ID cards is much higher than that of travel documents. In terms of volume over time, the decline is higher for identity cards (over 2,000 units, the number decreased each year) than for travel documents (the number decreased by approx. 1,000 units each year) and in percentage terms. The average number of issued identity cards for the monitored period is 42,116 and travel documents are 17,714. The connection can also be seen in the fact that most people carry their ID card with them, which is why there is

a greater percentage loss to the total volume. Another reason may be that the borders of Europe are expanding, and that is why a significant part of the population tends to acquire only an ID card, given that they are able to travel all over Europe with this ID card and because the costs of travel documents are higher than for an ID card. As a result of the sub-goal, it can be noted that more clients prefer to issue an identity card rather than a travel document, because nowadays it is usually possible to travel everywhere with it.

The contribution itself Analysis of the quality of services at the Department of Citizenship and Travel Documents at the Municipality of the City of Ostrava complements the bachelor's thesis entitled "Evaluation of the Quality of Selected Administrative Services at the Municipality of Ostrava".

Acknowledgements

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Appendix 1

Client satisfaction questionnaire of the Department of Identity Cards and Travel Documents
Objective: Evaluation of the quality of services provided at the Department of Travel Documents (TD) and Identity Cards (IC) of the Department of Internal Affairs of the Municipality of Ostrava through a client satisfaction survey.
Hello, my name is …… and I am a 2nd-year student of the VŠB-TU in Ostrava. In cooperation with the Municipality of Ostrava, we are carrying out a short survey of citizens' satisfaction with the services of the Department of Travel Documents and Identity Cards, and therefore I would like to ask you to answer a few questions about satisfaction.

1. Gender
- ☐ Man
- ☐ Woman

2. How old are you?
- ☐ 18-24
- ☐ 25-64
- ☐ 65+

3. What is your highest level of education?
- ☐ Primary education
- ☐ High school without high school diploma
- ☐ High school with high school diploma
- ☐ University

4. Are you here for the first time (at the IC and TD department)?
- ☐ Yes
- ☐ No

5. Were you pre-ordered in the ordering system?
- ☐ Yes
- ☐ No

6. If yes, please tell us which ordering method you chose:
- ☐ By phone (call center)
- ☐ Website of the Municipality
- ☐ in person

7. What is the purpose of your visit?
- ☐ I am going to process the document:
  - ☐ IC
  - ☐ TD
  - ☐ IC and TD
- ☐ I am going to pick up the document:
  - ☐ IC
  - ☐ TD
  - ☐ IC and TD (note Respondent/Child (legal representative))

8. What is the reason for your visit?
- ☐ Change of name (marital status)
- ☐ Change of address
- ☐ End of validity of the document
- ☐ Processing of the first document
- ☐ Loss/theft of a document
- ☐ Another option_____

9. How satisfied were you with… ? (1-5, evaluation as in school) + don't know
- a) with the availability of information on how to proceed in handling your matter (whether you found everything you needed to know on the website),
- b) with the clarity of information about how you should proceed in handling your matter,
- c) with office hours,
- d) with transport accessibility (parking, public transport stop),
- e) with the clarity of the terminal menu system (it was clear to you what I should choose from the terminal menu)
- f) with clear signage in the building (orientation in the building – where you should go)

	1	2	3	4	5	don't know
a)						
b)						
c)						
d)						
e)						
f)						

10. How long did you wait?
- ☐ do 10 min.
- ☐ 11-30 min.
- ☐ more than 30 min.

11. How satisfied are you with...? (1-5, evaluation as in school) + don't know
- a) with the actions of the official
- b) the speed of processing your matter
- c) with the information provided and its comprehensibility
- d) with the department's environment and equipment (possibility to sit down, put your things down, wifi, toilet)
- e) with the cleanliness of the department

	1	2	3	4	5	don't know
a)						
b)						
c)						
d)						
e)						

12. How do you rate overall satisfaction? (1-5, graded as in school)

1	2	3	4	5

13. What would you improve the functioning of the department?

14. Do you know that you have the possibility to arrange an IC or TD at any municipal office with extended jurisdiction in the Czech Republic?
- ☐ Yes
- ☐ No

15. Would you recommend the workplace to your friends?
- ☐ Yes
- ☐ No

16. If necessary, would you choose this department again?
- ☐ Yes
- ☐ No

Thank you for your time and have a nice day

Appendix 2

Development of the contribution to the transferred performance of the state administration (CZK million)
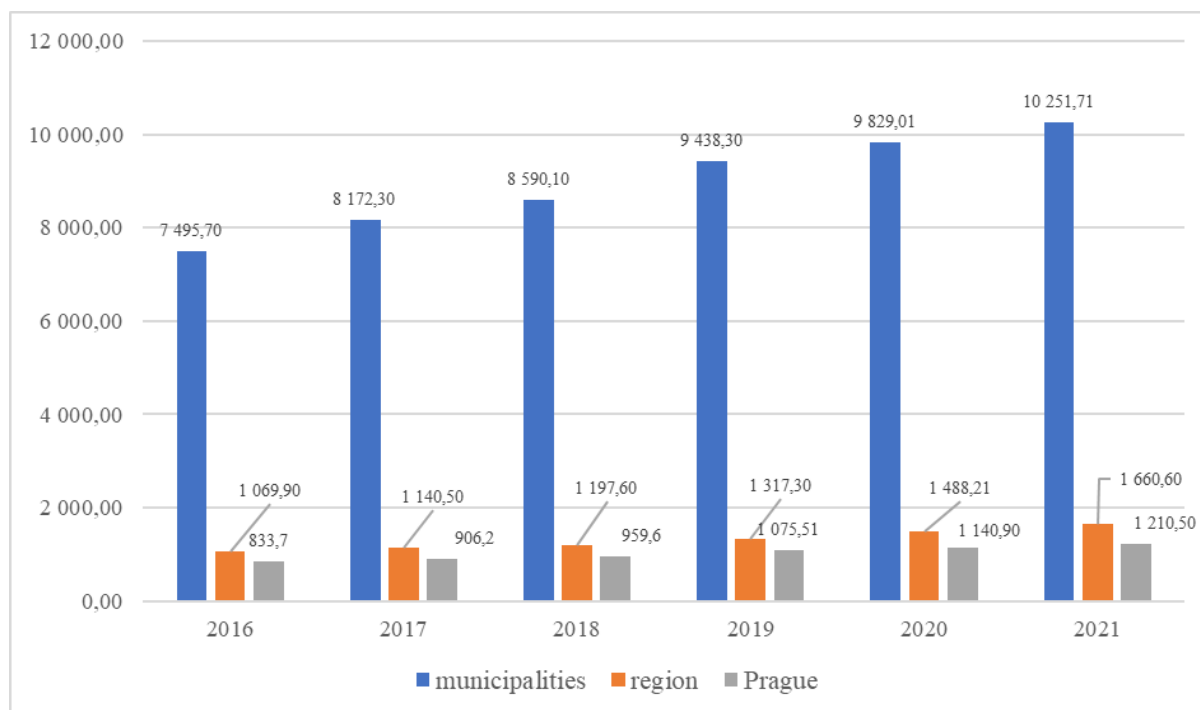
Source: Own processing

Key Indicators of Research and Development: The Case in EU27 Countries

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Abstract: R&D indicators are used as targets for research and innovation policy and international comparisons. The article focuses on the importance and position of R&D indicators in the European context. The aim is to evaluate key R&D indicators with a focus on financing, human resources and innovation performance and then to assess the similarities of EU countries according to selected R&D indicators. The assessment of R&D indicators (financial, human resources and innovation) in EU countries between 2010 and 2020 shows that most EU countries have shown positive trends over time in the R&D areas under study. Using hierarchical cluster analysis, EU countries were divided into six clusters based on the intrinsic similarity of R&D indicators. The results show the greatest similarity between the countries in the same cluster, particularly in R&D intensity as measured by Gross domestic expenditure on R&D as % of GDP and in innovation performance as measured by the Summary Innovation Index. The findings may be particularly useful for national R&D policy makers in decision-making and management on key R&D areas, as well as in the design of measures, targets and strategies.

Keywords: R&D indicators, financing, human resources, innovation, cluster analysis

JEL Classification: C38, H50, O32

1 Introduction

The European Research Area (ERA) is defined as an internal market for research, in which researchers, scientific knowledge and technology can circulate freely. Building on a series of innovation processes, the ERA also focuses on delivering investment and reform, improving access to excellence and increasing researcher mobility (Zhylinska et al., 2020; European Commission, 2023). Each country is part of the European Research Area (ERA) and develops its own research, development and innovation policy. RDI policy is a shared policy in which the principle of subsidiarity is applied. However, the EU only intervenes in activities that cannot be effectively managed by individual states themselves i.e. financial support, setting certain objectives and priorities that are interpreted in EU strategic documents (Bevan, 2019; Blažka and Kraus, 2021). An overview of research and development (R&D) activities in a country is provided by research and development (R&D) indicators, which help in decision-making and management but also in the formulation of measures, objectives and strategies. R&D indicators are used to facilitate international comparisons and as targets for research and innovation policy (Moncada-Paterno-Castello et al., 2020).

However, in order to produce quality R&D results and to develop the overall R&D in the selected area, it is necessary to ensure a functioning funding system. The amount of financial resources spent on the R&D sector in a country is assessed by a number of indicators that ensure the objectivity of inter-annual and international comparisons (Pelikanova, 2019; Tudor and Sova, 2022; Decyk, 2023). Funds (mainly from public budgets) must then be allocated efficiently not only to research organisations but also to companies (Moncada-Paterno-Castello et al., 2020). Also human resources in research and development are i) an important factor of the economic and social progress; ii) one of the indicators which reflect a country's degree of implication in supporting of the science, research, development and innovation; and iii) an indispensable element for producing quality outputs (Roy, 2018; Svermova et al., 2020; Halaskova et al., 2022). When assessing human resources, it is also necessary to look at the expertise of the staff (type of scientific field), the way of working (type of R&D activity and type of employer), as well as the motivation of the staff (especially financial) to carry out R&D activities (Medase, 2021). Various approaches can be found in literature toward evaluation of R&D indicators. Some research adopt a comprehensive viewpoint of R&D indicators, whereas others focus on individual areas of R&D indicators, such as human resources, funding, innovation, or international cooperation. In the present study, we aim for filling the gap in research and evaluate three key areas of R&D indicators, crucial for the making of national R&D policies in the individual countries.

The aim of the article is to evaluate key R&D indicators with a focus on financing, human resources and innovation performance and then to assess the similarities of EU countries according to selected R&D indicators. In order to meet the goal, the following research question (RQ) is validated: Do any similarities exist between EU countries in research and development according to R&D intensity and in innovation performance? The R&D indicators (financial, human resources and innovation performance) in 2010 and 2020 are assessed in more detail, including their changes in EU countries. Subsequently, using hierarchical cluster analysis, EU countries are assessed according to the internal similarity of the selected R&D indicators.

1.1 Literature Review

A number of studies have examined and evaluated R&D and innovation indicators both at the national level and at the European and international level. Many indicators are used to assess R&D and innovation and can be classified according to different methodologies (Bevan, 2019; Taquese et al., 2019; Svermova et al., 2020; Decyk, 2023). In addition to input indicators, output indicators are also used to assess R&D activities. As stated by Mana (2016); Bevan (2019); Taquese (2019) input indicators in R&D assess how economically resources (inputs) are used to achieve outputs. However, input resources may be subject to some manipulation by the company. On the other hand, output indicators in R&D according to (Mana, 2016; Bevan, 2019 or Taquese et al., 2019) summarise what has been produced from R&D activities and what positive effects this has on society and the country's competitiveness. They also provide information to assess the achievement of objectives in strategic documents and programmes. Output indicators with a focus on innovation and innovation performance have been analysed by e.g. Dobrzanski (2018) or Prokop et al. (2021). Dobrzanski (2018) and Klímová and Žítek (2020) examined the position of countries according to innovation performance, whether the position of European R&D leaders is stable over time and what is the influence of factors that ensure a country's position among innovation leaders. Prokop (2021) and Xu et al. (2023) then assessed in more detail the factors most influencing innovation efficiency in EU countries and the influence of factors that may affect companies' innovation performance.

As some authors point out (Mana, 2016; Svermova et al., 2020) to ensure development in a country, R&D must be built primarily on human resources. Svermova et al. (2020) show that human resources are a fundamental factor determining the quality of higher education and research. According to OECD (2015), researchers who focus on R&D activities and the production of R&D results are the main driving force. A number of authors (e.g. Lelek, 2014; Suarez et al., 2020) then agree that it is very difficult to attract highly qualified researchers and potential human resources in R&D (students and graduates of higher education). Lelek (2014) conducted an analysis of the number of researchers as an important input factor for R&D and conducted it on university graduates, which can be considered as the core group of researchers. Some authors (Kim et al., 2018; Roy, 2018; Kou et al, 2020; Martínez-Sánchez et al., 2020) have looked at the flexibility of human resources and the relationship between R&D effort and knowledge absorption capacity, or have looked at the factors that affect the performance of R&D workers and human resources in R&D. Other authors (e.g., Medase, 2021) have emphasised employee qualifications, training and internal R&D as one of the current areas of human resource development.

Financial support for R&D is also central to the development of a country's research and innovation activities (Pelikanova, 2019 or Moncada-Paterno-Castello et al., 2020). Many authors then agree that without a functioning funding system, new R&D results cannot be generated (Correa, 2014; Pegkas et al., 2019; Tudor and Sova, 2022; Decyk, 2023). The authors identify R&D expenditure as the baseline indicator in R&D financing. Total R&D expenditure then captures a view of the innovation capacity of a country or region. As stated by Decyk (2023) expenditures on innovative activities, including R&D, play a key role in introducing innovations and consequently in the level of innovativeness. Pegkas et al. (2019) investigated whether expenditures stemming from different sectors of R&D implementation yield different results in innovation activity across EU countries. Similarly, other authors, Tudor and Sova (2022), investigated which factors most influence R&D intensity and how they affect its structure.

2 Material and Methods

The subject of this article is research, development and innovation in the European dimension. An analytical approach has been used to assess changes and similarities in R&D indicators in EU countries. The paper draws on the literature on R&D and key R&D indicators in the European context. In the empirical part, the article uses data from Eurostat (statistical database) - Science, Technology, Digital Society (R&D section) and data from the European Commission – European Innovation Scoreboard. The role of Eurostat is to provide EU level statistics that allow comparisons between countries and regions. The European Innovation Scoreboard provides a comparative analysis of innovation performance in EU countries, in other European countries and in

neighbouring regions. Innovation performance is assessed by an aggregate indicator, the Summary Innovation Index. Selected key indicators have been used to assess R&D performance and to evaluate country similarities, as documented in Table 1.

Table 1 – Used R&D Indicators

R&D Indicators	Unit	Abbreviation	Source
Gross domestic expenditure on R&D	% of GDP	GERD	Eurostat
Government budget allocations for R&D	mil. EUR	GBARD	Eurostat
R&D personnel full-time equivalent	Number	R&DP (FTE)	Eurostat
Researchers full-time equivalent	Number	RES (FTE)	Eurostat
Summary Innovation Index	index	SII	European Innovation Scoreboard

Source: Authors according to Eurostat (2023); European Commission (2022b)

The analysis is performed over the years 2010 and 2020. These years reflect the development of the Europe 2020 strategy (the beginning, and end of the period). The selected set is composed of 27 EU countries i.e. Austria (AT), Belgium (BE), Bulgaria (BG), Croatia (HR), Cyprus (CY), Czechia (CZ), Denmark (DK), Estonia (EE), Finland (FI), France (FR), Germany (DE), Greece (GR), Hungary (HU), Ireland (IE), Italy (IT), Latvia (LV), Lithuania (LT), Luxembourg (LU), Malta (MT), Netherlands (NL), Poland (PL), Portugal (PT), Romania (RO), Spain (ES), Slovakia (SK), Slovenia (SI), Sweden (SE).

In our research, hierarchical cluster analysis was used to assess the similarity of EU countries according to five R&D indicators (financial, human resources and innovation performance). Cluster analysis is a multivariate statistical analysis method for classifying samples based on the principle of "an alike attracts an alike" (Scitovski et al., 2021). Cluster analysis or clustering is the task of grouping a set of objects such that objects in the same group (called a cluster) are more similar to each other (in some sense) than objects in other groups (clusters). Cluster analysis is usually used when there is no assumption about the likely relationships in the data. Hierarchical cluster analysis was used to create clusters of statistical units (EU countries), which allows the construction of a dendrogram as a sequential clustering graph and the determination of the appropriate number of clusters. In our case, the EU countries were divided into six clusters based on internal similarity, which represented their most even distribution. For clustering, Ward's method based on the least squares method was used, which tends to produce compact clusters of approximately equal size. The square of the Euclidean distance between the centroids of the clusters is used to measure the distance between the clusters (Murtagh and Contrera, 2017). Cluster analysis has been used by other authors (e.g. Bere and Bucerzan-Precup, 2015) to address similar issues.

3 Results and Discussion

In this section, key R&D indicators in EU countries are analysed and evaluated, with an emphasis on financial, human resources and innovation performance.

3.1 Analysis of Key R&D Indicators in the European Context

For international comparisons, the key R&D indicators most commonly used include funding, human resources, results, innovation and international collaboration (Bevan, 2019). Typical R&D funding indicators used internationally include those according to the Eurostat and OECD database. However, there are many other types of indicators focusing on R&D funding. A key indicator in R&D funding is total R&D expenditures, which can be categorised by institutional and functional aspects (Mana, 2016). The categorisation of expenditures by institutional and functional aspects can be combined and tracked across sectors of R&D implementation. This view then allows for comprehensive information on the expenditures provided for different R&D activities. In the Eurostat and OECD databases, R&D expenditures is tracked in almost the same categorisation (by sector of implementation, source of funding, type of expenditure, R&D activity, scientific area, socio-economic objectives). Eurostat also uses a categorisation of expenditures by NUTS2 regions compared to the OECD (Eurostat, 2023). A more detailed breakdown of R&D expenditures by other categories can then be found at national level of each country.

Like the R&D funding indicators, the R&D human resources indicators are also tracked by several databases (Eurostat, OECD or EIGE). The R&D human resources indicators can be tracked as Head Count (HC) and Full Time Equivalent (FTE). The HC indicator shows the number of all employees in the R&D sector who work on both a core and a non-core basis in the sector. In contrast, the FTE indicator is a converted indicator that characterises the actual involvement of a worker in R&D activities (OECD, 2015). In the Eurostat and OECD

database, the main human resource indicators in R&D are tracked: employees in R&D (HC, FTE), researchers (HC, FTE), women working in R&D and women working as researchers (HC, FTE). In addition to the total number, human resource indicators are also measured as number per 1000 population, as % of active population, % of employment. For women in R&D, % of total R&D employees is also tracked. In the European context, other human resources indicators are also monitored, broken down by sector of implementation, gender, work activity, predominant economic activity or by educational attainment. In Eurostat, human resources indicators are also available by age category, by discipline or by regional breakdown (Eurostat, 2023).

For the purpose of measuring innovation performance, simple or composite indicators are used in the international context. The most commonly used simple indicator to determine innovation performance is knowledge intensity. It expresses the ratio of the total expenditure on research and development (GERD) to the amount of gross domestic product (GDP). Composite indicators of innovation performance have several dozen sub-indicators. These indicators better characterise the phenomenon being described and are more useful for finding the real causes of innovation performance. However, they have the disadvantage of making it more difficult to interpret the impact of individual factors on overall innovation performance. The most commonly used composite indicators are the Summary Innovation Index, Global Innovation Index and Innovation Output Indicator. However, for a comprehensive and objective analysis of innovation performance, it is necessary to use both types of indicators (RVVI, 2019).

3.2 Comparison of R&D Indicators (financial, human resources and innovations) in EU Countries in Years 2010 and 2020

For the comparison of R&D indicators in EU countries in 2010 and 2020, 5 R&D indicators were selected, i.e. financial indicators (Gross domestic expenditure on R&D as % of GDP and Government budget allocations for R&D in million EUR), human resource indicators (R&D personnel-FTE (R&DP FTE) and Researchers-FTE (RES FTE) and a composite indicator of innovation performance – Summary Innovation Index). The comparison of selected key areas of R&D according to the selected R&D indicators in EU countries in 2010 and 2020 is documented in Table 2. As shown in Table 2, a comparison of R&D human resources indicators reveals significant differences in the number of R&D personnel (FTE) and researchers (FTE) in EU countries. Large and populous countries dominate in the number of R&D human resources. Extremes are particularly evident in Germany, France and Italy with the highest numbers of R&D personnel compared to Malta and Cyprus with the lowest numbers of R&DP (FTE) and RES (FTE). In 2020, compared to 2010, an increase in the number of R&DP (FTE) and RES (FTE) is apparent in almost all countries. The largest increases in R&DP(FTE) and RES (FTE) are found in Italy, Germany and France, which is also due to the high numbers of R&D personnel in these countries. In 2020, compared to 2010, a twofold increase in R&D personnel was found in Hungary and Poland and a twofold increase in researchers (FTE) was achieved in Hungary, Poland and the Netherlands. In contrast, a slight decrease in R&D personnel (FTE) was observed in Finland and a slight decrease in researchers (FTE) in Romania. From the results it can be concluded that the total numbers of R&DP (FTE) and RES (FTE) in each EU country reflect in most cases the magnitude of their changes.

Looking at the financial indicators of R&D in 2010 and 2020, similarly to human resources R&D, an increasing trend over time was found in most countries (see table 2). In the case of R&D intensity, i.e. Gross domestic expenditure on R&D (GERD) as % of GDP, the largest increases in 2020 compared to 2010 were observed for Belgium, Greece, Poland and the Netherlands. The upward trend in total R&D expenditure in these countries reflects the achievement of the Europe 2020 R&D target. In contrast, the lowest increase in GERD as % of GDP in 2020 was found in RO, ES, DK, MT and PT. A decrease in R&D intensity in 2020 compared to 2010 was also recorded by FI, IE and LU. Within the indicator Government budget allocations for R&D (GBARD) in million EUR, Germany, France and Italy reached the highest values. On the other hand, Malta and Latvia document the lowest values in both 2010 and 2020. In 2020, the highest increase in GBARD in € million compared to 2010 was found in particular for Germany. An increase is also evident for Italy and the Netherlands (although significantly lower than for Germany). On the other hand, France documents a slight decrease in GBARD in million EUR.

Table 2 – Comparison of Selected Key R&D Indicators in EU Countries

| EU Countries | Indicators of R&D Human Resources | | | | R&D Financial Indicators | | | | Innovation | |
| | R&D personnel (FTE)- number | | Researchers (FTE)- number | | GERD (% of GDP) | | GBARD (mil. EUR) | | SII | |
	2010	2020	2010	2020	2010	2020	2010	2020	2010	2020
BE	60 075	96 828	40 832	64 053	2.06	3.35	2 375.0	3 401.8	117.5	138.1
BG	16 574	26 085	10 979	16 691	0.56	0.85	99.7	145.1	49.3	46.5
CZ	52 290	80 958	29 228	44 206	1.33	1.99	893.9	1 439.8	89.7	89.6
DK	56 623	62 049	37 435	44 553	2.92	2.96	2 395.5	3 023.3	139.0	145.5
EE	5 277	6 449	4 077	5 098	1.58	1.75	102.7	187.1	86.1	112.7
FI	55 897	53 519	41 425	41 707	3.71	2.1	2 068.9	2 286.6	132.9	138.7
FR	397 756	470 586	243 533	321 550	2.18	2.3	16 360.3	15 847.1	105.1	115.8
HR	10 859	15 517	7 104	9 113	0.73	1.24	324.6	393.3	56.0	69.0
IE	19 722	32 757	14 176	23 929	1.59	1.23	824.8	8 66.8	113.8	121.9
IT	225 632	342 286	103 424	156 989	1.22	1.51	9 548.0	11 020.0	75.7	102.0
CY	1 302	2 231	905	1 545	0.44	0.84	80.5	117.2	89.9	109.0
LT	12 315	14 245	8 599	10 183	0.78	1.14	118.0	163.2	55.0	83.5
LV	5 563	6 559	3 896	4 072	0.61	0.69	28.6	79.2	48.1	56.9
LU	4 972	5 782	2 613	3 082	1.42	1.09	189.0	372.0	121.2	132,8
HU	31 480	59 628	21 342	42 099	1.13	1.59	349.3	730.1	69.5	71,1
MT	1 102	1 840	587	1 011	0.59	0.65	14.3	33.9	69.1	108.0
DE	548 723	733 831	327 996	450 796	2.73	3.13	23 015.6	37 171.1	127.4	129.9
NL	100 544	166 422	53 703	102 077	1.70	2.31	4 857.2	6 063.5	119.6	139.0
PL	81 843	173 392	64 511	124 600	0.72	1.39	1 313.6	2 292.6	53.3	59.9
PT	47 616	66 044	41 523	53 174	1.54	1.61	974.1	740.9	86.4	89.4
AT	59 923	82 053	36 581	51 892	2.73	3.2	2 269.9	3 287.1	112.0	127.5
RO	26 171	33 189	19 780	18 331	0.45	0.47	353.3	396.9	46.8	38.2
GR	X	58 103	x	42 949	0.60	1.51	683.9	1463.2	69.4	81.0
SK	18 188	22 405	15 183	17 276	0.61	0.9	252.8	383.9	62.8	65.8
SI	12 940	16 833	7 703	10 845	2.05	2.14	217.8	243,5	95.9	96.0
ES	222 022	231 769	134 653	145 372	1.36	1.41	8 308.2	6963.1	76.2	93.1
SE	77 418	95 463	49 312	80 089	3.17	3.49	3 093.8	3668.8	143.1	147.8
EU Average	*82 801	109 512	*50 812	69 899	1.50	1.76	3 004.2	3806.7	89.3	100.3

Note: x- Unavailable data in the given year; * EU Average counted per 26 Countries excluding Greece
Source: Authors according to EUROSTAT (2023), European Commission (2017, 2022b)

Another area of comparison is Innovation Performance, assessed by the Summary Innovation Index (SII). The SII divides EU countries into four groups of innovators (Innovation leaders, Strong innovators, Moderate innovators and Emerging innovators). The indicator has undergone a number of changes over the years (due to the constantly evolving environment), so the criteria for classifying countries into different groups of innovators in 2010 and 2020 differ. i) Innovation leaders (above 120% of the EU average in 2010, above 125% of the EU average in 2020); ii) Strong innovators (between 90-120% of the EU average in 2010, between 95-125% of the EU average in 2020); iii) Moderate innovators (between 50-90% of the EU average in 2010, between 50-95% of the EU average in 2020); and iv) Emerging innovators (below 50% of the EU average in both 2010 and 2020), (European Commission, 2022a).

From the results of innovation performance according to SII divided into 4 groups of innovators (see Table 2), it was found that in 2010 and 2020 the Innovation leaders among the EU countries were Sweden, Denmark, Finland, Germany and Luxembourg. In 2020, the Netherlands, Belgium and Austria also joined the leaders. Ireland was in the Strong innovators group (approaching Innovation leaders). In contrast, two EU countries (Romania and Bulgaria) fall into the Emerging innovators group each year. These countries have not been able to increase their innovation performance for eleven years. In 2010, Latvia was also in the Emerging innovators group, while Poland, Lithuania and Croatia in particular can be classified as Moderate innovators with the lowest SII values (slightly above 50%). Similarly, in 2020, Latvia and Poland were classified as Moderate innovators with low SII values. The results also demonstrate that most EU countries showed a positive evolution over time between 2010 and 2020. The only exceptions are Romania and Bulgaria, where the SII value slightly decreased in 2020 compared to 2010. The largest changes in innovation performance according to the SII in 2020 compared to 2010 were seen in Malta, Lithuania, Estonia and Italy. The differences between EU countries in innovation performance are mainly

linked to different R&D trends and priorities, but also to the focus of R&D activities and the type of innovation activities in each country. Other factors related to the overall economic and financial situation of each country also play a role.

3.2 Assessment of the Similarities of Key Indicators of R&D and Innovation in EU Countries

Hierarchical cluster analysis is used to assess the similarities of EU countries according to selected R&D indicators with a focus on financial, human resources in R&D and innovation performance in 2020. Five key R&D and innovation indicators are selected for the cluster analysis across EU countries. These are two financial R&D indicators (GERD as % of GDP and GBARD in million EUR), two human resources indicators (number of R&D staff (FTE) and number of researchers (FTE)) and one composite indicator assessing innovation performance (Summary Innovation Index). The results show the grouping of the 27 EU countries into 6 clusters according to the internal similarity of the selected R&D indicators in 2020. The Dendrogram (Figure 1) documents the country breakdown in more detail. The results of the grouping of EU countries according to the internal similarity of R&D indicators are also documented in more detail in Table 3. As the most even distribution (see Figure 1), the division of EU countries into six clusters was chosen.

As can be seen from Table 3 and the dendrogram (Figure 1), *the first cluster* includes two EU countries (Germany and France), which are characterised by a high number of R&D human resources (high number of total R&D employees and number of total researchers). In terms of financial indicators, the high values of GBARD in million EUR dominate, but also the values of GERD as % of GDP.

The second cluster includes six countries (Sweden, Belgium, Austria, Finland, Denmark, the Netherlands), which are characterised by high values of GERD as % of GDP, but also by innovation performance and activities according to the Summary Innovation Index. The most similar in this cluster are then two pairs of countries. The first one is Sweden and Belgium, which show the highest similarities according to total R&D staff, but also according to GERD as % of GDP and GBARD in million EUR. The second pair is Finland and Denmark, which show the highest similarity according to GERD as % of GDP and number of researchers. *The third cluster* is characterised by eight countries (Greece, Portugal, Hungary, Lithuania, Croatia, Slovenia, Czech Republic and Estonia), which can be characterised mainly by similarities in GERD as % of GDP and innovation performance according to the composite indicator SII. The greatest similarity can be found for Greece and Portugal in terms of SII, GERD as % of GDP, but also in terms of the total number of R&D employees. Lithuania and Croatia have slightly lower similarity in this cluster, especially in terms of GERD as % of GDP and total R&D staff. Similarities also exist between Slovenia and the Czech Republic, which are similar mainly in terms of GERD as % of GDP.

The fourth cluster consists of four countries (Luxembourg, Ireland, Malta and Cyprus), which are characterised by a relatively high innovation performance according to the Summary Innovation Index. With the exception of Ireland, the other countries are characterised by lower values of GERD as % of GDP, but also by low total number of R&D staff and number of researchers. Luxembourg and Ireland are the most similar in this cluster, showing similarities in innovation performance according to the SII and in total R&D expenditure according to GERD as % of GDP. Another similar couple is Malta and Cyprus, showing similarities mainly according to innovation performance according to the SII. *The fifth cluster* comprises four countries (Romania, Bulgaria, Slovakia, Latvia) characterised by low GERD as % of GDP, low innovation performance according to SII and relatively low number of researchers (FTE). Romania and Bulgaria are the most similar in terms of R&D indicators. Another similar couple in the fifth cluster is Slovakia and Latvia. Romania and Slovakia are most similar in the case of the financial indicator GBARD in million EUR. In the case of GERD as % of GDP and total number of researchers, Slovakia and Bulgaria are most similar.

Figure 1- Dendrogram – Grouping of EU Countries according to Similarities of Key R&D Indicators
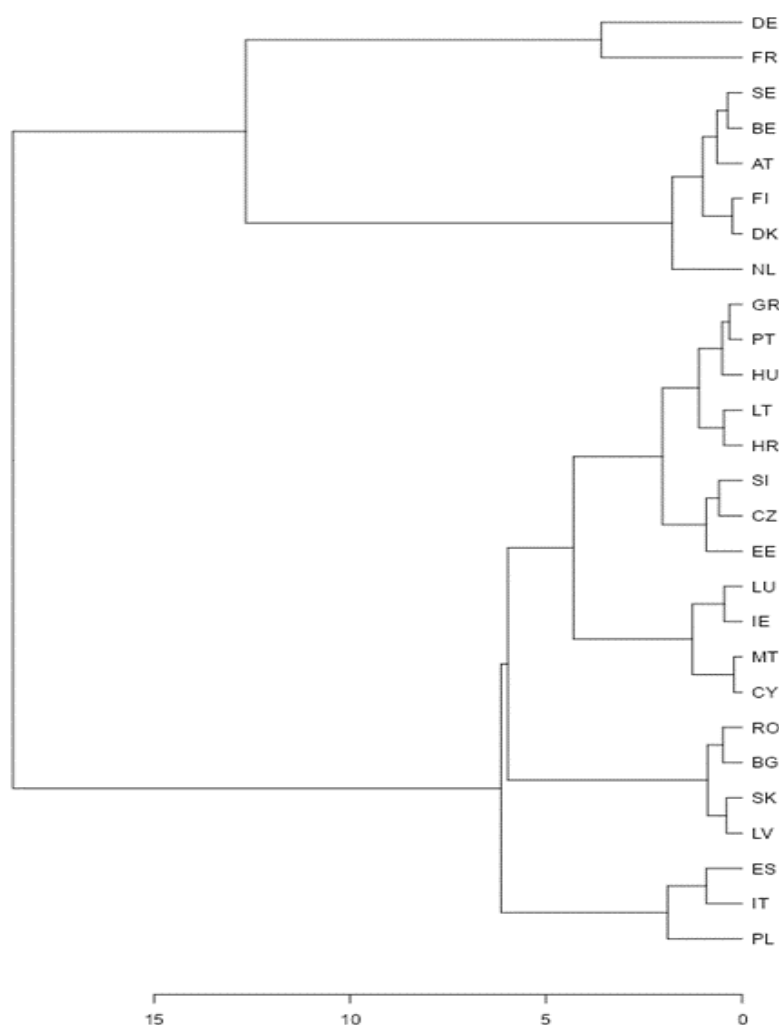
Source: Authors' calculation

Table 3 - Division of EU Countries by Similarity of R&D Indicators using Cluster Analysis

Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6
France Germany	Sweden Belgium Austria Finland Denmark Netherlands	Greece Portugal Hungary Lithuania Croatia Slovenia Czechia Estonia	Luxembourg Ireland Malta Cyprus	Romania Bulgaria Slovakia Latvia	Spain Italy Poland

Source: Authors' calculation

The sixth cluster includes three countries (Spain, Italy and Poland). In these countries, the similarity of R&D indicators was not found to be as high as in the other clusters. Spain and Italy are more similar in terms of the R&D indicators observed in this cluster, with similarities in GERD as % of GDP and total number of researchers (FTE).

From the assessment of R&D indicators in EU countries, it was found that there are similarity and also differences between countries classified in the same clusters (based on the internal similarity of the R&D indicators monitored). In particular, the results showed the greatest similarity between pairs of countries in the same cluster. On the basis of the assessed R&D indicators (financial, human resources and innovation), it can be concluded that the countries included in the same cluster show the greatest similarity especially in R&D intensity according to the indicator Gross domestic expenditure on R&D as % of GDP and innovation performance according to the

Summary Innovation Index. Based on these results, it may be argued that the answer to the research question is affirmative.

4 Conclusion

Research and Development indicators are used to facilitate international comparisons and as targets for research and innovation policy. From the comparison of financial R&D indicators and indicators of human resources in R&D, an increasing trend was found in almost all countries in 2020 compared to 2010. The results showed an increase in the number of R&D personnel (FTE) and researchers (FTE), but also gross domestic expenditure on R&D as % of GDP and in government budget appropriations of R&D in millions of EUR. Similarly, most EU countries also recorded a positive development over time in innovation performance according to the Summary Innovation Index between years 2010 and 2020. From the results of Innovation performance according to 4 groups of innovators, it was found that the Innovation leaders in 2010 and 2020 included Sweden, Denmark, Finland, Germany and Luxembourg. In 2020, the Netherlands, Belgium and Austria also joined the Innovation leaders. On the contrary, Romania and Bulgaria fall into the group of Emerging innovators every year, where the value of the Summary Innovation Index in 2020 fell even slightly compared to 2010.

The results of the cluster analysis in 2020 showed that there are both similarities and differences between countries included in the same cluster according to the internal similarity of key R&D indicators (financial, human resources and innovation) in EU countries. From the results, the greatest similarity was found mainly in different pairs of countries included in the same cluster. On the basis of the evaluated R&D indicators (financial, human resources and innovation), it can be concluded that countries included in the same cluster show the greatest similarity in the intensity of research and development according to the indicator Gross domestic expenditure on R&D as % of GDP and innovation performance according to the Summary Innovation Index. Differences between EU countries in the monitored areas of R&D are linked mainly to different priorities and trends in research and development activities and to the goals of national R&D policies in the individual countries. Other factors associated with innovation performance and the overall economic and financial situation of individual countries also have an influence. The findings achieved can be particularly beneficial for the creators of national R&D policies in decision-making and management of key areas of R&D, but also in the creation of measures, goals and strategies. As a topic for further research, the authors see the evaluation of other key R&D indicators on a wider sample of European countries than in the research carried out.

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Government Expenditures and Employment in Services: An Empirical Analysis of European Countries

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Abstract: The article aims to analyse government expenditures and employment in selected public services in European countries and then to examine the impact of government expenditures on employment in services. An analytical approach is used (comparative analysis, regression analysis of panel data) to examine government expenditures (total expenditures, expenditures by function) and employment in services in European countries in 2002 to 2021. In 2002-2021, the extent of allocated total government expenditures (in % of GDP) in 29 European countries had a growing trend. Also, the analysis of employment in selected areas of public services showed a moderately growing trend on average in European countries. Results using panel data analysis confirmed that European countries with a higher and lower economic level differ not only in their structure but also influence of specific categories of government expenditures. In the case of employment in services, European countries with lower economic level showed a significant effect of seven out of the ten categories of government expenditures. In European countries with a higher economic level than the EU average, a significant effect of five categories of government expenditures on employment in services manifested. For both groups of European countries, the effect of the analysed government expenditures on employment in services can be evaluated as mixed. The achieved findings can be beneficial especially for the creators of national public policies, but also for other interested entities.

Keywords: Employment in services, European countries, government expenditures by COFOG, panel data analysis

JEL Classification: C23, E62, H50, H59

1 Introduction

Government expenditures are amongst the most significant instruments of fiscal policies (Fouladi, 2010). Government expenditures include all government consumption, investment, and transfer payments. Two types of government spending, on final consumption and on gross capital formation, together constitute one of the major components of gross domestic product (Baaro, Grilli, 2007). Several viewpoints exist about government expenditure effects. According to Szarowska (2022, p. 15) government expenditure can help in smoothing out cyclical fluctuations in the economy and influences the level of employment and price stability. In case that government expenditures constitute complementary effect for private investment, we can expect that an increase in government expenditure will lead to growth in production and employment (Fouladi, 2010). For the purposes of further research, some authors divide government expenditures into two categories: productive expenditures and non-productive expenditures (Mura, 2014, Felice, 2016; Chu et al., 2020). According to Mura, (2014, p. 8) "productive government expenditures carry an impact upon the efficiency of the private sector, generating positive externalities to firms, and have a positive effect on the marginal productivity of capital and labour. Non-productive government expenditures have a direct benefit for households, affect the welfare of the consumers, but do not change the efficiency of the private sector".

The current topic of numerous researches is the examination of the mutual relation between government expenditures and economic development in wider context (Meričková et al., 2017; Lupu et al., 2018; Fedotenkov, Grupta, 2021; Haini, Loon, 2022). By contrast, a thorough examination of the relation between government expenditures and employment, in particular in public services, is paid smaller attention in research.

The subject of our research are government expenditures (total expenditures, by functions) and employment in the service sector in the European context. The aim of the paper is to analyse government expenditures and employment in selected public services in European countries, following with the examination of the impact of government expenditures on employment in services. In relation to the aim, the research question is validated: "Does the influence of government expenditures on employment in services vary between European countries with a higher and a lower economic level? An analytical approach is used (comparative analysis, regression analysis of panel data) for the sake of examining government expenditures and employment in services in 29 European countries in the period 2002-2021.

1.1 Literature Review - Relationship of Government Expenditures, Economic Growth and Employment in Services

The topic of a number of research studies is the relationship (effect) between government expenditures on economic growth in the European and international context (Murova, Khan, 2017; Lupu et al., 2018; Alqadi, Ismail, 2019; Mitkova, Mlynarovič, 2021; Szarowska, 2022). Creedy et al. (2011) analysed differences in the composition of government spending in democratic countries and focused on the extent to which these differences could be explained by economic conditions or preferences of the countries. Gemmell et al. (2016) evaluated long term effects of changes of total government expenditures and the share of various categories of spending on GDP in OECD countries with respect to ways of financing changes of expenditures and potential endogenous relationships. Lupu et al. (2018) examined the relationship between ten categories of public expenditures and growth of gross domestic product in selected countries of Middle and Eastern Europe. The authors found that expenditures on education and health had a positive effect on economy, whereas expenditures on defence, economic affairs, general public services and social protection have a negative effect on economy. Results of Murova, Khan (2017) confirm a positive relationship between economic growth and expenditures on education, transport, health care, social security or public safety. By contrast, their results have shown negative relations between output and employment in health care and public safety services.

Szarowska (2022, p.13) states that "despite the fact that many studies have focused on the relationship between government expenditure and economic growth, it cannot be clearly stated that an increase in government expenditure has a positive effect on economic growth. Empirical studies provide mixed and unclear conclusions about the effect of government expenditure on economic growth, as studies with positive, negative, and even zero effects can be found". Also Alqadi, Ismail (2019), who summarised theoretical and empirical resources on the evaluation of the relationship between government expenditures and economic growth argue that neither theoretical nor empirical literature provides convincing proof on the nature of this relationship.

Fedotenkov, Gupta (2021) analysed the influence of government expenditures and their structure on growth of productivity in industries a services in countries of the European Union. The authors reached the conclusion that in the case of services, productivity growth declines with military expenditures and increases with the centralisation of expenditures on public order and safety. This influence has manifested mainly in Eastern European countries, and it is less marked in Western European countries. Some studies carried out earlier also examined relations between government expenditures and employment in services (Martinez-Vazquez, Yao, 2009; Stare, Jaklic, 2011; Ramey, 2012; Felice, 2016, Cvecic, Sokolic, 2018). Martinez-Vazquez, Yao (2009, p. 539) investigated "the relationship between public sector employment and fiscal decentralization. Their findings indicate that total public sector employment is higher in unitary countries vis-à-vis federal countries, and that public employment increases with the country's international economic openness." Stare, Jaklic (2011) estimated the main determinants affecting employment in public and private services and arrived at the conclusion that government expenditures give insufficient explanation for a growing rate of employment in services. Felice (2016) analysed the relationship between the size and composition of public expenditures and the sectoral employment composition of the economy. Her findings have shown that government productive expenditures indirectly affect long term growth through changes to sectoral composition of employment of the economy. Also Ramey (2012) examined the impact of government spending on labour markets. Her findings have confirmed that the effect of government expenditures is associated mainly with an increase in employment rate in public administration.

2 Material and Methods

For the analysis, we use data from available databases (Eurostat and World Bank). The data used from the Eurostat database in the years 2002-2021 include Employment by A*10 industry breakdowns (Eurostat, 2023a) and Government finance statistics – Annual government finance statistics – General government expenditures by function COFOG (Eurostat, 2023b). According to the COFOG classification (the Classification of the Functions

of Government), categories of general government expenditures (ten divisions) are selected which correspond to the breakdown according to the COFOG first level (Eurostat, 2023c). The data used from the World Bank in the years 2002-2019 for the purposes of a comprehensive indicator Employment in services (data was only available till 2019). All variables utilised are stated in Table 1.

Table 1 – Used Variables for Analysis

Variable	Abbreviation	Unit	Source
Government expenditure on general public services	GF01	percentage of GDP	Eurostat
Government expenditure on defence	GF02	percentage of GDP	Eurostat
Government expenditure on public order and safety	GF03	percentage of GDP	Eurostat
Government expenditure on economic affairs	GF04	percentage of GDP	Eurostat
Government expenditure on environmental protection	GF05	percentage of GDP	Eurostat
Government expenditure on housing and community amenities	GF06	percentage of GDP	Eurostat
Government expenditure on health	GF07	percentage of GDP	Eurostat
Government expenditure on recreation, culture and religion	GF08	percentage of GDP	Eurostat
Government expenditure on education	GF09	percentage of GDP	Eurostat
Government expenditure on social protection	GF10	percentage of GDP	Eurostat
Employment in services	EMPS	percentage of total employment	World Bank

Source: Authors

The selected set comprises 29 European countries (27 EU countries, Iceland and Norway). For the purposes of a more detailed examination, the European countries have been divided and evaluated (with respect to their economic levels according to GDP per capita (in PPS EU27 2020) into: 1) *European countries with a lower economic level than the EU average*: Bulgaria (BG), Czech Republic (CZ), Estonia (EE), Greece (EL), Spain (ES), Croatia (HR), Italy (IT), Cyprus (CY), Latvia (LV), Lithuania (LT), Malta (MT), Hungary (HU), Poland (PL), Portugal (PT), Romania (RO), Slovenia (SI), Slovakia (SK); 2) *European countries with a higher economic level than the EU average*: Austria (AT), Belgium (BG), Denmark (DK), Germany (DE), Ireland (IE), France (FR), Luxembourg (LU), Netherlands (NL), Finland (FI), Sweden (SE), Iceland (IS), Norway (NO).

2.1 Methods

A panel data analysis is used for the purposes of the analysis of the relation between government expenditures and employment in services in the period 2002-2019. Ten categories of government expenditures by function represent independent variables and dependent variable - employment in services. Panel data is "a dataset in which the behaviour of each individual or entity (in this case a country) is observed at multiple points in time. Using panel data accounts for variables that change over time, but not across entities" (Princeton University Library, 2023). Models have been selected for the analysis (model for 29 European countries and separately for countries with higher and lower economic levels than the EU average according to GDP per capita in PPS).

As the individuals (the European countries) are not obtained arbitrarily or randomly, the random effect panel regression model should not be applied. To test the consistency of the random effect model, we performed the Hausman test (Baltagi, 2021). The fixed effects method "utilises panel data to control for (omitted) variables that differ across individuals or entities (in this case European countries), but are constant over time. In fixed effects models, the slope coefficient of the population regression line is the same for all individuals or entities (European countries), but the intercept of the population regression line varies across individuals/entities (countries)" (Stokes, Watson, 2019; Princeton University Library, 2023). All computation of the panel regression were carried on R- package plm (Croissant, Millo, 2008).

3 Results and Discussion

An analysis has been conducted of total government expenditures and employment in selected areas of public services in 29 European countries in the period 2002-2021. In addition, the impact of government expenditures by function on employment in services in the period 2002-2019 is examined.

3.1 Development of Government Expenditures in European Countries in 2002-2021

The volume of total government expenditures (in% of GDP) in the selected years of the period 2002-2021 in terms of the 29 analysed European countries (27 EU countries, Iceland, and Norway) is shown in Table 2. The analysis of total government expenditures in 2002 has shown that the highest levels of expenditures in% of GDP are seen in Sweden (53.6% of GDP), Denmark (53.2% of GDP), France (52.8% of GDP), followed by Austria (51.1% of

GDP) and Hungary (51% of GDP). The lowest total government expenditures (in% of GDP) are allocated in Ireland (32.9% of GDP), Romania (34.9% of GDP), Latvia (35% of GDP) and Lithuania (35% of GDP). In 2021, the highest levels of government expenditure in% of GDP were found in France (59.0% of GDP), followed by Greece (57.4% of GDP), Austria (56.0% of GDP), Finland (55.6% of GDP), Belgium (55.5% of GDP) and Italy (55.3% of GDP). On the contrary, the lowest levels of government expenditures were found in Ireland (24.8% of GDP), Lithuania (37.5% of GDP), Romania (39.8% of GDP) and Bulgaria (40.6% of GDP). The volume of allocated total government expenditures in % of GDP in years 2007, 2012 and 2017 are shown in more detail in Table 2.

Table 2 – Total Government Expenditures in European Countries (% of GDP)

Countries	2002	2007	2012	2017	2021
EU-27 countries	47.4	45.6	49.8	46.7	51.4
BE	49.9	48.6	56.5	52.0	55.5
BG	39.1	37.7	34.3	34.8	40.6
CZ	44.7	40.4	44.7	39.0	46.5
DK	53.2	49.6	58.0	50.5	50.8
DE	47.9	43.4	44.9	44.2	51.3
EE	35.9	33.7	39,2	39.2	41.5
IE	32.9	35.6	42,5	26.2	24.8
EL	45.8	47.1	56,7	48.5	57.4
ES	38.6	39.3	49.5	41.3	50.6
FR	52.8	52.6	57.1	56.5	59.0
HR	50.1	45.8	48.3	44.7	48.5
IT	46.7	46.8	50.6	48.8	55.3
CY	37.0	37.6	42.1	36.4	43.1
LV	35.0	34.5	38.8	38.7	44.0
LT	35.2	35.3	36.2	33.2	37.5
LU	41.8	37.4	41.8	41.3	42.9
HU	51.0	49.9	49.1	46.7	48.4
MT	41.4	40.9	42.1	34.5	43.6
NL	43.7	42.7	47.0	42.5	46.6
AT	51.1	49.2	51.2	49.3	56.0
PL	45.2	42.9	43.4	41.4	44.2
PT	43.7	44.5	48.9	45.4	47.8
RO	34.9	37.5	36.2	33.6	39.8
SI	47.3	43.4	49.4	44.1	49.3
SK	45.4	36.4	41.1	39.5	46.3
FI	48.5	46.6	55.4	53.6	55.6
SE	53.6	49.3	51.0	49.2	49.4
IS	45.5	44.7	47.7	44.4	49.2
NO	47.1	41.6	43.0	50.1	48.3

Source: Eurostat (2023c).

Government expenditures can be classified into four categories: 1) Functional Classification or Budget Classification, 2) Economic Classification, 3) Cross Classification, 4) Accounting Classification (Szarowska, 2022, p.15). According to the Classification of the Functions of Government (COFOG) are government expenditure into ten main categories (divisions) as the 'COFOG I level: general public services; defence; public order and safety; economic affairs; environmental protection; housing and community affairs; health; recreation, culture and religion; education; social protection [online] (Eurostat, 2023c).

Relatively stable shares of total expenditures over 2002-2021 are noted for public order and safety, environmental protection and "recreation, culture and religion". A steady increase over the period from 2002 to 2021 is noted for health' where the shares in total expenditure increased from 13.4% of GDP in 2002 to 15.8% of total expenditures in 2021. On the contrary, decreases in the share of total expenditures over 2002 to 2021 are noted for defence (2.9% of total expenditures in 2002 and 2.5% of total expenditures in 2021), housing and community amenities (1.9% of total expenditures in 2002 and 1.2% of total expenditures in 2021) and general public services (16.0% of total expenditure in 2002 and 11.7% of total expenditures in 2021). More detailed information about the issue of government expenditures by function - COFOG [online] (Eurostat, 2023c).

3.2 Service Sector and Employment in Selected Areas of Services

Service sector, also referred to as tertiary sector, involves all areas of human activity that are essentially based on provision of services, thus the provision of work, knowledge, financial means, infrastructure, products or their combination. A special category of the service sector is the public sector, which includes public services, namely services funded from public finances [online] (Management Mania, 2016b). Various classifications are applied for a more detailed categorisation of the service sector into individual areas and specific economic activities. The basic classification used for economic activities of the service sector is NACE-Statistical Classification of Economic Activities in the European Community [online] (Management Mania, 2016a). Benčo, Kuvíková (2011, p. 105) divide economic activities according to NACE in the section G-N into services predominantly commercial (profit orientated). Economic activities in section O-T represent public services provided by public and private non-profit providers (for more information about public services, read for instance Benčo, Kuvíková, 2011 or Murray Svidroňová, Mikušová Meričková, 2022). The classification of the areas of tertiary sector according to NACE is shown in Table 3.

Table 3 – Classification of Tertiary Sector according to NACE

G	Wholesale and retail trade; repair of motor vehicles and motorcycles	O	Public administration and defence; compulsory social security
H	Transportation and storage	P	Education
I	Accommodation and food service activities	Q	Human health and social work activities
J	Information and communication	R	Arts, entertainment and recreation
K	Financial and insurance activities	S	Other service activities
L	Real estate activities	T	Activities of households as employers
M	Professional, scientific and technical activities	U	Activities of extraterritorial organisations and bodies
N	Administrative and support service activities		

Source: Management Mania (2016a)

Service sector is often used as an indicator of the development of a country – "the higher the share of a productive population of employed in the tertiary sector is, the more developed a country should be. Over the past 100 years, a notable change in the share of the employed across sectors in industrialised countries has taken place. After these changes, the tertiary sector the largest and at the same time the most rapidly developing economic sector in the western world" [online] (Wikipedie, 2022; Quickonomics, 2023).

3.2.1 Employment in Selected Areas of Public Services in European Countries in 2002-2021

Employment is defined as persons of working age who were engaged in any activity to produce goods or provide services for pay or profit, whether at work during the reference period or not at work due to temporary absence from a job, or to working-time arrangement [online] (The World Bank, 2023). According to Eurostat (2023d) in 2021, employment in services accounted for 73% of total employment in the EU compared with 65% in 2000. Service activities represented more than 80% of total employment in the Netherlands and Malta (both 83%), Belgium (82%) as well as Luxembourg, France and Denmark (all 81%. In 2021 employment in selected services (public administration, defence, education, human health and social work activities) reached 24.1% of total employment in the EU, compared with 22% in 2002.

In 2021, the share of employed people according to the selected areas of services (according to NACE) in total employment for Health and social care accounted for 11.1%, Public administration and defence 7.3%, Education 7.5%, and Arts, entertainment and recreation 5.3% in the EU-27 [online] (NPI ČR, Infoabsolvent, 2023).

In 2002 to 2021, the analysis of employment in services in 29 European countries shows (Table 4) that an increase in employment in public services took place in the majority of European countries in public services (public administration, defence, education, human health and social work activities). The largest increase in employment in these services manifested in IE by 7.2%, ES by 5.6%, RO by 5.1%, or HR by 3,5%. By contrast, six European countries (BG, IT, LT, HU, MT, and SK) saw a decline in employment rate in these areas of services between 2002-2021. In 2021, countries with the highest employment in public services (public administration, defence, education, human health and social work activities) were Norway (36.6%), Sweden (34.3%), Iceland (31.7%), Denmark (31.1) and Belgium (30.9%). Meanwhile, countries with the lowest employment rate in these areas of services in 2021 were Romania (13.7%), Bulgaria (16.8%), followed by Italy (19.1%), Czech Republic and Slovenia (19.3%). The analysis of the period 2002-2021 clearly shows that some European countries (in particular,

Denmark, France, Lithuania, and Malta) reached the highest employment rate in public services in 2012. The trend of European countries regarding employment in public services in the analysed years 2007 and 2017 is captured in more detail in Table 4.

Table 4 – Employment in Selected Industry of Public Services in European Countries (% of total, based on persons)

Countries	2002	2007	2012	2017	2021
EU-27 countries	22.0	22.0	23.2	23.5	24.1
BE	27.4	28.6	29.9	30.6	30.9
BG	18.0	16.4	15.8	15.4	16.8
CZ	17.9	17.7	17.6	18.2	19.3
DK	30.8	29.7	31.8	30.5	31.1
DE	23.2	23.4	23.8	24.7	26.0
EE	21.3	20.3	23.4	21.1	23.4
IE	19.8	21.1	25.7	24.6	27.0
EL	18.9	20.7	22.3	22.3	21.9
ES	17.8	17.8	22.1	22.1	23.4
FR	28.9	29.2	29.6	30.0	29.4
HR	17.9	16.4	18.2	20.9	21.4
IT	19.8	18.7	18.8	18.9	19.1
CY	19.7	18.8	20.4	20.0	20.0
LV	20.4	19.4	21.2	20.8	21.7
LT	23.0	22.1	23.0	22.9	22.7
LU	17.1	18.1	19.9	20.6	21.5
HU	21.0	20.2	22.1	22.3	20.8
MT	23.9	23.7	25.0	24.6	22.8
NL	24.4	25.5	27.6	26.3	27.5
AT	21.4	21.9	22.9	23.6	24.1
PL	20.2	19.3	20.2	20.3	20.8
PT	18.5	18.9	21.1	20.6	21.4
RO	8.6	12.5	12.9	13.7	13.7
SI	16.0	16.7	18.9	18.9	19.3
SK	22.2	20.5	20.3	20.0	20.6
FI	27.7	27.3	28.5	28.8	30.5
SE	34.0	34.2	33.4	34.2	34.3
IS	30.1	27.6	30.2	27.0	31.7
NO	34.2	34.0	35.4	36.3	36.6

Note: Selected economic activity (industry of public services) by NACE: Public administration, Defence, Education, Human health and social work activities
Source: Processed according to Eurostat (2023a)

3.3 The Effect of Government Expenditures on Employment in Services in European Countries

We examine the influence of ten categories of government expenditures by function on employment in services (EMPS) in years 2002-2019 in 29 European countries (model EMPS-M1), in European countries with a lower economic level than the EU average (EMPS-M2), and European countries with a higher economic level than the EU average (model EMPS-M3). The results are shown in Table 5.

For 29 European countries (model EMPS-M1) shows that out of the ten categories of government expenditures, expenditures on health (GF07), expenditures on recreation, culture and religion (GF08) and government expenditures on social protection (GF10) have a statistically significant positive effect at the level of 0.1%. By contrast, government expenditures on defence (GF02), public order and safety (GF03), housing and community amenities (GF06) and government expenditures on education (GF09) have a statistically negative effect on EMPS, at the level of 0.1%. The results show that an increase in government expenditures (GF07, GF08, GF10) by 1% leads to an increase in EMPS (GF07 by 1.302; GF08 by 2.182, and GF10 by 1.098). By contrast, an increase in allocated government expenditures (GF02, GF03, GF06 and GF09) by 1% has an impact on the decrease in EMPS (GF02 reduced by 2.2; GF03 reduced by 3.091; GF06 reduced by 3.906, and GF09 reduced by 3.001).

Table 5 – The Effect of Government Expenditures on Employment in Services in Years 2002-2019

Var	EMPS-M1 All countries	EMPS – M2 countries with a lower economic level	EMPS -M3 countries with a higher economic level
Hausman	FE ***	FE ***	FE ***
GF01	-0.214	-0.102	-0.461 *
	(0.114)	(0.171)	(0.214)
GF02	-2.2 ***	-1.518 **	-4.122 ***
	(0.426)	(0.485)	(0.957)
GF03	-3.091 ***	-3.368 ***	-1.67
	(0.771)	(0.878)	(1.842)
GF04	-0.038	-0.018	-0.02
	(0.064)	(0.095)	(0.097)
GF05	0.324	1.005	2.765 *
	(0.586)	(0.692)	(1.356)
GF06	-3.909 ***	-2.436 ***	-6.847 ***
	(0.46)	(0.56)	(1.036)
GF07	1.302 ***	1.133 ***	0.317
	(0.234)	(0.334)	(0.461)
GF08	2.182 ***	3.518 ***	1.534
	(0.517)	(0.661)	(0.917)
GF09	-3.001 ***	-3.441 ***	-0.372
	(0.33)	(0.394)	(0.579)
GF10	1.098 ***	1.298 ***	0.649 ***
	(0.077)	(0.098)	(0.118)

Note: Coefficients of models of EMS, (FE – fixed effect model, RE – random effect model, stars describe signification of Hausman test, std.err. in parentheses, stars describes signification *** 0.1%, ** 1%, * 5%)
Source: Authors

In European countries with a lower economic level than the EU average (model EMPS-M2), seven categories of government expenditures have a statistically significant effect on EMPS. Similarly to the group of 29 European countries, GF07, GF08 and GF10 have a significant positive effect on EMPS, at the level of 0.1%. By contrast, government expenditures GF02 at the level of 1%, and GF03, GF06, GF09 at the level of 0.1% have a statistically significant negative effect on EMPS. Following the results of countries with a low economic level, it may be argued that an increase in government expenditures (GF07, GF08, GF10) by 1% has an impact on an increase in EMPS. The expenditures with the most significant impact on an increase in employment in services, namely by 3.518, is government expenditures on recreation, culture and religion (GF08). By contrast, an increase in government expenditures (GF02, GF03, GF06, GF09) by 1% leads to a decrease in EMPS in these countries. The biggest effect on the decrease in EMPS have government expenditures on public order and safety-GF03 (reduction of the EMPS level by 3.368) and government expenditures on education-GF09 (reduction of the EMPS level by 3.441). Detailed results are provided in Table 5.

In countries with a higher economic level than the EU average (model EMPS-M3), government expenditures on environmental protection (GF05) have a statistically significant positive effect on EMPS at the level of 5%, and government expenditures on social protection (GF10) at the level of 0.1% (see Table 5). That means that an increase in the volume of these government expenditures by 1% affects the increase in EMPS (when GF05 increase EMPS by 2.765 and GF10 by 0.649). By contrast, three categories of government expenditures (on general public services-GF01, defence-GF02, housing and community amenities-GF06) have a statistically significant effect on EMPS at the level of 0.1%, however a negative. That means that in European countries with a higher economic level, an increase in the volume of these categories of government expenditures by 1% will lead to a decrease in EMPS. At the same time, the largest impact on the decrease in the level of employment in services have expenditures on housing and community amenities-GF06 (a decrease in the level of EMPS by 6.847) and government expenditures on defence-GF02 (a decrease in EMPS by 0.169).

While on EMPS has a significant effect of seven categories of government expenditures (positive and negative) in European countries with a lower economic level (model EMPS-M2), in countries with a higher economic level (EMPS-M3 model) five categories of government expenditures have a statistically significant effect on EMPS. Following the results, we may also argue that for all groups of European countries, statistically significant

influence was not demonstrated of government expenditures on economic affairs (GF4) in the case of EMPS. The analysis makes it apparent that European countries with a higher and a lower economic levels differ not only according to their structure but also the influence of specific categories of government expenditures. On the research question can be answered in the affirmative (YES).

4 Conclusion

The aim of the contribution was to analyse government expenditures and employment in selected services in European countries and to examine the impact of government expenditures on employment in services. In 2002-2021 the extent of allocated total government expenditures (in % of GDP) in the analysed European countries had an increasing tendency, ranging from 32.9% to 53.6% GDP in 2002, and 24.8% to 59% GDP in 2021. The analysis of employment in selected areas of public services (public administration, defence, education, human health and social work activities) showed, on average, a moderately increasing tendency in European countries. In 2002 to 2021, economically more developed countries showed the highest rate of employment in public services, such as Denmark, Sweden, Finland, Norway and Iceland, while Romania and Bulgaria have been showing the lowest employment rate in public services for a long time. The results using panel data analysis confirmed that European countries with both higher and lower economic levels differ not only in their structure, but also in the influence of specific categories of government expenditures. In terms of employment in services, European countries with a lower economic level showed a significant impact of seven out of a total of ten categories of government expenditures. The government expenditures that had a significant a positive impact on employment in services were government expenditures (on health; recreation, culture and religion; social protection). By contrast, four categories of government expenditures (on defence; public order and safety; housing and community amenities; education) had a negative impact on employment in services. In European countries with a higher economic level than the EU average, a significant impact of five categories of government expenditures on employment in services manifested. At the same time, government expenditures on social protection and expenditures on environmental protection affect employment in services in a positive way. By contrast, allocated government expenditures (on general public services, defence, housing and community amenities) have a negative impact on employment in services. In terms of both groups of European countries, we can consider the effect of the analysed government expenditures on employment in services mixed, which opens up possibilities for further research. The achieved findings can be beneficial especially for the creators of national public policies, but also for other interested entities.

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Factors for the development of accessibility of health services in the field of palliative care

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Abstract: The aim of the paper is to analyse the organisation of palliative care in the Czech Republic, with a closer focus on the Moravian-Silesian Region, and to evaluate the coverage of mobile specialized palliative care (in the field of health care) from public health insurance. The evaluation is based on a comparison of the length of the treatment time and the legal reimbursement limits in the Czech Republic. Another goal is to evaluate spatial and temporal accessibility of palliative care in the Moravian-Silesian region. Based on the results, it was confirmed that the public health insurance fully covers the health care provision by the medical staff throughout the average treatment time, however, this interpretation of the data does not consider other costs of palliative care. Spatial and temporal availability, examined using the example of the Moravian-Silesian Region, depends on the territorial specificities of the region. The accessibility of inpatient and mobile specialised palliative care in the Moravian-Silesian Region is not ensured throughout the entire region. The article provides a multifaceted view of the provision of palliative care in the Czech Republic. Specific measures are proposed to ensure the sustainability of the current palliative care delivery system.

Keywords: Funding, health care, Moravian-Silesian Region, palliative care, staffing

JEL Classification: I11, I13, I15

1 Introduction

Palliative medicine deals with the treatment and care of patients with incurable, progressive and advanced disease. The WHO defines the palliative care as an approach that improves the quality of life of patients and their families who are facing problems associated with life-threatening illness. It prevents and relieves suffering through the early identification, correct assessment and treatment of pain and other problems, whether physical, psychosocial, or spiritual (WHO, 2002). The goal of palliative care is to achieve the best possible quality of life for patients and their families. This care provides relief from pain and other symptoms, promotes life and treats dying as a normal process. At the same time, it emphasizes the patient's quality of life, a holistic approach to the patient and their family, including their friends, and their involvement in their care. Palliative care creates a support system that helps the patient to live as effectively as possible until death. However, palliative care also helps the family cope with the illness and death of their loved one, using teamwork such as psychologists, social workers, nutritional therapists, or pain clinics (APHPP, 2019). The current trend of an ageing population means that more and more people are facing the consequences of serious chronic diseases towards the end of their lives. These people need palliative care, including care planning for where they wish to die (Nakanishi et al., 2020). Most people wish to die at home but, the majority die in hospital (Broad et al., 2013).

Palliative care provided to children differs from that provided to adults mainly in the spectrum of diseases. The nature of care and the duration of care differ. Children may need palliative care not only for a few days and weeks, but also for many years. Palliative care should not only be provided at the end of a child's life but is also very beneficial for children with chronic illness. The care provided is completely individual and must be based on the specific needs of the child and their family. The care provided is partially covered by public health insurance, however not all pediatric patients meet the criteria for reimbursement by public health insurance in the Czech Republic (Centre for Palliative Care, 2017).

The aim of the paper is to evaluate the factors for the development of accessibility of health services in the field of palliative care in the Czech Republic and especially in Moravian-Silesian Region.

Two research questions (RQ1 and RQ2) were formulated to support the aim of the paper:

- RQ1: Does the reimbursement of mobile specialised palliative care from public health insurance match the demand? Does public health insurance cover all the patient's treatment days?
- RQ2: Is the spatial and temporal availability of palliative care services in the Moravian-Silesian Region sufficient (is the entire region covered)?

1.1 Forms of palliative care in the Czech Republic

The European Association for Palliative Care recommends dividing palliative care provision into two levels. All health professionals should be able to provide general care, according to their specialty. General care is provided in in 80-90 % of cases. Specialized palliative care (10-20 % of cases) is active interdisciplinary care provided by a team of professionals who are specially trained and experienced in palliative care (EAPC, 2009). The forms of palliative care are defined in the Methodological Instruction of the Ministry of Health of the Czech Republic concerning mobile specialised palliative care (MZ ČR, 2017).

Table 1 – Forms, levels of palliative care and healthcare providers (MZ ČR, 2017)

Form of health care	Level of palliative care and healthcare providers	
	General care	Specialized care
Primary outpatient care	registering doctor with specialized competence in general practical medicine, general medicine for children and adolescents or a doctor with specialized competence in pediatrics, including a visiting service	x
Specialized outpatient care	outpatient specialist	outpatient specialist with specialized competence in palliative medicine, including a visiting service
Inpatient care	health professionals in an inpatient facility within their own expertise, including inpatient long-term care facilities and residential social services facilities, inpatient hospice-type facilities	inpatient care in palliative medicine, consultation service of a doctor and a multidisciplinary team with specialized competence in palliative medicine in an inpatient facility
Health care provided in the patient's own social environment	doctor outpatient health services provided by a registering doctor with specialized competence in general practical medicine, practical medicine for children and adolescents or a doctor with specialized competence in pediatrics; home care agencies, visiting service by an outpatient specialist	mobile specialized palliative care or palliative care in the patient's own social environment in the field of palliative medicine and general nursing, where the professional supervisor is a doctor with specialized competence in the field of palliative medicine

Source: Own processing

1.1.1 Organizational forms of specialized palliative care

Palliative care is a part of the health and social care system in the Czech Republic, most often represented by the following organizational forms:

- outpatient palliative care clinic,
- inpatient hospice,
- mobile hospice,
- day hospice,
- hospital palliative care team.

1.2 Palliative Care Staffing in the Czech Republic

The Czech Society of Palliative Medicine of Jan Evangelista Purkyně Medical Society (ČSPM ČLS JEP) presents an overview of certified doctors in the field of palliative medicine, according to which there are 239 certified doctors in the Czech Republic (in the years 2005-2022). This means that there are 0.022 FTE certified doctors in the field of palliative medicine per 1000 inhabitants. 1.7 FTE palliative medicine physicians per 1000 deceased in 2021 (including 8.6 FTE palliative medicine physicians per 1000 cancer deaths).

1.2.1 Inpatient health care facility – minimum staffing requirements

The care requirements include a minimum number of physicians in an inpatient hospice palliative care facility, expressed as the number of full-time equivalent staff for a 30-bed facility. A total of 1.7 FTE doctor must be provided for care, consisting of a lead physician with a specialized competence in palliative medicine or palliative medicine and pain management, or a specialty established by legislation (Decree No. 99/2012 Coll.) with a minimum of 0.2 FTE (according to the binding opinion of the Czech Medical Chamber No 5/2003), a doctor with a specialized competence of 1.5 FTE and other physicians to ensure the availability of the physician 24 hours a day, 7 days a week. Out of hours, on Saturdays, Sundays and public holidays, a doctor must be on call 24 hours a day.

The minimum staffing requirements for non-medical professions (nursing staff) in an inpatient hospice palliative care facility are set in numbers for a facility with 30 beds. This includes a general nurse 11.0 FTE, an orderly or nursing assistant 5.0 FTE, a direct care worker (social worker) 10.0 FTE, a social worker 1.0 FTE and a priest, chaplain, or pastoral assistant 0.2 FTE. Other recommended professions are psychologist/psychotherapist, nutritional therapist, or activation worker, according to the Association of Hospice Palliative Care Providers.

In the Moravian-Silesian Region there are a total of 3.6 FTE physicians with specialised competence in inpatient hospices with a total capacity of 57 beds, their average age as of 31. 12. 2021 was 56.4 years (VZP, 2021).

1.2.2 Mobile hospice – minimum staffing requirements

The minimum staffing requirements for a mobile palliative hospice care team with a current capacity of 15 or more patients, providing palliative care to patients in their own social environment, require 1.2 physician FTE, including a lead physician or a physician with specialized competence in palliative medicine or palliative medicine and pain management (minimum of 0.2 FTE). Additional physicians to ensure the continuous availability of a physician 24 hours a day, 7 days a week. Out of hours, 24-hour physician availability is provided by on-call physician.

Minimum staffing requirements for non-medical professions (nursing staff) include general nurse 5.0 FTE, social worker 1.0 FTE, priest, chaplain, or pastoral assistant. Recommended occupations are social service worker or psychologist/psychotherapist.

1.3 Material and technical equipment

Palliative medicine is complex nursing care, which provides for all the needs of the dying patient such as hygiene, positioning, nutrition and hydration, sleep, skin care or pain relief, often using not only positioning but also micro-positioning and basal stimulation. Patient needs include also meeting spiritual needs in collaboration with the multidisciplinary team and family. Specific requirements for material and technical equipment for outpatient and inpatient facilities are defined in Decree No 92/2012 Coll., on requirements for minimum technical and material equipment for healthcare facilities and home care contact points. These include, for example, automatic reclining beds, anti-disability mattresses or mattress pads, wheelchairs, beds and walkers, chairs with armrests, medical pumps, oxygen concentrators, glucometers, pulse oximeters, monitoring equipment, etc.

2 Socio-economic and health indicators

Population ageing is a characteristic feature not only of the Moravian-Silesian Region, but also of the entire Czech Republic. Life expectancy is increasing in the Czech Republic and is generally higher for women than for men. Since 2001, life expectancy at birth has increased by 2.6 years for men and 2.2 years for women in the Moravian-Silesian Region (ČSÚ, 2022).

Mortality trends are influenced by the age structure of the population and the different probabilities of death in different age cohorts. The development of the mortality rate in the Moravian-Silesian Region follows the national trend. However, the crude mortality rate in the Moravian-Silesian Region is generally higher than the national average.

Figure 1 – Crude mortality rate in the Czech Republic and Moravian-Silesian Region
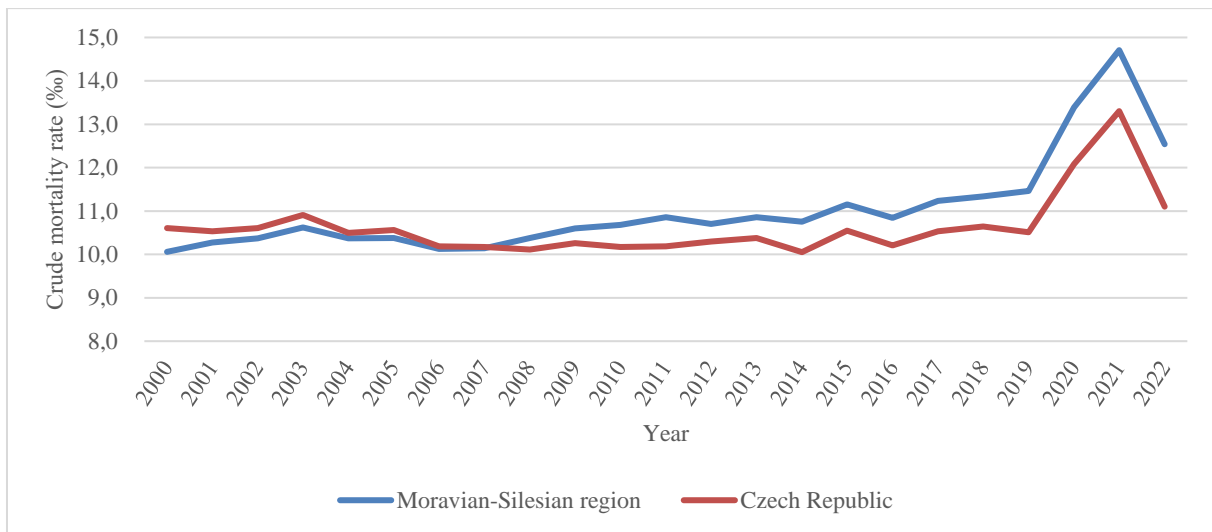
Source: Czech Statistical Office (ČSÚ), Demographic indicators for the Czech Republic and the Moravian-Silesian Region, own processing

Another indicator of health status is mortality by cause of death. Causes are defined according to the International Statistical Classification of Diseases. The analysis of the number of deaths by cause of death is particularly important for setting the needs for preventive measures. The most common causes of death in the Moravian-Silesian Region are diseases of the circulatory system and neoplasms. The third most common cause of death are respiratory diseases.

Figure 2 – Causes of death 2014-2021 (% of total deaths) in the Czech Republic and Moravian-Silesian Region
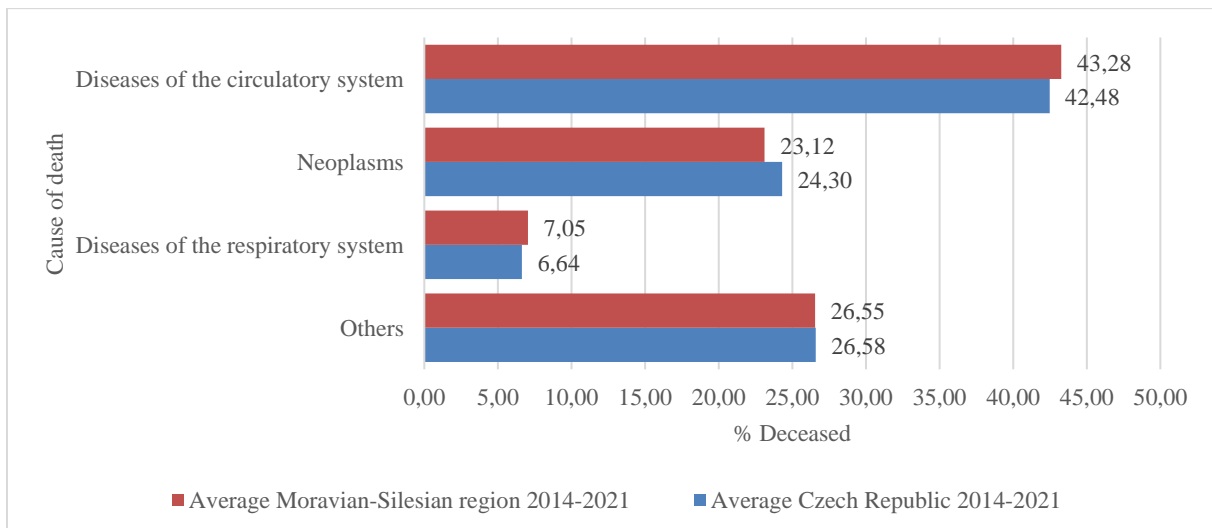
Source: Czech Statistical Office (ČSÚ), Causes of death for the Czech Republic and the Moravian-Silesian Region, own processing

Most deaths occur in inpatient health care facilities (more than 60%). Most of these are acute care beds. 2% of patients die in a hospice. According to the National Database of Palliative Care, the three main groups of causes of death in the Moravian-Silesian Region are heart diseases which are specific to the elderly and malignant neoplasms (ÚZIS, National Database od Palliative Care, 2023).

Figure 3 – Deaths by place of death in 2020
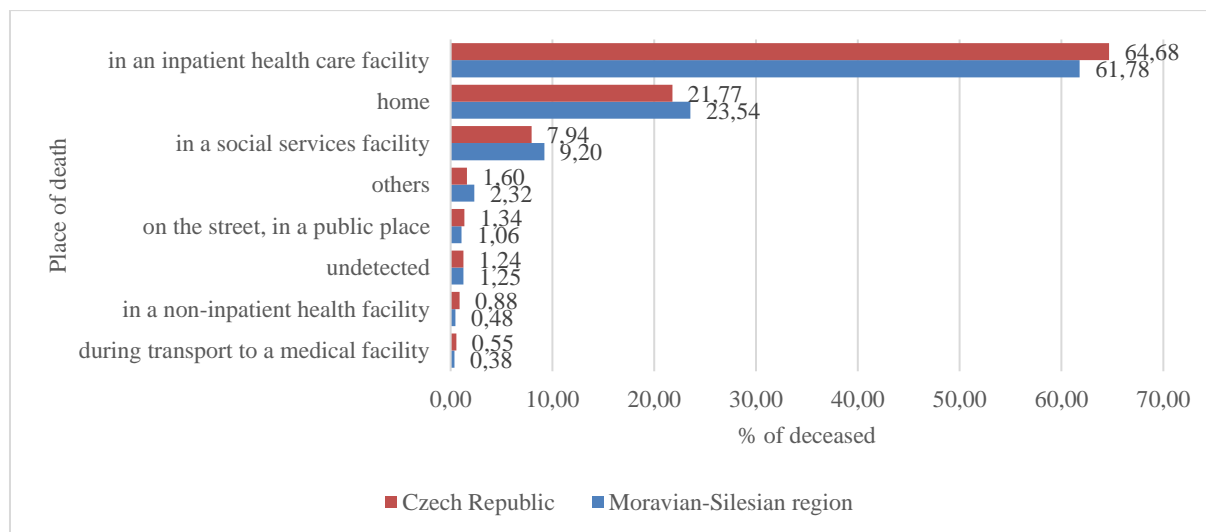
Source: ÚZIS, Deceased by place of death 2020, own processing

3 Palliative care funding in the Czech Republic

The financing of palliative care is based on its position in the legal system of the Czech Republic. Palliative care lies on the borderline between social and health services. In terms of its status in the Czech legal system, a palliative care provider is a registered provider of health services who also provides social services.

Palliative care is financed by multiple sources. The sources of funding can be divided into public and alternative (private, own sources). The health care component is systematically covered by public health insurance, public budgets are an important source of funding, other sources of income are subsidies from the state budget, funds from founders, subsidies from the budgets of local self-government units, donations, sponsorship, income from ancillary activities or from EU sources.

Mobile specialised palliative care is covered by public health insurance for up to 30 treatment days for adult patients and up to 180 days for children. Analysis of internal data provided by the selected provider of mobile specialised palliative care in the Moravian-Silesian Region show that the average treatment time in 2020-2022 for adult patients is 23.6 days and 158.08 days for children (Mobile Hospice Ondrášek, 2020-2022). According to the limitations set by the mentioned law, it could be said that health care of adults and children is fully covered. However, the reimbursement for medical procedures only covers care provided by medical staff (medical procedure no. 80090 and 80091). In addition, other costs of the mobile hospice, such as material consumption, transport to patients, rental costs and other team members personal costs (priest, social workers, service staff) must be covered. This implies that health insurance does not cover the actual total costs of health services per treatment day. In addition, reimbursement for mobile specialized palliative care does not allow for overlap with care from another health care provider. For example, if a palliative patient is taken to hospital, the mobile hospice will have to pay for the care provided in hospital. The health care provided by the mobile hospice is incompatible with health care provided by any other health care facility. The amount of reimbursement depends on the legislation (reimbursement decree) and the contract with the insurance company, e.g. payment from VZP insurance company covers less than 1/2 of the cost of health care (Decree No 315/2022 Coll.).

4 Spatial and temporal accessibility of health services in the field of palliative care in the Moravian-Silesian Region

The availability of inpatient palliative care is regulated by the documentation of the programme of the Ministry of Health of the Czech Republic "Support of hospice palliative care in the Czech Republic" for the period 2017-2022, which sets a driving distance of 50 km. The availability of inpatient specialised palliative care in the Moravian-Silesian Region is not ensured in the administrative districts of Rýmařov, Bruntál and Krnov according to these requirements (Figure 4). These administrative districts are in the mountains and are also characterised by low population density, high unemployment, and population migration from the area. However, according to the information provided by the providers of inpatient palliative care, the bed capacity in the Moravian-Silesian Region

is sufficient (57 beds, 31. 12. 2021). The CITADELA Hospice in the Zlín Region also provides care to the citizens of the Moravian-Silesian Region.

Figure 4 – Spatial and temporal accessibility of inpatient hospice
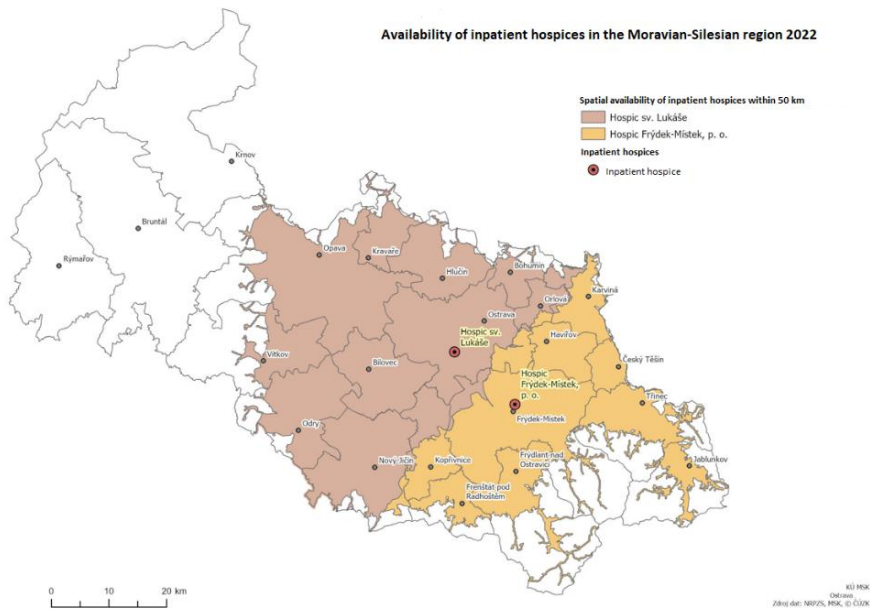
Source: ÚZIS, National Register of Health Service Providers, own processing

The figure 5 shows the time availability of outpatient and home palliative care in the Moravian-Silesian Region (driving distance up to 30 minutes). There is no binding legislation on the availability of mobile specialised palliative care that determines the ideal spatial and temporal availability. The 30-minute commute time was selected according to the Mobile Hospice Forum's statement (Fórum mobilních hospiců, 2018). It can be concluded that in the administrative districts of Rýmařov, Bruntál and Krnov the availability of outpatient and home palliative care according to the mentioned requirements is not ensured.

Figure 5 – Spatial and temporal accessibility of outpatient palliative care clinic and mobile hospice
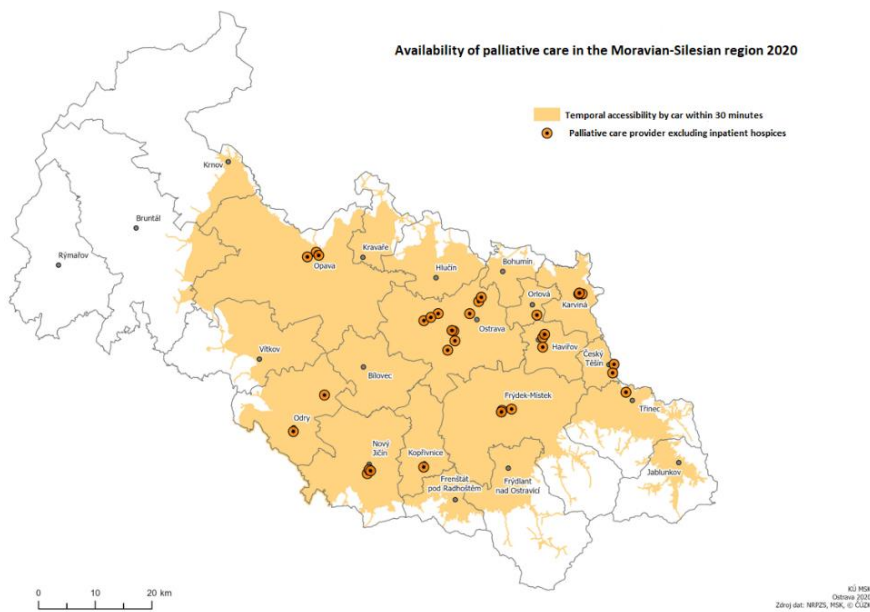
Source: ÚZIS, National Register of Health Service Providers, own processing

The accessibility of palliative care is affected by:

- lack of human resources (lack of interest in palliative care, unequal salaries of nurses in home care compared to nurses in hospitals regarding demanding and continuous service, migration of staff out of palliative care, insufficient development of training of staff in palliative care),
- insufficient coverage by public health insurance,
- low connection of social services and health care,
- lack of health care providers in excluded localities,
- waiting times, limited capacities, waiting lists in outpatient and inpatient care etc.

5 Data

Data were taken from the Czech Statistical Office (CSU), Institute of Health Information and Statistics of the Czech Republic (ÚZIS - National Register of Health Service Providers), legislative regulations of the Ministry of Health of the Czech Republic, The Czech Society of Palliative Medicine of Jan Evangelista Purkyně Medical Society (ČSPM ČLS JEP), Register of Territorial Identification, Addresses and Real Estate (RÚIAN) and National database of palliative care.

6 Results and Discussion

Several main problems were identified in the data analysis. They are presented below in the form of problem trees (Figure 6).

Figure 6 – Problem trees
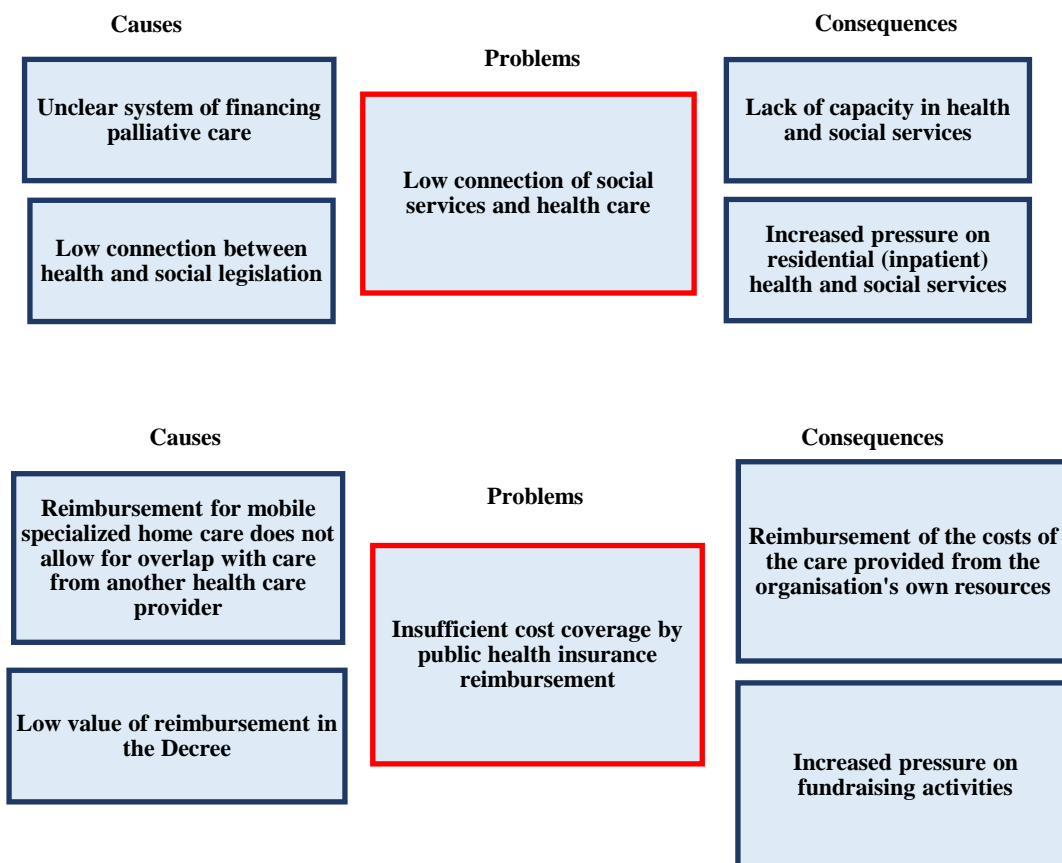
Source: own processing

Measures to ensure the sustainability of the current palliative care system must be implemented at the state, regional and local level. Palliative care must be affordable in terms of time, money, and staffing. Greater support from public health insurance is needed for legislative changes. Further proposed measure is the expansion of the

network of palliative medicine outpatient clinics, palliative teams in hospitals and outpatient care, supportive care and palliative care clinics. Furthermore, ensuring the accessibility of mobile specialised palliative care and sufficient vehicle equipment for providers. In terms of human resources, optimal staffing, tools to increase the attractiveness of the profession and staff recruitment and retention (motivation programmes, benefits, part-time work), and attention to accompanying persons (health workers, overburdened family carers, other family members, bereaved children) are important. A key area is palliative care education at all levels of staff.

7 Conclusion

Palliative care in the Moravian-Silesian Region operates as a long-term, uniform and coordinated management system of care for patients whose disease does not respond to curative treatment. The primary strategic objective is to ensure the accessibility of general and specialised palliative care on the territory of the Moravian-Silesian Region.

Two research questions guided the evaluation of factors for the development of accessibility of health services in the field of palliative care. The first research question (RQ1): "Does the reimbursement of mobile specialised palliative care from public health insurance match the demand? Does public health insurance cover all the patient's treatment days?" can be answered as follows:

- the average treatment time is lower than the legal limits of reimbursement from public health insurance, it can be applied to both adult and paediatric patients,
- however, the costs of palliative care do not include only the health care provided by medical staff in the meaning of the reimbursement decree (Decree No 315/2022 Coll.),
- palliative care providers must also cover other costs that are not part of public health insurance reimbursement but are determined by other legislation (e.g. on staffing, material and technical equipment, interconnection with social services),
- this research question cannot be answered explicitly, as it requires a deeper analysis of the additional costs of providing palliative care (inpatient and mobile) not only in the field of health care, but also in the field of social services and other support activities. These are linked activities that are provided simultaneously to patients.

The second research question (RQ2): "Is the spatial and temporal availability of palliative care services in the Moravian-Silesian Region sufficient (is the entire region covered)?" was not confirmed. The accessibility of inpatient and mobile specialised palliative care in the Moravian-Silesian Region is not ensured throughout the entire region. When comparing the availability of inpatient hospices, outpatient palliative care clinic and mobile hospices, it was found that care is not provided in the same areas of the region. Limited accessibility is due to a wide range of demographic and socio-economic factors. Limited accessibility is highest in the excluded localities of the Moravian-Silesian Region. Other factors influencing the supply of palliative care, such as human resources or funding, have also been identified.

The basic priority for the further development of palliative care in the Moravian-Silesian Region is support from the health and social sectors in ensuring the availability and development of all forms of palliative care with an emphasis on preserving the quality of life of patients and their families. In addition, support for the training of professionals in health care and social services and support for educating the general and professional public. Cooperation and coordination among palliative care providers must also be a priority. The starting point for increasing support for palliative care in the Moravian-Silesian Region would be a change in the current legislation, namely more financial support from public health insurance, i.e. a change in the reimbursement decree in favour of inpatient hospices and an increase in reimbursement from public health insurance for the next period. Under the reimbursement decree, inpatient hospice care is often underfunded, while, for example, long-term care facilities have lower care and staffing requirements but higher reimbursements from public health insurance. Another problematic area in palliative care is human resources, as it is not a popular specialisation and evokes negative or sad emotions. However, the opposite may be true, and in recent years, thanks to multidisciplinary teams, the quality of life of patients has been steadily improving.

In recent years, the Moravian-Silesian Region has succeeded in increasing support for palliative care both through financial support through subsidies and media education. A working group on palliative care has been established and cooperation between health care providers, social care providers and educational organisations is maintained. Furthermore, an increase in the number of palliative care beds in all inpatient health facilities was implemented. Education in palliative medicine and care is progressively provided at all staff levels, with the participation of general practitioners and hospitals. Congresses and seminars are organised and brochures on palliative care have

been produced for health and social service providers, patients and their families and relatives. At the same time, consultation teams for supportive and palliative care have been set up in the Moravian-Silesian Region (University Hospital Ostrava, Silesian Hospital in Opava, etc.). In view of the ageing population and the increasing number of diseases, the topic of palliative care support is constantly in demand, including a continuous increase in financial support, whether from public health insurance, other public budgets, non-profit organisations, or the support of the region itself.

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Economics factors of the city's standard of living: Doing Business Index in Wuhan

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Abstract: Will improving the Doing Business boost or discourage residential consumption? This study uses the entropy value method to evaluate the Doing Business in Wuhan from 2012-2021.The study found that Wuhan's Doing Business score has shown positive growth over the past decade. Further analysis of the chain growth rate shows that the growth of Wuhan's Doing Business is dynamically fluctuating, and the growth rate has been decreasing year on year for the past three years. A least squares regression model was constructed to explore the relationship between the Doing Business and consumption levels in Wuhan. The study found that Wuhan's Doing Business has a positive and significant impact on residents' consumption. For every 1% optimisation of the business environment, Wuhan's consumption level will increase by 0.084%.

Keywords: Doing Business; consumption; Wuhan

JEL Classification: E20, H11, O13, R11

1 Introduction

The coronation epidemic caused a brief break in the global value chain. To prevent and control disease outbreaks, while also protecting local industries. World value chains are trending toward localization and regionalization. As a result of the dramatic external changes, China has also made a major strategic shift from foreign investment to domestic demand to drive economic growth and quality economic development.

Since the COVID-19 in 2020, China's domestic consumer demand has been out of balance with international consumer demand. It grows negatively by -3.6% in 2020 and resumes a very small positive growth in 2021. China's total retail sales of consumer goods exceeded RMB 40 trillion in 2021, an increase of 12.5% over the previous year. The contribution of domestic demand to economic growth will be close to 80%, 4.4% higher than the previous year. Consumption takes another sharp turn in 2022 due to the massive rebound of the epidemic. Total retail sales of consumer goods in China decline by 0.2% year-on-year in 2022. In particular, consumption fell by 1.8% year-on-year in December and by 3.7% in real terms net of prices. The consumer market shows a steady recovery in 2023 with the gradual liberalization of epidemic control in China. According to the National Bureau of Statistics, China's total retail sales of consumer goods were RMB 7.8 trillion, up 3.5% year-on-year.

The Doing Business, as one of the important factors for local economic development, has also received much attention in China in recent years. Improving the quality of the Doing Business is of great importance to the economic development, business investment, employment opportunities and the living standards of residents in all regions.

At present, there is one important issue for further deepening of the Doing Business: will improving the Doing Business boost consumer consumption? How strong is the boost or disincentive?

2 Theoretical Research Basis

2.1 Literature Review

There is a large number of studies on the factors influencing consumption. Based on the research needs, here is a review of the factors influencing consumption in the broad sense. Yang, Binru et al. [1] state that consumption structure factors, consumption rate factors, income factors and inflation factors are all major influencing factors on consumption. Du Jiang et al. [2] point out that indicators such as net income per capita, food consumption expenditure, the total consumer price index, the share of industrial value added in regional GDP and the total retail

price index of goods all have an impact on consumption. By compiling data, Ni Kun et al. [3] found that China's consumption is influenced by five aspects in the order of total population, per capita income, consumer prices, one-period lagged consumption inertia and government consumption.

How does the Doing Business relate to the local economy? Cui Xinsheng [4] pointed out through an empirical study that there is a significant positive contribution of the Doing Business to GDP per capita in countries along the "Belt and Road". According to Liu Jian, Liu Ximeng et al. [5], the construction of a Doing Business can improve consumer confidence and willingness to consume and promote the sustained growth of the consumer market. At the same time, a good Doing Business can attract more enterprises to locate in the area, increase employment opportunities and raise the income level of residents, thus promoting the growth of consumption.

When it comes to the study of the Doing Business, the earliest was in 1968 by American scholars Litvak and Banting. they proposed the "hot and cold analysis method". Seven factors of the investment environment including political stability, market opportunities, economic growth, degree of cultural unity, legal barriers, substantive barriers, geographical and cultural differences are used to evaluate the investment environment.

The World Bank established the Global Business Environment Assessment Project (GBEP) organisation in 2001 and published its first Doing Business report in 2003. Its Doing Business Index system is widely recognised internationally. It covers ten main areas, including starting a business, applying for a building permit, accessing electricity supply, registering property, accessing credit, investor protection, paying taxes, trading across borders, contract enforcement and insolvency. In August 2020, the World Bank announced the suspension of the Doing Business report. This was because of the limitations of using a set of assessment criteria to determine the business environment of individual economies, which vary greatly in terms of systems, cultures and levels of development. It was decided to launch a project tentatively named "BEE". In March 2023, the Bank's new Doing Business assessment system is officially named Business Ready (B-READY). The new indicators include business entry, business location, utility comeltions, labour, financial services, international trade, and taxation. trade, taxation, dispute resolution, market competition and business insolvency.[6]

Research on China's investment environment began in the late 1980s. The existing index system for evaluating the Doing Business in China can be divided into three levels: provincial, municipal and enterprise, showing obvious differences in levels.

This paper refers to the logic of the World Bank's Doing Business evaluation index system construction. From the perspective of investors' "cost-benefit", the construction of an index system for the Doing Business in Wuhan is determined. Consider data accessibility and comparability. Four first-level indicators are identified, including "business costs, factor markets, macro environment and ecological environment".

Based on existing research, the most commonly used consumption expenditure per capita is used as the explanatory variable in this paper. Wuhan was selected as the sample city and the Doing Business of Wuhan over the years was rated through the above index system as the explanatory variable. The urban registered unemployment rate, consumer price index, per capita disposable income of urban residents and gross national product were selected as control variables. In this way, the relationship between the Doing Business and consumption is further explored.

2.2 The Impact Mechanism of the Doing Business on Consumption

This paper considers the mechanism by which the Doing Business affects consumption through three main effects as shown in the figure.

Figure 1 – Mechanisms for optimising the impact of the Doing Business on consumption
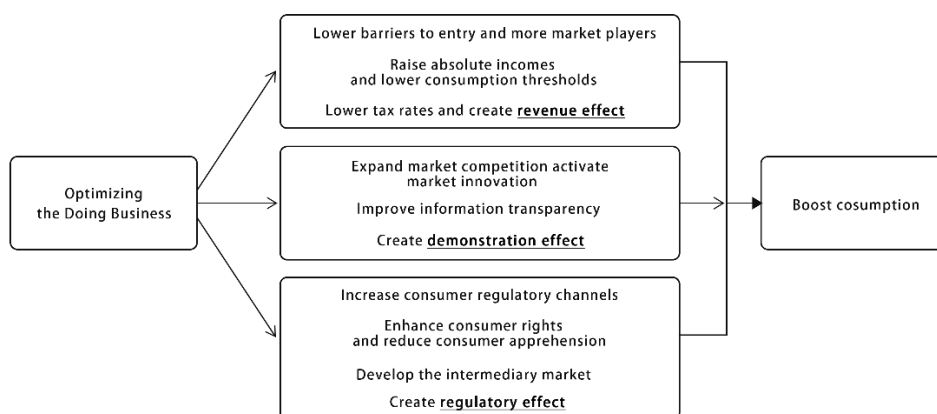
Source: [5]

3 Methodology and Data

3.1 Model construction

3.1.1 Modeling the impact of Doing Business on consumption

Keynes' theory of absolute consumption states that the relationship between consumption expenditure and income is not simply linear. Rather, there is a certain non-linear relationship. When income is low, consumption expenditure increases rapidly as income rises; when income is high, the rate of increase in consumption expenditure gradually slows down. Therefore, increasing the income level of residents can promote the growth of consumption. But increasing income does not necessarily increase the growth rate of consumption directly.

Based on the core research theme of this study. The Doing Business was selected as the core explanatory variable and measured by the Doing Business index score calculated by the entropy method. Consumption level was chosen as the explained variable and measured by per capita consumption expenditure. The urban registered unemployment rate, consumer price index, urban disposable income per capita and gross domestic product were chosen as control variables.

According to existing studies, unemployment leads to a reduction in work-related consumption. The consumer price index reflects the trend of commodity price changes. Therefore, the relationship between these two and consumption is considered to be inversely correlated. According to Keynes' absolute income hypothesis, in the short run, income and consumption are correlated, and they show a positive relationship. GDP is an important indicator of economic development. Its development leads to an increase in the income of the population which in turn affects the consumption of the population.

Based on this , this paper aims to explore the impact of Wuhan's Doing Business on residents' consumption. The data involved in the variables are obtained from the Wuhan City Statistical Bulletin. This can be seen in Table 1 below.

Table 1 – Variable description

Characters of variables	Variable names	Variable notation	Data sources
Explained variables	per capita consumption expenditure	PE	Wuhan City Statistical Bulletin
Explanatory variables	Doing Business Index	BEI	Calculated from the indicator system
Control variables	Urban registered unemployment rate	URUR	Wuhan City Statistical Bulletin
	Consumer Price Index	CPI	Wuhan City Statistical Bulletin
	Disposable income per urban resident	UPDI	Wuhan City Statistical Bulletin
	Gross Domestic Product	GDP	Wuhan City Statistical Bulletin

Source: own

According to Keynes' absolute consumption theory. A regression model of the impact of Doing Business on residents' consumption in Wuhan can be constructed as follows：

$$PE=B+\beta_1 \ln BEI+\beta_2 \ln URUR+\beta_3 \ln CPI+\beta_4 \ln UPDI+\beta_5 \ln GDP+\varepsilon \tag{1}$$

In the above equation, B denotes the constant term; β1, β2, β3, β4 and β5 are the OLS regression model impact coefficients and ε denotes the error term of the regression model.

To attenuate heteroskedasticity in the model data, logarithms were taken for all datas in the model.

3.1.2 Measurement model of the Doing Business

This paper measures the Doing Business by applying the entropy method to calculate its score, with the following formula：

Firstly, the indicators need to be standardised because of the differences in their scales and orders of magnitude. The standardisation formula is as follows

$$X_{ij}^{'} = \frac{X_{ij} - X_{min}}{X_{max} - X_{min}}; \quad X_{ij}^{'} = \frac{X_{min} - X_{ij}}{X_{max} - X_{min}} \tag{2}$$

In the above equation, Xj is the value of the jth indicator, and Xmax and Xmin represent the maximum and minimum values of the jth indicator. The former is the standardisation formula for positive indicators and the latter is the standardisation formula for negative indicators.

Secondly, as there are zero values in the normalised results, a non-negative translation of the normalised results is required. The translation formula is as follows

$$X_{ij}^{'} = X_{ij}^{'} + 0.0001$$

Thirdly, calculate the weight of indicator value Yij for year i under indicator j

$$Y_{ij} = X_{ij}^{'} / \sum_{i=1}^{m} x_{ij}^{'}$$

Fourthly, calculate the entropy value

$$S_j = -K \sum_{i=1}^{m} Y_{ij} \ln Y_{ij}, K = 1 / \ln(m)$$

Fifthly, calculating the variance factor

$$E_j = 1 - S_j$$

Sixthly, calculating the weight of indicator j

$$W_j = E_j / \sum_{i=1}^{m} E_j$$

Seventhly, calculating the composite score for year i

$$U = \sum_{i=1}^{n} X_{ij}^{'} W_j$$

3.2 Selection and Construction of a Doing Business Evaluation Index System

With reference to the research results of Wang Xinyu [7], Tu Zhengge [8] , BEATA [9]and others[10][11]. Based on the connotation of the concept of Doing Business as well as following the principles of scientific, systematic, operable and dynamic construction of a comprehensive index system. A comprehensive evaluation index system of Doing Business is constructed from four latitudes: business cost, factor market, macro environment and ecological environment. There are four criteria level indicators, twelve factor level indicators and twenty-five indicator level indicators in this index system. Details can be seen in Table 2 below.

3.3 Data sources

The data on the variables involved in this study were obtained from the Wuhan Statistical Yearbook and the Wuhan Statistical Bulletin. The missing data were mainly interpolated by the mean interpolation method and linear interpolation method.

4 Empirical research

4.1 Calculation and analysis of the weights of Doing Business indicators based on the entropy value method

4.1.1 Calculation of Doing Business

Based on the above formula, the indicator data obtained from the Wuhan Statistical Yearbook and Wuhan Statistical Bulletin were integrated. The ranking of government-business relations in Chinese cities obtained from the "Evaluation Report on Political and Business Relations in Chinese Cities" published by the Institute for National Development and Strategic Studies of Renmin University of China.

The weights of the indicators in the comprehensive evaluation index system of the Doing Business in Wuhan were calculated. The results can be seen in Table 2 below.

Table 2 – Wuhan Doing Business comprehensive evaluation index system and weighting measurement results

Guideline Layer	Element Layer	Indicator Layer	Unit	attribute	Code	Weighting
The cost of Doing Business	Cost of labor	Wages	CNY	-	A_{11}	0.0405
	cost of production	Average price of commercial housing	CNY	-	A_{12}	0.0404
Production elements market	Human resource	Number of University students	million people	+	B_{11}	0.0361
		Net inflow of population	%	+	B_{12}	0.0371
	logistics	Turnover of goods	billion tkm	+	B_{21}	0.0409
	business flow	Total retail sales of consumer goods	billion	+	B_{31}	0.0410
		Per capita disposable income	CNY	+	B_{32}	0.0406
	Capital flows	Number of listed companies	NO.	+	B_{41}	0.0390
		Local and foreign currency loans from financial institutions	billion	+	B_{42}	0.0396
	information flow	Number of Internet broadband access	NO.	+	B_{51}	0.0413
Macro environment	economic environment	Gross domestic product	billion	+	C_{11}	0.0406
		Proportion of tertiary industry	%	+	C_{12}	0.0406
	innovation	Proportion of R&D investment	%	+	C_{21}	0.0408
		Amount of patent granted	Item	+	C_{22}	0.0379
	internationalization	External dependency	billion	+	C_{31}	0.0410
		foreign direct investment	US$ billion	+	C_{32}	0.0406
		Number of Arrivals	million people	+	C_{33}	0.0412
		Number of international routes	line	+	C_{34}	0.0395
	facilitation	the number of health institutions	NO.	+	C_{41}	0.0388
		the proportion of health technicians in the resident population	%	+	C_{42}	0.0404
		the ranking of government-business relations in Chinese cities	%	+	C_{45}	0.0398
		the proportion of private investment	%	+	C_{46}	0.0410
Ecological environment	greenization	The number of days with good environment	Day	+	D_{51}	0.0408

		the rate of green land in built-up areas	%	+	D_{52}	0.0402
		the ranking of traffic congestion	NO.	-	D_{53}	0.0402

Source: own

4.1.2 Analysis of the evaluation results of Wuhan's Doing Business

Based on the above formula and the derived indicator weights for the Doing Business layer, the Doing Business Index score for Wuhan from 2012-2021 can be calculated. The year-on-year growth rate can also be calculated with the help of the score results at each time point, as shown in Table 3 below.

Table 3 – Results of Doing Business Evaluation Index Scores for Wuhan from 2012 to 2021

year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
score	0.16	0.20	0.24	0.34	0.37	0.51	0.60	0.67	0.70	0.81
rank	10	9	8	7	6	5	4	3	2	1
YOY		25%	20%	41.7%	8.8%	37.8%	17.6%	11.7%	4.5%	15.7%
rank		3	4	1	8	2	5	7	9	6

Source: own

Firstly, Wuhan's Doing Business Index score has shown a year-on-year increase from 2012 to 2021. This indicates that Wuhan's Doing Business has been continuously improved and enhanced over the past decade. From a score of 0.16 in 2012 to 0.81 in 2021, the overall score has increased by nearly five times, which proves that Wuhan has made significant progress in terms of its Doing Business.

Secondly, the growth rate of the Doing Business Index over the last ten years shows a dynamic fluctuation. The fastest growth rate was recorded in 2015, when the year-on-year growth rate ranked first, reaching 41.7%. This indicates that Wuhan's Doing Business was highly effective in that year. The slowest growth rate was recorded in 2020, when the year-on-year growth rate was at the bottom of the list, at 4.5%. This indicates a relatively low level of improvement in Wuhan's Doing Business in that year, mainly due to the impact of the COVID-19.

Thirdly, the year-on-year growth rate of Wuhan's Doing Business index has gradually slowed down. This reflects the fact that the current momentum of Doing Business development in Wuhan is still insufficient. The growth rates over the last three years have been 11.7%, 4.5% and 15.7% respectively, a decline relative to the previous growth rates. There is a need to find further power points to stimulate and promote the development of the Doing Business in order to drive its further optimisation and development.

4.2 An empirical study of the impact of the Doing Business on consumption levels in Wuhan

4.2.1 Descriptive analysis

A descriptive statistical analysis of the variables involved in the impact of Wuhan residents' consumption level on the Doing Business was conducted using Stata 17.0 software. This can be seen in Table 4 below.

Table 4 – Descriptive statistics results

Variable	N	Mean	Std. Dev.	Min	Max
PE	10	2.29	0.03	2.24	2.33
BEI	10	-0.91	0.57	-1.83	-0.21
URUR	10	1.10	0.15	0.76	1.34
CPI	10	4.63	0.01	4.61	4.64
UPDI	10	10.57	0.32	10	10.92
GDP	10	9.66	0.61	9.11	11.29

Source: own

4.2.2 Correlation analysis

Correlation analysis was conducted on the variables involved in this study. The core explanatory variable BEI was found to be positively correlated with the explained variable PE, with a correlation coefficient of 0.946 by the 5% significance test. As shown in Tables 5 below. it can therefore be concluded that there is a strong positive correlation between the core explanatory variables and the explained variables in this study, and further causal inferences can be made between the explained variables and the explanatory variables.

Table 5 – Correlation test results

	PE	TG	BEI	URUR	CPI	UPDI	GDP
PE	1.000						
BEI	0.946***	0.541	1.000				
URUR	-0.710**	-0.576*	-0.702**	1.000			
CPI	-0.271	-0.177	-0.192	0.297	1.000		
UPDI	0.780***	0.385	0.9277***	-0.593*	-0.004	1.000	
GDP	-0.329	-0.943***	-0.242	0.358	0.165	-0.082	1.000

Note: significance level:***=p<0.01; **=p<0.05; *=p<0.1
Source: own

4.2.3 Regression analysis

The regression analysis was carried out for model (1) and the specific influence relationship can be seen in Tables 6 below. It can be found that Doing Business (BEI) has a positive influence on consumption (PE) with a coefficient of influence of 0.084 by 5% significance test. The R2 is 0.965, which is a good explanation rate.

The model was further tested for covariance, F-test, heteroskedasticity and autocorrelation and it was found that the model passed all these tests and therefore the estimation results of model (1) could be considered valid. The regression analysis leads to the following conclusions.

Firstly, the optimisation of Doing Business has boosted consumption in Wuhan. For every 1% optimisation of the business environment, Wuhan's consumption level will increase by 0.084%.

Secondly, the control variables show that the disposable income of urban residents passes the 5% significance test. For every unit increase in its level, the consumption level will decrease by 0.007 units, the sign is not as expected. This may be related to various business restrictions and people's fears, with consumers' desire to spend being greatly curbed. Consumers are more inclined to save rather than spend when they have some surplus after the epidemic. Which is used to satisfy an inner sense of security.

Table 6 – Results of regression analysis

PE	Coef.	Std. Err.	t	P>|t|
BEI	.0838258	.0183454	4.57	0.010***
URUR	-.0039671	.0232297	-0.17	0.873
CPI	.1598723	.4741962	0.34	0.753
UPDI	-.0695491	.0230046	-3.02	0.039**
GDP	.0003562	.0020203	0.18	0.869
R-squared 0.965				

Note: significance level:***=p<0.01; **=p<0.05; *=p<0.1
Source: own

A unit root test on the seven core variables of this study revealed that the variables GDP was found to be significantly stable at the 5% level of zero order; PE, BEI, URUR and UPDI were found to be significantly stable at the 5% level of lagged first order; CPI was found to be significantly stable at the 5% level of lagged second order. Therefore, all the variables involved in this study are considered to be stable.

4.2.4 Robustness test

By using the replacement variable method, the explanatory variable was replaced from consumption expenditure per capita to total retail sales of consumer goods as a share of GDP. The explanatory and control variables were held constant. Constructing the model 2. Regression analysis was again conducted. The effect of Doing Business on consumption levels in Wuhan was found to remain significant after replacement, with a p-value of 0.051, and for every 1% improvement in Doing Business, consumption levels would increase by 0.345%. The impact of Doing Business on consumption level is considered to be robust.

Table 7 – **Results of robustness test**

	Model（1） PE	Model（2） TG
BEI	0.084** （0.018）	0.345* （0.159）
URUR	-0.004 （0.023）	-0.415 （0.212）
CPI	0.160 （0.474）	3.466 （3.302）
UPDI	-0.070** （0.001）	0.041 （0.190）
GDP	0.001 （0.002）	-1.024*** （0.029）
Constants	2.365 （2.051）	-2.253 （14.188）
F test	156.40***	156.40***
M_VIF	5.75	5.75
R^2	0.965	0.965
Heteroskedasticity test	10.00 （0.351）	10.00 （0.351）
Autocorrelation test	7.001*** （0.008）	2.861* （0.091）
Sample size	10	10

Note: significance level:***=p<0.01; **=p<0.05; *=p<0.1. Robust standard errors in brackets.
Source: own

5 Conclusion and recommendations for countermeasures

The main conclusion from the above empirical study is that Doing Business can significantly affect the level of consumption in Wuhan. For every 1% optimisation of the business environment, Wuhan's consumption level will increase by 0.084%.

Based on this, this study proposes a strategy to promote the improvement of residents' consumption level with the Doing Business as the core from four aspects. These are to create an open and inclusive market environment, to build an efficient and convenient governmental environment, to strengthen the security capacity of resource factors, and to actively create a livable and business-friendly ecological environment. The details are as follows:

Creating an open and inclusive market environment. The Wuhan government should promote market-oriented reforms, lower market entry barriers, strengthen market regulation, protect the legitimate rights and interests of consumers, enhance market dynamics, and explore and cultivate new consumption models. This will raise residents' incomes, protect their confidence in consumption as well as meet their diverse consumption needs and raise consumption levels.

Building an efficient and convenient governmental environment. To achieve standardisation, informatisation and intelligence in government services. The government creates a favourable atmosphere for innovation and entrepreneurship through measures such as improving the efficiency of approval and reducing transaction costs for enterprises.

Strengthening the ability to secure resource elements. Increase investment in infrastructure such as transportation, water conservancy and energy, improve public services, strengthen investment in education, science and technology, and improve the quality of talent training.

Actively create a livable and business-friendly ecological environment. Promote the development of clean energy and green industries to improve the quality of the city's ecological environment. Strengthen urban planning and management, and promote the coordinated development of urban ecology and construction in order to enhance the attractiveness and competitiveness of the city.

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Relative Weights of Indicators in Health System Efficiency Evaluation

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Abstract: The objective of this study is to determine the relative weights of input and output indicators used in evaluation of health system efficiency. For this purpose, a short questionnaire was sent to 83 experts in Czech health policy (academicians, healthcare managers and officials, politicians). Out of the 83 respondents, 27 replied (33%). Health expenditures as % of GDP are the most important health system input. The experts identified the number of physicians per 1,000 inhabitants and the number of nurses per 1,000 inhabitants as less important health system inputs, and the number of hospital beds per 1,000 inhabitants as the least important input. The most important output is healthy life expectancy, followed by life expectancy at birth, while infant mortality is the least important factor. The results of the study will serve as the key input to efficiency evaluation by multi-criteria decision-making and by data envelopment analysis.

1 Introduction

An international evaluation of health system efficiency/performance is a quite popular health policy analysis method (e.g., Papanicolas, Smith, 2013, Papanicolas, Rajan, Karanikolos, Soucat, Figueras, 2022). The general definition describes efficiency as the best use of available resources without any waste. Technical efficiency describes how health care is produced when both outputs and inputs are measured in natural units. There are various ways of how to evaluate the efficiency of health systems.

According to the way of setting the relative weights of performance indicators, we can distinguish three methods. Firstly, the multi-criteria decision-making (MCDM) is widely used in the public sector for evaluating options with multiple indicators. The weights of indicators are set by an analyst or group of experts and weights are the same for all evaluated units. This presents an advantage in that the analyst determines the importance of the individual inputs and outputs based on his/her knowledge and a disadvantage in that the decision itself fundamentally affects the results. Secondly, data envelopment analysis (DEA) (Charnes, Cooper, and Rhodes, 1978, Cooper, Seiford, and Zhu, 2004, Jablonský and Dlouhý, 2015) is one of the most commonly used non-parametric methods for evaluating the efficiency of health systems (Hollingsworth, 2003, Mbau et al., 2022). The weights are determined by the DEA model and weights may differ for different units. Thirdly, econometric methods, such as stochastic frontier analysis (Kumbhakar and Lovell, 2000), that can test the significance of included indicators, but they can only work with a single output, which brings considerable limitations.

The objective of the study is to determine the relative weights of input and output indicators used in the evaluation of health system efficiency. The results of the study will serve as the key input to efficiency evaluation by MCDM and DEA.

2 Methods

We decided to develop a short questionnaire and send it to leading experts in the area of healthcare in the Czech Republic to help us professionally determine the weights of individual health system inputs and outputs. In the questionnaire, we included only the most frequently used health system inputs and outputs in the literature (Mbau et al., 2022). The questionnaire was sent to 83 healthcare experts that we divided into three professional groups:

academicians (22), healthcare managers or public sector officials (23) and politicians (38). The list of experts was prepared by the authors. The questionnaire was sent on May 11, 2023. We waited two weeks for answers. Out of the 83 respondents, 27 replied (33%).

3 Results

Looking at the composition of the respondents that did reply, health care managers and officials were the most active respondents. Out of the 23 healthcare managers or public sector officials approached, 12 responded (52.2%). Out of the 22 academicians, 10 respondents completed the questionnaire, representing 45.5%. Politicians showed the lowest response rate. Out of the 38 politicians approached, only 5 provided feedback (13.2%). Figere 1 illustrates the distribution.

Figure 1 – Response rate in each group of respondents
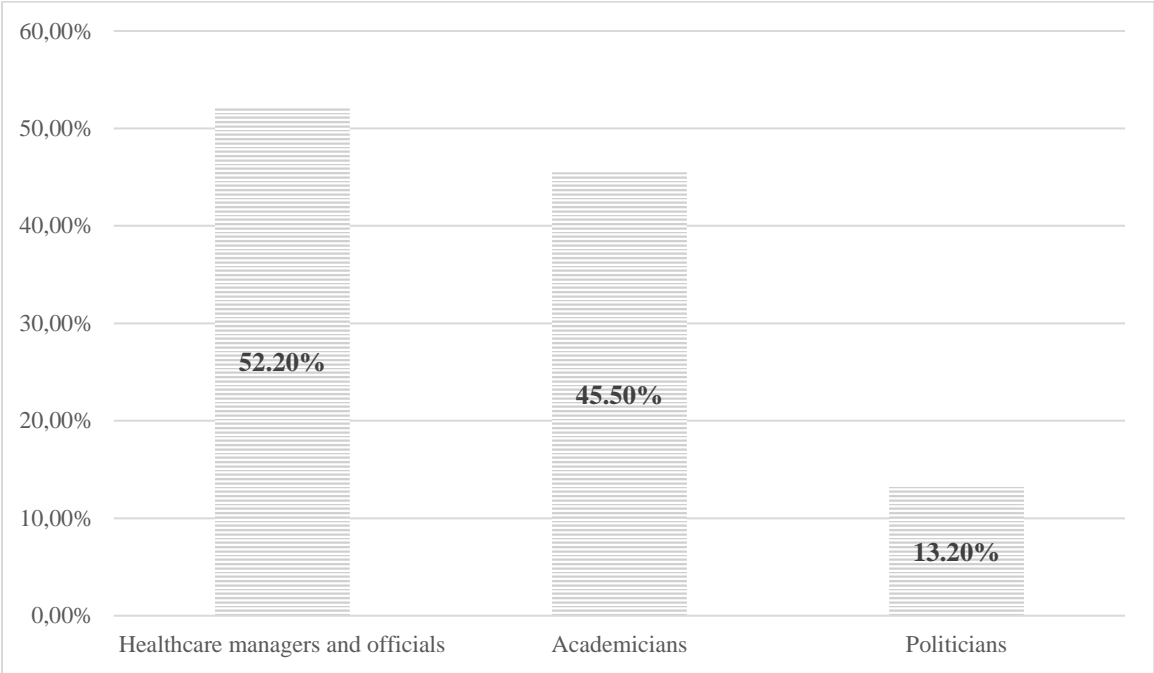
Source: authors

Another observation was the replying respondents' education. We found out that 13 of the respondents had medical training (48.1%), and 14 had a different education than medical (51.9%). Figure 2 illustrates this distribution.

Figure 2 – Respondents' education
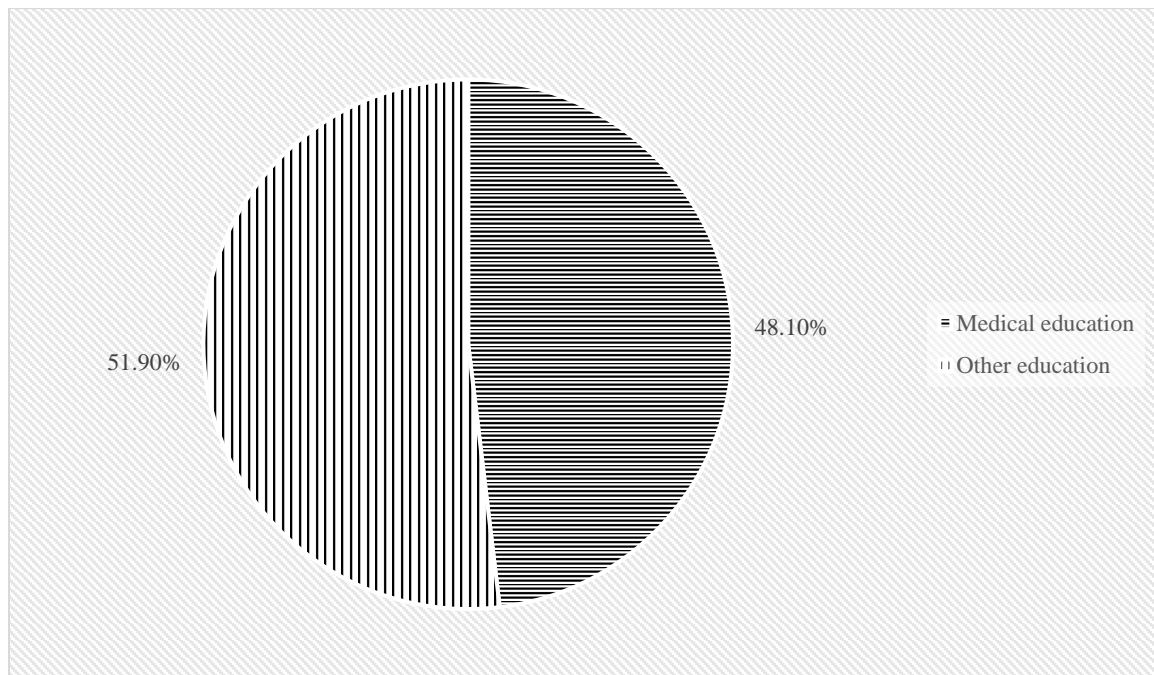
Source: authors

The task for respondents was to set relative weights of health system indicators to reflect the importance of the individual inputs and outputs as accurately as possible according to the respondents. There were four health system inputs: health expenditures as % of GDP, the number of physicians per 1,000 inhabitants, the number of nurses per 1,000 inhabitants and the number of hospital beds per 1,000 inhabitants. If we look at the average distribution of weights, we can see that the respondents identified health expenditures as % of GDP as the most important health system input with a relative weight 41.60%. The second most important input was the number of physicians per 1,000 inhabitants, obtaining 22.50%, closely followed by the number of nurses per 1,000 inhabitants with 21.40%. Hence, the experts consider nurses almost as important as physicians. The number of hospital beds per 1,000 inhabitants was identified as the least important of the four specified inputs (Figure 3).

Figure 3 – Distribution of input weights
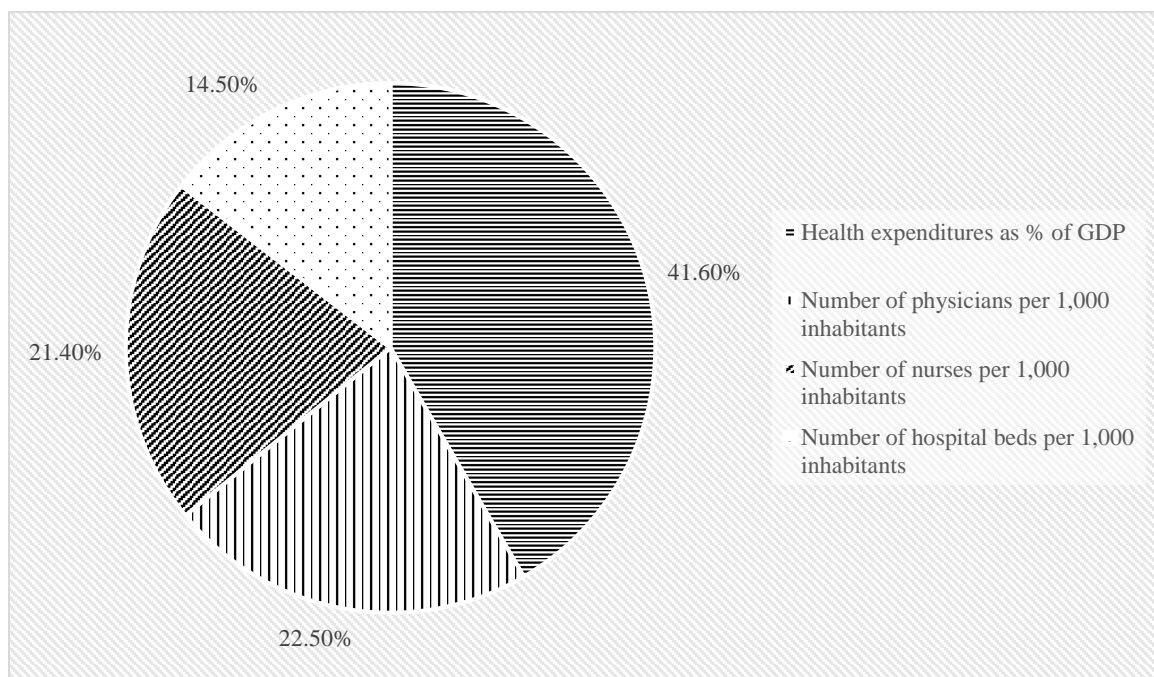
Source: authors

The next task for the respondents was to estimate the relative weights of three health system outputs: life expectancy at birth, healthy life expectancy, and infant mortality. The experts were asked to distribute 100% among all the outputs. Looking at the average weights assigned by the experts to the outputs (Figure 4), we can see that they considered healthy life expectancy as the most important, assigning 48.30% to it, which may be a little surprising given that life expectancy at birth is the most frequently used indicator in healthcare. However, that is probably because life expectancy at birth is easier to measure than healthy life expectancy. Life expectancy at birth was found by the experts to be the second most important output, obtaining a weight of 29.90%. The experts saw infant mortality as the least important, which was expected. They attributed a weight of 21,80% to infant mortality. That is significantly less than the first two outputs.

Figure 4 – Distribution of output weights
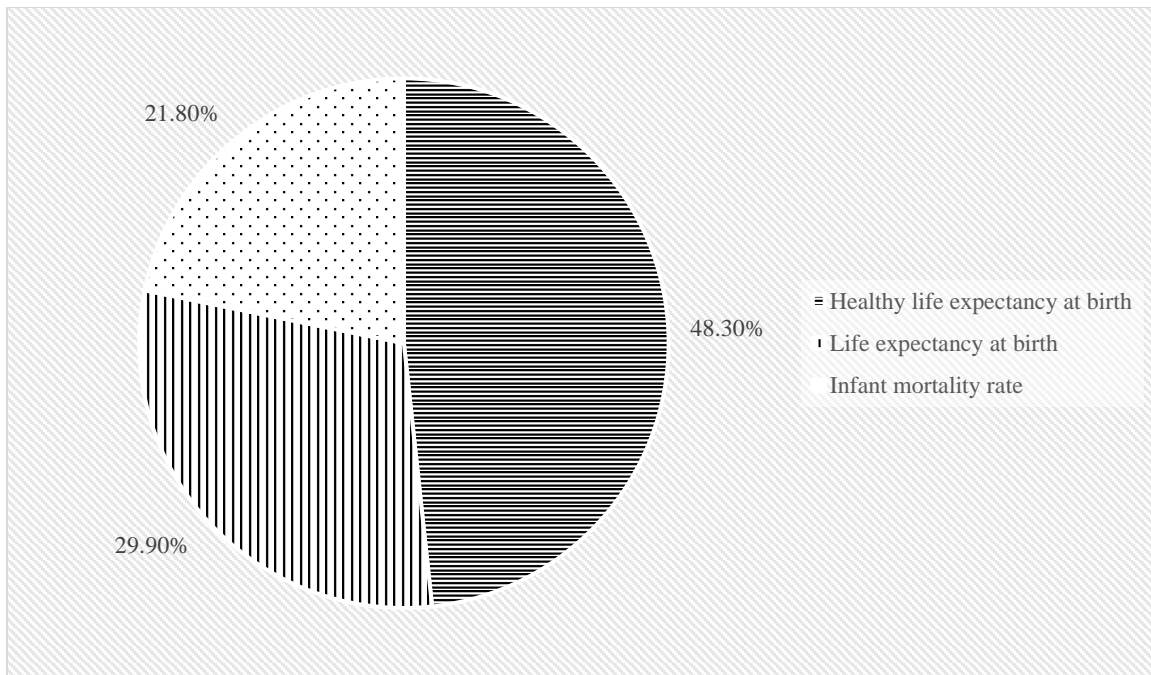
Source: authors

Next, the experts could express their views if some other health system inputs or outputs could be added to the model. They offered a wide range of interesting ideas. One of the respondents proposed choosing an indicator of technical equipment improvements. Another respondent mentioned hospitalization rates of chronic patients or the number of new oncological patients. Another expert would, in turn, choose to focus on prevention and motivating patients to take care of their health. There was also the idea to include in the model the development of cardiovascular or oncological deaths and the use of an oral health indicator, such as the percentage of people without loss of teeth. Another respondent would add economic and personnel stability as an input and timely identification of disease, patients' access to the latest healthcare trends or quality of treatment obtained by patients as outputs. Another expert also suggested an indicator of treatment quality and patient satisfaction. The idea of using a prevention indicator in the sense of the share of health expenditures on prevention also recurred. Other experts would choose, for example, waiting periods or the percentage of patients having a GP as outputs. An appropriate output suggested by one expert was the availability of healthcare services and their quality. If we look at the input and output proposals as a whole, the use of a healthcare quality indicator occurred the most often. There are many types of such indicators, but they are often problematic because every patient has a slightly different idea of quality care. Nevertheless, the issue will be added to the model. The choice of the indicators of preventive care and the numbers of cardiovascular or oncological patients is a very beneficial recommendation from the experts. This information is reported in great detail by individual countries, so there is no data availability problem, but there may be a problem with correlating the figures to life expectancy or healthy life expectancy.

The respondents were also asked to choose a country or group of countries that should act as efficient targets for the Czech health system. They could choose a country with the most efficient health system, a country with similar economic development, or a neighbouring country, or provide their own opinion on which country they think is the best. In total, 60% of the respondents thought the country with the most efficient health system should be the model for the Czech Republic; 16.7% of respondents thought that countries with the same level of economic

development should be the model; 10% of the respondents identified neighbouring countries as the best models for the Czech health system; and 13,3% took the opportunity to suggest a specific model country (Figure5). Those respondents thought that Germany, Austria, Canada, Denmark, Israel and the Netherlands should be the model countries. It is obvious that most of the experts think that the Czech health system should learn from the country with the most efficient health system, irrespective of economic performance or geographical location.

Figure 5 – Distribution of efficient targets (countries) for the Czech Republic
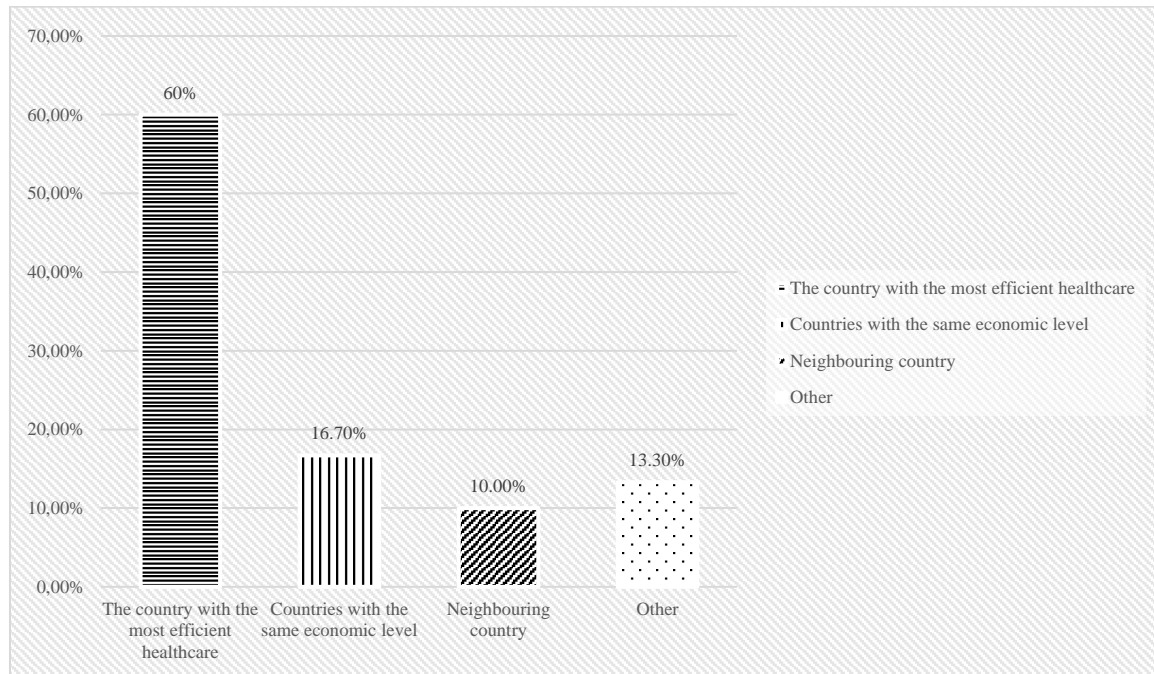
Source: authors

Finally, the respondents were given the chance to provide their email addresses to stay informed about the results of our survey.

3 Conclusion

Using a questionnaire survey among health policy experts, we found that health expenditures as % of GDP are the most important health system health system input. The respondents identified the number of physicians per 1,000 inhabitants and the number of nurses per 1,000 inhabitants as less important health system inputs, and the number of hospital beds per 1,000 inhabitants as the least important health system input. The most important health system output is healthy life expectancy, followed by life expectancy at birth, while infant mortality is the least important health system output. The survey results will be used in the health system efficiency evaluation using both DEA and MCDM. We will especially focus on the efficiency of the Czech health system from an international perspective.

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The relationship between the minimum wage and other macroeconomics published in the Czech Republic and in the terrestrial European Union

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Abstract: Minimum wages are a topic that most EU governments deal with, their level is important both for maintaining the standard of living of the inhabitants of a given region and for gaining plus political points. Across the European Union, we encounter different methods of setting the minimum wage, and each method of setting it has its advantages and disadvantages. A minimum wage can provide social protection for employees, and also serves to prevent the exploitation of low-wage workers. In this work, we focused on the growth rate of the minimum wage in individual EU countries and also on the comparison of the minimum wage with the average wage. We conclude that minimum wages should grow steadily, predictably and not deviate from the average rate of inflation and average wage growth. By lowering the growth rate of the minimum wage, low-wage employees may be demotivated to do their jobs.

1 Introduction

In this case study, we focused on minimum wages in the Czech Republic and EU countries. We consider the minimum wage to be a very important tool of employment policy and, at the same time, as social security for employees who, for various reasons, do not earn more. The focus of the thesis is to approximate the minimum wage, their functions and the relationship between the minimum wage and real indicators of the economy.

2 Minimum wage

2.1 Minimum wage in theory

As stated by Pícl and Körner (2016, p.1), the minimum wage is an economic policy institute that aims to prevent employees with the lowest wages from falling into poverty. The minimum wage should ensure that a working person is able to meet his or her basic living needs from his or her income and is not dependent on social benefits.

The concept of minimum wage is described by a large number of definitions, but most authors agree on two basic functions of the minimum wage: social-protective and economic-criteria. The social-protection function consists in ensuring the protection of employees from poverty, ensuring sufficient income to cover all necessary costs. The economic-criterion function ensures the motivation of citizens who do not have a job to look for one. For employers, the minimum wage means the lowest level of wage costs per employee.

2.2 Setting the minimum wage

Across the European Union, there is a considerable disparity both in the setting of the minimum wage and in the nominal value of the minimum wage. In EU countries, there is no mandatory minimum wage yet, nor is there a blanket regulation on how to determine the value of the minimum wage. In the EU, the law regulates the minimum wage in 21 countries in some way, with the exceptions being Finland, Sweden, Denmark, Cyprus, Austria and Italy. In these countries, the minimum wage can be addressed at the level of trade union negotiations and agreements.

In the Czech Republic, the minimum wage is decided by the Government of the Czech Republic, but negotiations take place at the tripartite level (the Government of the Czech Republic, trade unions and employers), but these negotiations do not have results in the form of a decision.

Across the EU countries, the model of automatic increase of the minimum wage according to the average increase in CPI is also applied. In the Netherlands, for example, minimum wages are further categorised by age.

3 Level of minimum wage

The minimum wage in the Czech Republic is usually increased annually, in exceptional cases it is increased during the year, mostly due to high inflation. In the period from 1991 to 2022, the minimum wage was increased every time, with the exception of 2009-2013, when there was no increase. In 2023, there was an increase of CZK 1,100, but this year is not shown in the chart due to external influences on the Czech economy and the impossibility of comparing these new data with other economic indicators.

From 1991 to 2022, the monthly minimum wage increased from 810%, the hourly wage was increased by 893%.

Figure 1 – Minimum wage in Czech Republic between 1991-2022
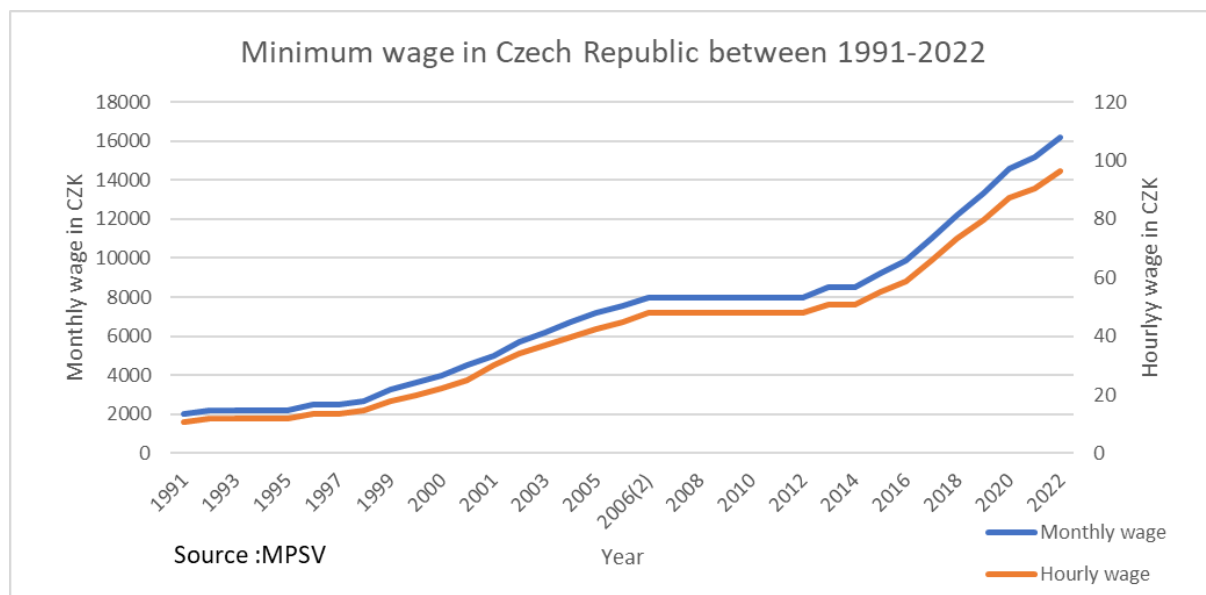
Source: MPSV

Between 2000 and 2022, the minimum wage grew the most in Romania (14.9%), Bulgaria (11.05%) and Slovakia (10.43%), Overall, the minimum wage increased by 1,786.71% in Romania and by almost 1,000% in Bulgaria, these high increases are due to the low minimum wage at the beginning of the millennium, due to economic growth there were significant increases, while the German minimum wage increased by only 12.26%. In Luxembourg, the minimum wage was increased by €1,094 in the reporting period, and is also the only EU country where the minimum wage exceeds €2,000.

Table 2 - Change in minimum wages nominally and in %

	Avarage	Max	Min	Change in €	Change in %
Romania	14,90%	68,85%	-10,18%	487,95 €	1786,71%
Bulgaria	11,05%	27,12%	5,88%	301,15 €	965,53%
Slovakia	10,43%	35,88%	3,02%	576,57 €	830,43%
Lithuania	9,85%	38,75%	2,04%	637,86 €	692,27%
Estonia	9,73%	20,84%	4,31%	574,11 €	718,63%
Czechia	9,16%	28,78%	-2,82%	559,35 €	605,68%
Latvia	9,02%	33,48%	0,00%	424,82 €	565,07%
Hungary	8,84%	50,76%	-9,17%	452,58 €	507,66%
Poland	6,75%	28,25%	-11,92%	495,85 €	311,97%
Slovenia	4,96%	25,22%	0,20%	713,10 €	197,35%
Croatia	4,10%	10,83%	-2,04%	250,24 €	67,01%
Spain	3,83%	22,30%	0,51%	640,12 €	131,79%
Portugal	3,72%	6,02%	2,10%	465,78 €	130,57%
Ireland	3,10%	10,24%	1,09%	829,79 €	87,84%
Luxembourg	2,94%	6,09%	0,10%	1 094,87 €	94,22%
Malta	2,37%	8,63%	-1,76%	327,33 €	70,40%
Netherlands	2,13%	5,72%	0,62%	660,80 €	62,09%
Greece	2,07%	10,91%	0,00%	268,44 €	53,15%
France	1,94%	5,84%	-5,30%	567,15 €	54,75%
Belgium	1,91%	5,95%	1,98%	583,79 €	54,33%
Germany	1,68%	4,29%	-1,09%	177,00 €	12,26%

Source: national database of EU countries

3.1 Minimum wage and its influence

When comparing minimum wages in nominal terms, there is a distortion of data because each EU country is at a different economic level, the price level in each country is different, and therefore the assessment is not objective. The Kaitz index offers the possibility of international comparison. As reported by Frejlich and Chytilová (2020), the Kaitz index can indicate the willingness of employees to work for the minimum wage, with the growth of the index, the difference between the average and minimum wage decreases. Developing countries are reaching values close to 1.

A coefficient value between 30-60% is generally considered to be a good minimum wage policy, does not indicate any problems in the wages paid and there are no large disparities in wages. In the EU, all countries operate in this area. The median wage is often used to calculate the coefficient, so the result is not affected by extreme values. The coefficient may indicate the effect of the minimum wage on the employment market, the smaller the value of the coefficient, the smaller the number of employees will be affected by the increase in the minimum wage.

The highest values of the coefficient were found in Slovenia, where the minimum wage exceeds half of average earnings. Minimum wages of more than half of average earnings were also found for Polish and Slovak wages.

Figure 2 – Kaitz coefficient in EU countries in 2021
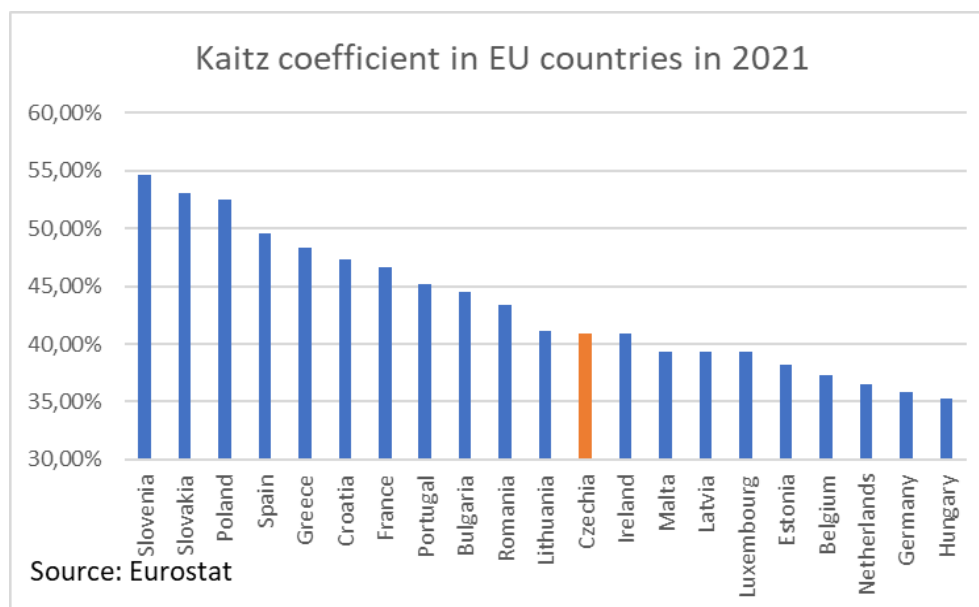
Source: Eurostat

3.2 Minimum wage and employment

The basic function of the minimum wage is to motivate people to work, to enter the labour market. The value of the time we are willing to sacrifice to work is determined individually by each person, but higher wages to some extent increase performance at work. According to Coviello et al. (2021), minimum wage growth is directly related to labor productivity, effective increases in the minimum wage can lead to productivity increases.

The relationship between the minimum wage and employment can be compared using a correlation coefficient from -1 to 1. The higher the correlation coefficient, the stronger the relationship between the above variables. In the observed period (2000 – 2020), positive values of the Kaitz coefficient were found for most countries. We calculated the Kaitz coefficient from Eurostat data. Most countries had a correlation coefficient higher than 0.6 (strong correlation). In Greece, Portugal and Ireland, the correlation was negative, indicating an inappropriate market reaction to the minimum wage increase, but the relationship was very weak.

The reaction on the labour market may be delayed due to labour market rigidity, which is why the observed employment data have been postponed by one year compared to the increase in the minimum wage. There were slight differences in most countries, only in Germany and Greece were the differences tens of percentage points lower a year later.

Figure 3 – The relationship between employment and minimum wage
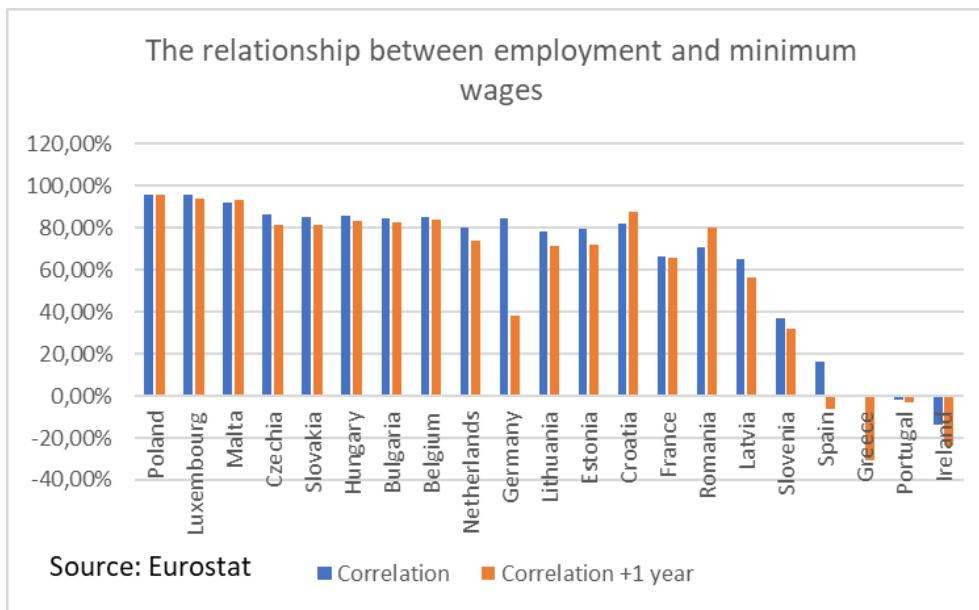
Source: Eurostat

4 Conclusion

This thesis dealt with minimum wages across EU countries. In the Czech Republic, the monthly minimum wage increased by 810% in the monitored period, while in most EU countries minimum wages grew by higher tens to hundreds of percent. The attached table shows that the minimum wage grew more in countries with a lower economic level and mainly in countries of Eastern and Central Europe.

The Kaitz index indicates the quality of the setting of minimum wages, in all EU countries this value takes the correct values. The relationship between the minimum wage and employment for most of the state is positive and mostly very strong.

We are of the opinion that the minimum wage is an important tool of state policy and its proper use can greatly affect the entire economy of a country. It is very important that the minimum wage is increased at least by an increase in the price level, as a lower increase will widen the differences in employees' incomes. We think it is important to ensure that the minimum wage is gradually raised every year to match inflation and the increase in the cost of living.

Regional differences in the cost of living in different parts of the country should be taken into account. This may mean that the minimum wage could vary from region to region to ensure a reasonable standard of living for all workers.

Some sectors, such as health and education, could require a higher minimum wage due to the high qualifications required by their workers. In general, when setting the minimum wage, it is also necessary to take into account the applicable legislation on the minimum wage. We recommend that you monitor changes in the law and adapt to them.

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Analysis of the Income of the General Health Insurance

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Abstract: Public health insurance is one of the subsystems of social insurance and is an indispensable part of the Czech healthcare system. The collected premiums are used to pay for health care for the insured, which is financed by health insurance companies. All persons with permanent residence in the Czech Republic must participate in public health insurance and foreigners who are employed in the Czech Republic must also participate. The paper analyses the development of the General Health Insurance Fund (VZP) revenues in the years 2010 - 2020. The main objective of the paper is to analyse the VZP revenues in the selected years. The paper determines the extent to which the monthly revenues of the VZP in the time period 2010-2020 are mostly influenced by seasonality, and furthermore, the dependence of the VZP revenues on the number of insured persons was determined using regression analysis.

1 Introduction

Healthcare is a specific industry that is fundamentally different from the competitive environment. The first difference is the nature of demand for healthcare, which is characterised by its unpredictability and irregularity. It can be argued that healthcare only provides benefits in the event of illness or injury. The only exception is prevention. (Arrow, 1963)

There are two types of health insurance to finance health care. The first type is called statutory health insurance, which is compulsory for all residents in a particular country. The second type is private health insurance in which participation is voluntary. There are two models for statutory health insurance - the Beveridge model and the Bismarck model. The Beveridge model is financed by general taxation. The Bismarck model is financed by compulsory levies on health insurance premiums. (Němec, 2008) The most famous example of the application of the tax financing model is the UK and its National Health Service. As noted, for example, by Vilcu and Mathauer (2016), the strong role of the state in health care was undoubtedly also manifested in Soviet-style central planning-based economies.

Getting health insurance financing right has an impact on reducing mortality, infant mortality and increasing the life expectancy of the population. (Finkelstein et al., 2012) Oliver and De Vocht (2017) report that the type of government policy in a country has a substantial impact on health insurance.

In the Czech Republic, public health insurance is a subsystem of social insurance; other subsystems include pension insurance, sickness insurance and state employment policy. (Vančurová, 2020) These three subsystems fall under the social security system, but unlike public health insurance, they are a revenue to the state budget and are administered by the Czech Social Security Administration. Public health insurance is a revenue of health insurance companies, which also administer it (Vančurová and Klazar, 2008).

In the Czech Republic, the provision of health care is separated from the ability to pay for it. Public health insurance is used as the primary source of funding for Czech health care. The public health insurance premium is a specific public revenue, and it differs from the definition of tax revenue mainly because it is earmarked for a specific purpose. The principle of ability to pay is applied in the collection of public health insurance in the Czech Republic, which takes into account the cash income of the insured. The solvency principle is an appropriate approach in terms of redistribution for health insurance premiums (Honekamp and Possenriede, 2008).

Data from the General Health Insurance Company were used to prepare the article. Mathematical and statistical methods are used to meet the main objective. Firstly, the extent to which the VZP revenues are affected by seasonality in individual months between 2010 and 2020 is calculated and then the months in which seasonality is

most pronounced are commented. Subsequently, the dependence of VZP revenues on the number of insured persons by regions of the Czech Republic for selected years is investigated using regression analysis. Adjusted indices of determination are calculated, which assess the percentage of VZP revenues explained by the independent variable, i.e. the number of insured persons. The dependence of revenue on the number of insured persons is compared in each year.

2 Material and Methods

In order to assess the revenues of the General Health Insurance Corporation (VZP), it was necessary to obtain data on the revenues from VZP premiums and the number of insured persons by regions of the Czech Republic and by groups of individual categories of insured persons (employees, entrepreneurs, persons without taxable income, state insured persons). Table 1 shows the premium income collected on behalf of employees in thous. The number of employees includes persons who have concurrent income from self-employment or are concurrently state insured.

Table 1 - Insurance premium income in thous. CZK and number of VZP insured persons for the category employees

Czech Region	Income for employees in thous. CZK			Number of employees		
	2012	2016	2020	2012	2016	2020
PHA	24 636 372	30 425 292	41 841 115	312 124	335 977	376 229
STC	7 166 682	8 258 201	11 585 690	271 235	274 052	281 882
JHC	4 182 862	4 750 546	6 253 183	150 209	151 170	153 420
PLK	4 185 883	4 880 326	6 277 885	132 283	134 144	135 733
KVK	1 827 291	1 981 215	2 418 711	73 094	71 810	67 431
ULK	5 251 948	5 760 247	7 637 016	197 665	203 161	206 969
LBK	3 278 085	3 832 895	4 934 795	122 793	127 201	129 820
HKK	3 453 446	3 793 436	5 054 034	123 351	125 675	126 541
PAK	3 625 906	4 260 821	5 567 279	139 878	143 815	146 432
VYS	3 951 058	4 550 198	5 761 073	145 959	150 746	151 933
JHM	9 078 596	10 469 513	13 747 781	257 175	256 954	261 565
OLK	2 611 623	2 958 402	3 771 392	92 220	92 035	89 944
ZLK	5 725 387	6 047 700	7 772 308	143 222	142 858	140 654
MSK	4 139 558	4 709 082	5 985 449	149 385	145 480	144 848
CZECH REPUBLIC	83 114 697	96 677 874	128 607 711	2 310 593	2 355 078	2 413 401

Source: own processing based on data from VZP (2020)

The table below shows the premium income paid by entrepreneurs in thous. The total number of entrepreneurs includes persons who have concurrent income from employment or are concurrently insured by the state.

Table 2 - Insurance premium income in thous. CZK and number of VZP insured persons for the category entrepreneurs

Czech Region	Income for entrepreneurs in thous. CZK			Number of entrepreneurs		
	2012	2016	2020	2012	2016	2020
PHA	1 965 667	2 395 116	2 413 655	102 921	108 153	120 367
STC	1 316 127	1 468 609	1 393 169	76 402	73 057	76 087
JHC	667 067	725 036	676 581	39 439	38 252	39 649
PLK	527 212	578 900	520 907	31 105	29 590	30 032
KVK	343 804	376 526	310 849	17 840	16 717	16 134
ULK	757 301	846 049	774 438	41 596	39 361	41 247
LBK	514 657	588 444	517 542	30 797	29 511	31 143
HKK	531 923	584 140	540 042	33 209	31 733	32 485
PAK	539 802	604 162	547 708	32 321	31 454	33 511
VYS	560 906	640 056	629 903	33 755	33 855	36 214
JHM	1 128 875	1 244 290	1 163 797	64 580	62 182	65 018
OLK	420 111	436 372	381 866	23 800	21 235	21 545
ZLK	693 193	668 868	586 739	35 541	32 943	32 823
MSK	627 129	672 703	587 841	37 387	34 461	35 623
CZECH REPUBLIC	10 593 773	11 829 270	11 045 039	600 693	582 504	611 878

Source: own processing based on data from VZP (2020)

Following table 3 shows data on total premium income in thous. CZK and the total number of VZP insured persons (each insured person is listed only once, even if person has a concurrent employment and self-employment).

Table 3 - Total premium income in thous. CZK and total number of VZP insured persons

Czech Region	Total revenue in thous. CZK			Total VZP insured persons		
	2012	2016	2020	2012	2016	2020
PHA	30 130 148	37 160 911	51 370 545	759 056	800 552	870 830
STC	12 088 556	13 840 371	19 276 556	708 540	681 961	686 204
JHC	6 945 324	7 833 125	10 544 688	399 804	381 301	382 340
PLK	6 449 333	7 385 330	9 786 139	339 757	321 252	322 949
KVK	3 239 776	3 527 242	4 471 221	207 332	189 961	182 083
ULK	9 145 240	10 117 895	13 653 387	571 865	542 500	536 254
LBK	5 558 039	6 420 280	8 536 310	330 777	321 171	322 874
HKK	5 758 711	6 335 945	8 564 863	333 934	315 276	312 566
PAK	6 099 579	7 022 824	9 414 394	365 824	350 770	348 638
VYS	6 505 713	7 468 889	9 852 966	379 114	368 057	364 716
JHM	13 812 450	15 794 221	21 139 635	687 229	652 548	650 134
OLK	4 498 662	4 992 180	6 464 558	269 372	247 639	235 951
ZLK	8 410 013	9 190 685	11 837 749	379 862	382 932	364 096
MSK	7 100 405	7 626 411	9 969 545	434 183	362 797	356 593
CZECH REPUBLIC	125 741 948	144 716 309	194 882 555	6 166 649	5 918 717	5 936 228

Source: own processing based on data from the VZP (2020)

The mathematical-statistical method is used to analyse the revenue of the VZP. The VZP revenues are examined by categories of insured persons, i.e. employees, entrepreneurs, persons without taxable income and state insured persons, and the total VZP revenues from insurance premiums are analysed.

The first part of this analytical chapter deals with the monthly seasonality of the VZP revenues between 2010 and 2020. Using average seasonal indices, it is investigated to what extent the VZP revenues are affected by a given month. To demonstrate seasonality in months, it is important to examine it over a sufficiently long time period. Seasonal variation can be caused by certain behaviours of individuals or by influences beyond human control (natural conditions). In order to calculate average seasonal indices, it was necessary to obtain data on VZP income by month. Seasonal indices can be obtained as the ratio of the time series values and the seasonally adjusted values in a given month. Next, these values are averaged for a particular month to obtain the monthly average seasonal index. Since the sum of the average indices must be equal to the number of seasons (for monthly series the sum is

12), a recalculation must be made for the indices. The values of the average seasonal indices are expressed as percentages and indicate the extent to which the months in the time series are affected by seasonality. The more the value of the average seasonality index differs from 100 %, the more seasonality is present in the month. If the seasonality index is greater or less than 1 (100%), it means that in a given month the average value of the time series increases or decreases due to seasonality by this seasonal index, e.g. if the index value comes out to 110%, the average value of the VZP income in that month increases by 10% and if the index comes out to 90%, the income decreases by 10% on average. The indices are examined for income derived from employees, business + non-taxable persons and state insureds. The group of insured entrepreneurs and persons with no taxable income is analysed together because the data from the VZP do not show the income for these insured persons individually. The monthly number of persons without taxable income from which the monthly premium income for this category of insureds could be calculated is not given either. A trial version of the Statgraphics Centurion 19 software is used to calculate the average seasonality indices.

The second part of the chapter is devoted to regression analysis. Using simple regression, the dependence of the VZP income on the number of insured persons by regions of the Czech Republic in 2012, 2016 and 2020 is examined. The aim is to compare the dependence of these variables in individual years. In the regression model, VZP income acts as the explanatory (dependent) variable. This variable can be written by a mathematical equation and its evolution can be represented by a function curve. The explained variable lies on the Y-axis of the graph and indicates the result of the interaction of two variables. In the regression analysis, the number of insured persons of the General Health Insurance Institution is the independent (explanatory) variable and explains the behaviour of the dependent variable Y, i.e. the amount of income from the General Health Insurance Institution premiums. This variable is indicated on the X-axis in the graph. A change in the explanatory variable results in a change in the explained variable. The dependence is first examined by category of insured, namely employees and entrepreneurs. For persons with no taxable income and state insured, there is no point in examining the dependence because their total income is determined as the total number of insured in that category multiplied by the premium income in that category, i.e. there is 100% functional dependence between the variables. To determine the type of dependency, it is necessary to determine the value of the coefficient of determination, which is denoted as R^2. Its values lie in the interval $<0;1>$. The more the value of the coefficient of determination approaches 1, the greater the dependency between the variables and indicates how "good" the chosen dependency model is. For verbal interpretation, its values are converted into percentages, which explains what percentage of the variability in the values of the explained variable is explained by the selected model. The following types of functions were selected to determine the dependence of the VZP income on the number of insured persons in the regions of the country:

- linear functions
  $$Y = \beta_0 + \beta x_1 \tag{1}$$
- quadratic function
  $$Y = \beta_0 + \beta_1 t + \beta_2 x^2 \tag{2}$$
- exponential function
  $$Y = \beta_0 \beta_1{}^x \tag{3}$$
- logarithmic function
  $$Y = \beta_0 + \beta_1 \ln x \tag{4}$$
- power function
  $$Y = \beta_0 x^{\beta_1} \tag{5}$$

where β_i represents the regression coefficients.

Because models with different numbers of regression coefficients (e.g., straight line, parabola) are compared, it was necessary to use a modified index of determination to select the appropriate model. The classical index of determination favours models that have more parameters. The modified index of determination can be written using the following formula:

$$R^2 = 1 - (1 - R^2)\frac{n-1}{n-p} \tag{6}$$

where n is the number of observed statistical units (number of counties) and p is the number of parameters in the model.

Among the above function types, the one with the highest value of the adjusted determination index was selected. The mean square error, partial t-tests and overall F-test values were also considered in selecting the appropriate function. Excel and the trial version of Statgraphics software were used for regression analysis.

3 Results and Discussion

3.1 Seasonality in VZP revenue

The aim of this subchapter is to find out, using mathematical and statistical methods, in which months the VZP revenues are most affected by seasonality in the time period between 2010 and 2020. Average seasonal indices are calculated to find seasonalities in monthly VZP revenues. In this paper, seasonality is found for the following types of income:

- Income for employees
- Income for entrepreneurs together with persons without taxable income
- Revenue on behalf of state insured persons

Following table 4 shows the calculated monthly seasonality indices of the VZP income for each category of insured persons for the years 2010-2020. If the value is around 100%, it means that the VZP income in a given month is not affected by seasonality, and if the index value is smaller, the income is lower than it should normally be. If the value is above 100%, then revenues in a particular month are overstated. In the case of employees, earnings are most understated in March and most overstated in December. For the insured group of business + non-taxable income, income is most affected by seasonality in the months of March and April. Income for state insureds is the least affected by seasonality, as index values are around 100% in almost all months. If the index values are converted from percentages to decimals, the sum of the index values in a given category must add up to 12. The seasonality indexes are further commented on in the individual graphs for each insurer category.

Table 4 - Average seasonal indices of the VZP income in individual months for the time period 2010-2020 (in %)

Moon	Staff	Entrepreneurs + persons without taxable income	State insured persons
1	104,38	100,18	101,44
2	95,70	101,85	100,85
3	93,93	113,73	100,14
4	101,60	92,99	99,32
5	99,10	95,82	98,58
6	99,82	98,20	101,66
7	100,13	103,70	100,30
8	99,75	97,34	100,08
9	96,69	95,50	99,10
10	97,46	99,79	99,09
11	99,55	99,51	99,77
12	111,90	101,39	99,68

Source: own calculations based on data from VZP (2020); Statgraphics software

Figure 1 shows the monthly evolution of the VZP premium income from 2010 to 2020 paid by employers for their employees. At a glance, the annual increase in revenue is already visible. A higher upward trend is observed from 2016 onwards, when the minimum wage and also the average gross wage increased faster, which has an impact on the premiums paid. It is also evident that premium income is well above trend in December.

Figure 1 - Monthly evolution of VZP income for employees from 2010 to 2020
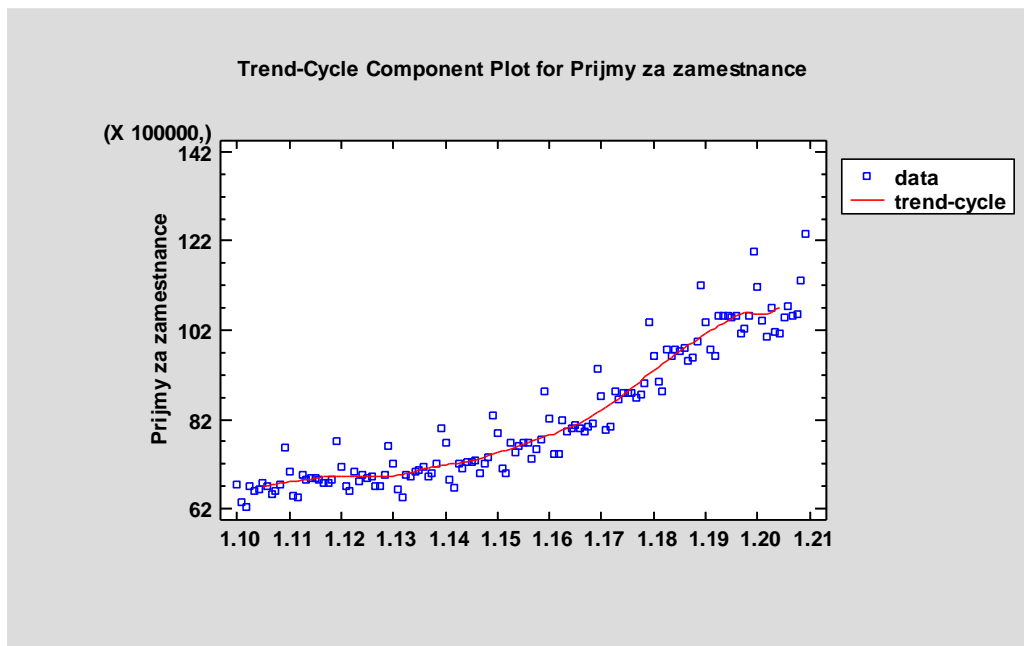
Trend-Cycle Component Plot for Prijmy za zamestnance

Following figure 2 below shows the evolution of the seasonality indices for the VZP employee premium income over the time period 2010-2020. The most above-average revenues were in December, most likely because this is the month when most employees receive performance bonuses or a 13th pay in addition to their December paycheck, and thus higher premiums are paid on their wages. According to the trend of the indices, the below-average premium income paid on behalf of employees is in March, and this means that the average time series value decreases by 7.01% in this month due to seasonality.

Figure 2 - Development of seasonality indices of the VZP income for employees from 2010 to 2020
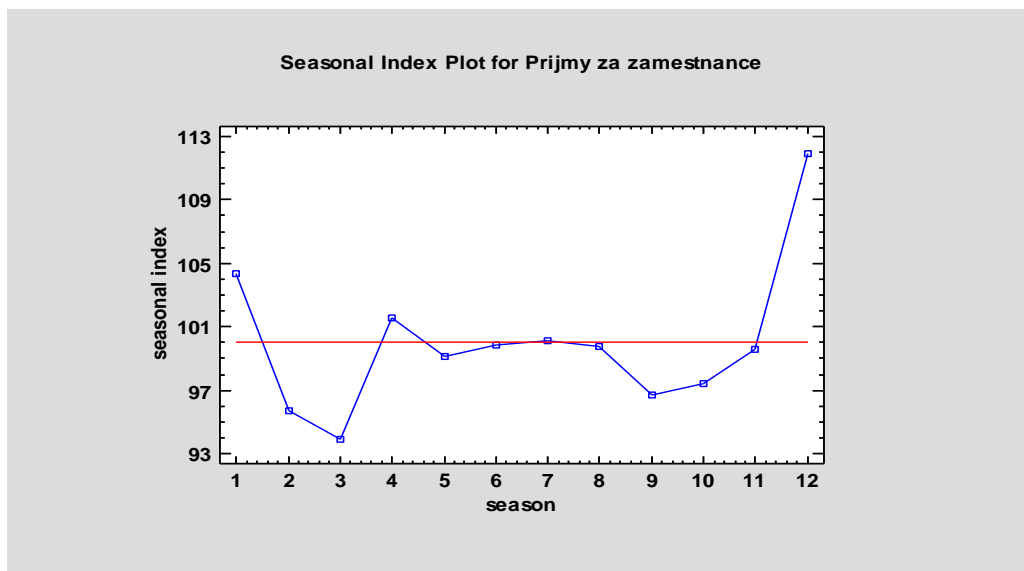
Seasonal Index Plot for Prijmy za zamestnance

Figure 3 shows the monthly evolution of the VZP premium income from 2010-2020 paid by entrepreneurs and persons without taxable income. The approximate share of entrepreneurs in this revenue is 80%. The trend is upward until 2019. Due to the Covid-19 pandemic, minimum monthly deposits were waived for the months of March to August in the year for entrepreneurs. If a business had advances above the minimum, it only paid premiums for those months in excess of the minimum advance. This measure caused a significant drop in income for this category of insured, as can be seen in the chart.

Figure 3 - Monthly development of the income of the VZP for entrepreneurs (OSVC) + persons without taxable income (OBZP) in 2010-2020
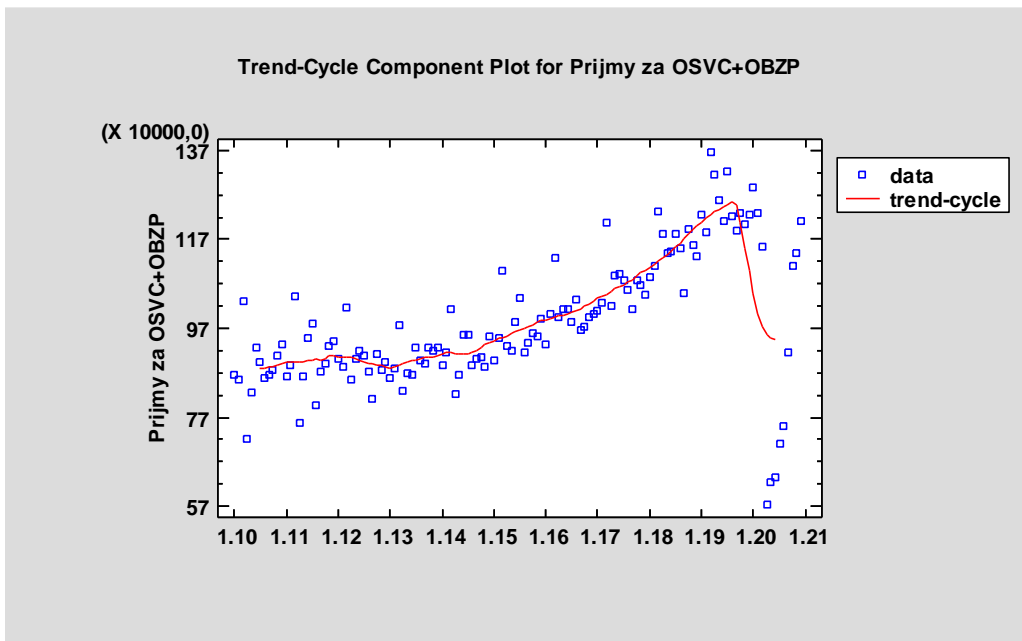
Source: own processing based on data from VZP (2020); Statgraphics software

Figure 4 models the evolution of the seasonal indices constructed from VZP receipts for entrepreneurs and persons without taxable income between 2010 and 2020. The most above-average receipts were recorded in March. This is because most entrepreneurs file their tax returns in this month along with their self-employment income and expenditure statements and aggregate advance payments of insurance premiums, and thus remit any underpayment of insurance premiums for the previous calendar year in March. From the month in which the entrepreneur submitted the statement, person must pay the new calculated advance payment of insurance premiums. However, if the entrepreneur is subject to the minimum assessment base, he or she is required to pay the new monthly deposit amount from January. Conversely, according to the seasonality index, the below-average premium income is in April

Figure 4 - Development of the seasonality indices from the income of the VZP for OSVCs + persons with no income between 2010 and 2020
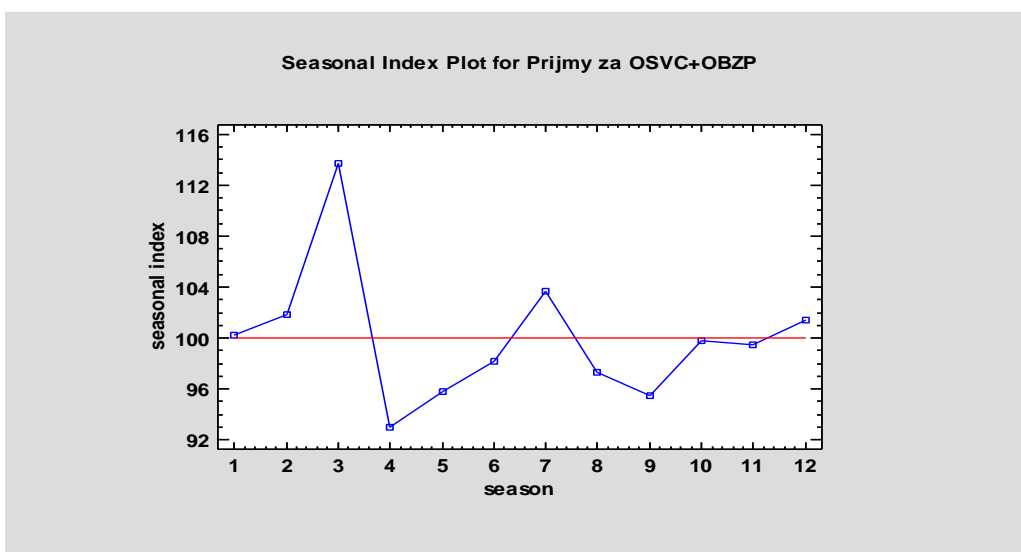
Source: own processing based on data from VZP (2020); Statgraphics software

Following figure 5 shows the monthly evolution of the VZP revenue for the state insured from 2010 to 2020. Since 2014, it is visible that the payments made by the state for the state insured have been increasing. However, revenues have increased the most since the second half of 2020, when, due to the Covid-19 pandemic, the government decided to significantly increase the monthly payments for this group of insured.

Figure 5 - Monthly development of VZP revenues for state insured persons in 2010-2020
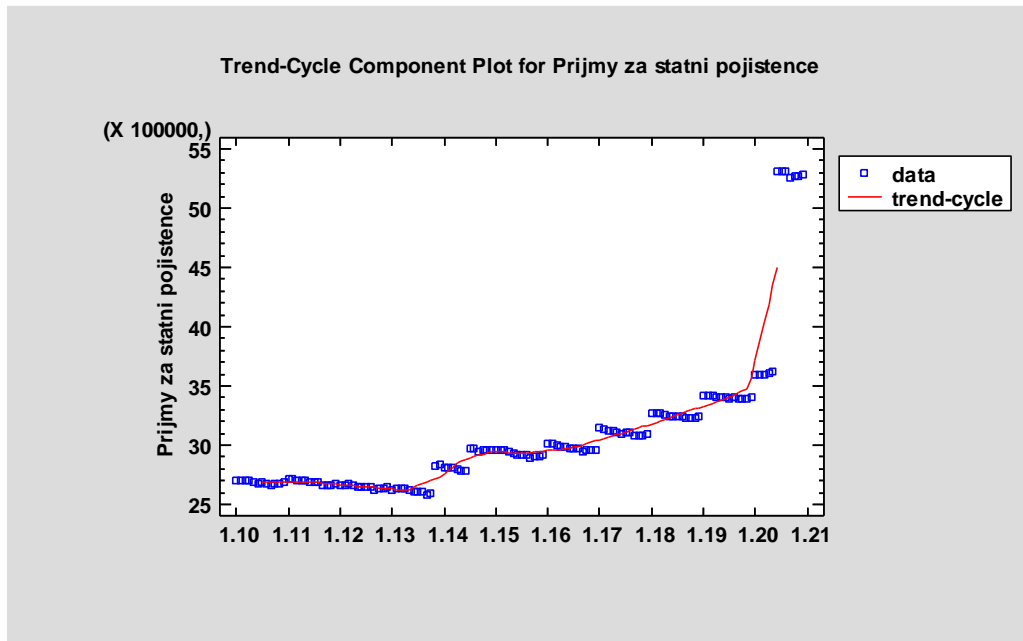
Source: own processing based on data from VZP (2020); Statgraphics software

Figure 6 shows the evolution of the monthly average seasonality indices for the 2010-2020 period for the state's receipts paid by the state on behalf of the state insured. The most overstated revenues were in June. This may have been due to the higher number of births that became state insured in that month. In contrast, below-average income was recorded in May. Compared to other categories of insured persons, however, income for state insured persons is least affected by seasonality, as the index values are close to 100%.

Figure 6 - Development of seasonality indices of VZP revenues for state insured persons in 2010-2020
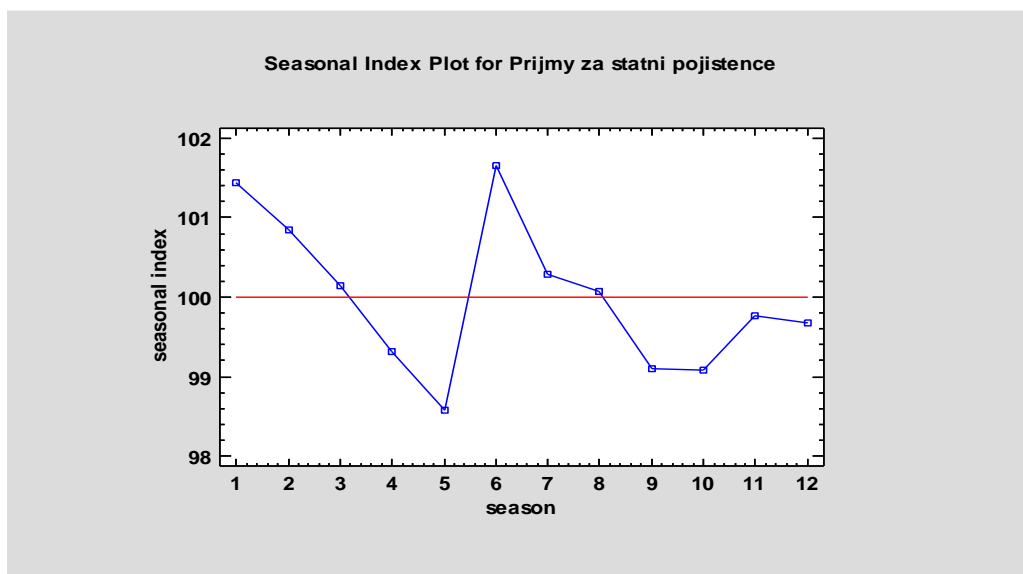
Source: own processing based on data from VZP (2020); Statgraphics software

3.2 Dependence of VZP revenues on insured persons by regions of the Czech Republic

In this part of the chapter, the dependence of the VZP income from premiums paid for selected categories of insured persons on the number of insured persons in a given category by regions of the Czech Republic is investigated.

The table below shows the adjusted indices of determination and the equations of the regression models for the category of insured employees. In each year, based on the value of the adjusted index of determination, an exponential type of dependence emerges. It can be seen that in each year the dependence of income on the number of employees increased. The highest dependence was in 2020 and explained 92.78% of the variability in the values of the variable of VZP revenues.

Table 5 - Dependence of VZP income on the number of insured persons by regions of the Czech Republic for the category employees

Year	R²	Function type	Equation function
2012	86,10%	Exponential	$y = 1190.6e^{0,0083x}$
2016	88,71%	Exponential	$y = 1339.3e^{0,0083x}$
2020	92,18%	Exponential	$y = 1830.8e^{0,0078x}$

Source: own calculations based on data from VZP (2020); Statgraphics software

The following graph shows the graphical dependence between the VZP income (for employees) and the total number of employees insured by VZP. The adjusted index of determination is 92.18%. The points show the values of VZP income in each region. The value of the test criterion of the overall F-test in 2020 between the regions came out to be 154.24. According to the p-value of this test, at the 5% level of significance, it is possible to reject the hypothesis tested and it can be argued that the regression model can be considered statistically significant at a certain level of significance. In 2012 and 2016, the regression models are also statistically significant at the 5% significance level.

Figure 7 - Dependence of VZP income on the number of insured persons by regions of the Czech Republic in 2020 for the category employees
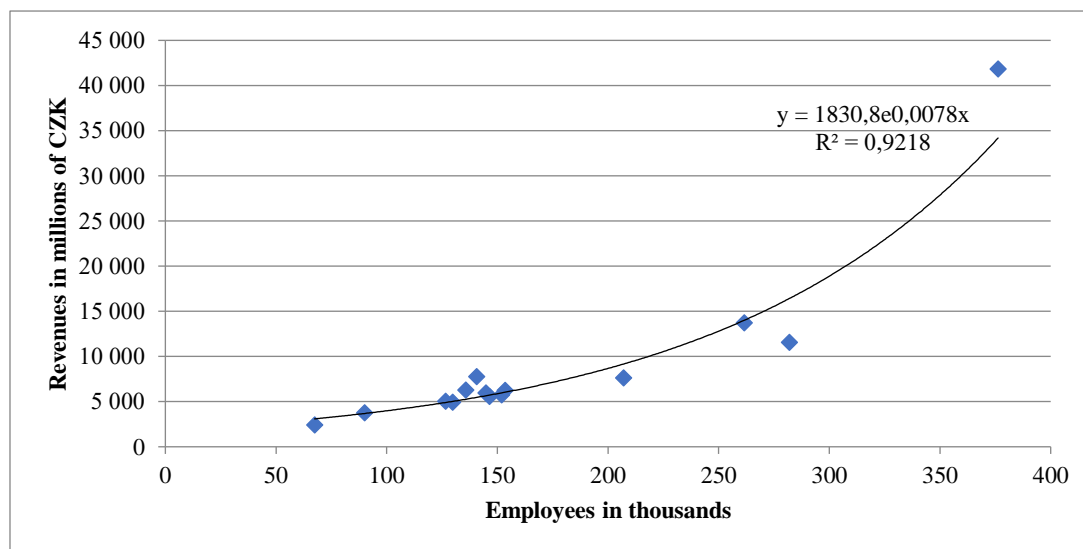
Source: own processing based on data from VZP (2020); Statgraphics software

The table 6 below shows the dependence of the VZP income on the number of insured persons for the category of entrepreneurs insured by VZP. In all years examined, the adjusted index of determination showed a quadratic dependence, which increased each year. In 2020, 99.79% of the variability of the values of the explained variable was explained. That is, there is a very high quadratic dependence between income and the number of entrepreneurs, and in the case of a compound regression it would be difficult to find another factor that influences the income of the VZP for the category of entrepreneurs.

Table 6 - Dependence of VZP income on the number of insured persons by regions of the Czech Republic for the category entrepreneurs

Year	R²	Function type	Equation function
2012	99,29%	Quadratic	$y = 0.0578x^2 + 11.952x + 109.25$
2016	99,68%	Quadratic	$y = 0.0642x^2 + 14.146x + 110.44$
2020	99,79%	Quadratic	$y = 0.0458x^2 + 14.096x + 54.328$

Source: own calculations based on data from VZP (2020); Statgraphics software

Figure 8 shows the relationship between the VZP income and the number of insured persons for the group of entrepreneurs. The overall F-test for this category among the regions of the country came out to be 3083.23. According to the p-values, the hypothesis tested can be rejected at the 5% significance level and the regression model is statistically significant at the significance level. The graphs for 2012 and 2016 are also statistically significant according to the partial p-values.

Figure 8 - Dependence of VZP income on the number of insured persons by regions of the Czech Republic in 2020 for the category entrepreneurs
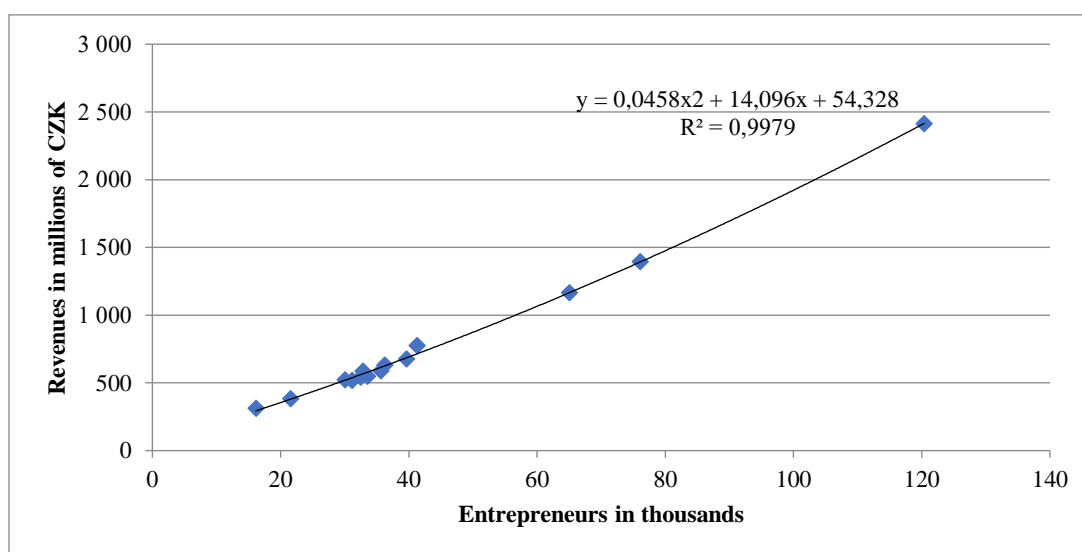
Source: own processing based on data from VZP (2020); Statgraphics software

Following table 7 shows the dependence between total VZP premium income and the total number of insured persons in the regions of the Czech Republic. In all periods examined, the adjusted index of determination showed an exponential dependence, which was probably due to the number of employees, which is the largest category of VZP. The exponential dependence increased with each year examined. In 2020, it was possible to explain 93.93% of the variability in the values of the explained variable, i.e., VZP income. In further research, it would be possible to investigate the complex regression dependence and add another explanatory (independent) variable to the number of insured, e.g., average gross wages.

Table 7 - Dependence of VZP income on the total number of insured persons by regions of the Czech Republic

Year	R²	Function type	Equation function
2012	86,18%	Exponential	$y = 2089e^{0,0029x}$
2016	90,97%	Exponential	$y = 2377.2e^{0,003x}$
2020	93,93%	Exponential	$y = 3274.5e^{0,003x}$

Source: own calculations based on data from VZP (2020); Statgraphics software

Figure 9 shows the exponential relationship between the total VZP premium income and the total number of insured persons. The overall F-test between the variables under study came out to be 202.17. According to the determined p-values, the hypothesis tested can be rejected at the 5% significance level and the given exponential dependence model is statistically significant at this significance level. The regression dependency plots for the period 2012 and 2016 for the total premium income of the VZP and the insured according to the partial p-values are also statistically significant.

Figure 9 - Dependence of VZP revenues on the total number of insured persons by regions of the Czech Republic in 2020
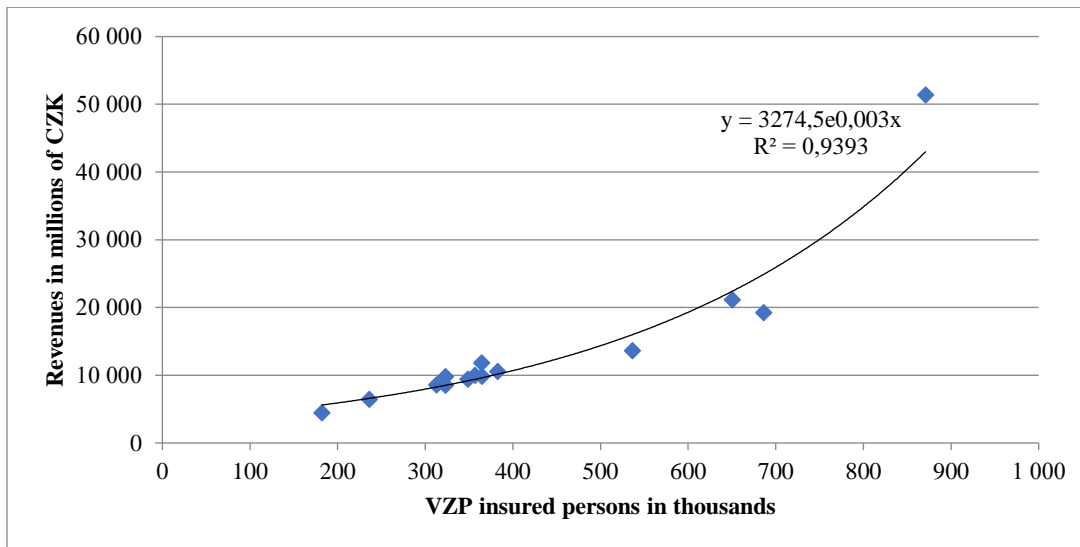
Source: own processing based on data from VZP (2020); Statgraphics software

4 Conclusion

The paper investigated to what extent the monthly revenues of the VZP in the time period 2010-2020 are mostly influenced by seasonality and furthermore, the dependence of the VZP revenues on the number of insured persons was investigated by means of regression analysis. For the category of insured employees, revenues were most above average in terms of seasonality in December and below average in March. For the business category, VZP revenues were most overestimated in March and most underestimated in April. For state insureds, the time series average value increased the most in June and decreased the least in May due to seasonality. Earnings for state insureds were the least affected by seasonality. Using regression analysis, it was found that the highest dependence between the VZP income and the number of insured persons by region of the country in 2012, 2016 and 2020 was for the category of business insured persons and a high quadratic dependence was demonstrated between the variables using the adjusted index of determination. The category of insured employees had an exponential type of dependence in all years analysed. For all income categories analysed (for employees, for entrepreneurs and for total number of insured), the highest dependence between the variables was shown in 2020 and the lowest in 2012. All the developed models can be considered statistically significant at the 5% significance level. It can be concluded that there is a high dependence between the VZP income and the number of insured persons by regions of the Czech Republic.

Acknowledgements

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Smart local governance and economic development

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Abstract: Smart city is a leading policy concept. Despite of existing numerous definitions it is difficult to tell what does the term means: its theoretic origin roots in green cities etc. and its physical origin relates it to ICT companies pilot projects. Still smart city by now is a local development strategy with a few special elements. As public policy it should respect norms of public developments of answering public interest, respecting public economics rules of transparency, defence of public goods etc. Measuring tools take part of good, efficient governance, but for helping smart local policy development a new method brink possible to see its coverage of public functions with smart city elements. Technology companies can be important actors of smart city policies and due to the nature of technology they can develop publicly financed monopolies (risk of rent-seeking). In Hungary local autonomy were shrinking, local government loss functions, resources, and capacities. A kind of apathy characterise them. Among these conditions they can initiate own programs with difficulties. Central government created frameworks for smart cities but financial resources are missing. For this reason, after a Europewide common starting of smart city story by now only a few can find.

1 Introduction

The aim of this paper is (1) to in deep knowledge about the character of smart cities and (2) to see a special case, Hungary, if among its changing conditions smart city concept can spread out. The interest of it is that in normal condition it can experience a kind of competition, while smart city performance is in many cases represent a kind of attractiveness.

2 Material and method

To meet objectives of this paper it had to (1) realize a broad literature review, (2) use European Innovation Scoreboard data (3) develop a special method for smart city policy analyses and (4) made a test survey using this method.

3 The success of smart city concept

In fact, smart city is a term with broad understanding, and it is a very trendy to be a smart city whatever it means. It is easy to find so called smart cities in the developed countries or in the developing world. In Europe Amsterdam or Barcelona are leading this current but Vienna or Copenhagen is doing their best too. Also, in the US or in Canada we have many metropolis or smaller places labelling themselves smart cities. In India it became a kind of national program (see https://smartcities.gov.in/). If we analyse more deeply what is called a smart city, what kind program can fit in we will find an even broader spectre from energy efficiency or ecology program to community leaded planning or high technology developments.

It is to state that smart city is common term for many programs and initiatives or innovations introduced in the last decades. At first it sounds to be exclusively related to technology but ecology, energy, community are equally important common elements of these programs. Innovation is also a key term, but it covers technological, institutional or community kinds. Can it be useful a wide term like this? My personal answers at first glance were negative as reject most of those thinks where I feel that it is not than a mainstream current of fashion. However, in the case of smart city I was force to in deep my knowledge on and I had to admit that this complex approach is more than a new way to express ourselves nowadays on old thinks. Finally, the usefulness of the terms can be found in a special understanding of the term "smart" which is flexibility, connectivity, and reliability.

The European Union itself is promoting the smart city programs, developments. Related to its Digital Agenda it opened a forum for definitions.[7] In a discussion in the City Hall of Budapest in mid od 2010's I heard from my colleague that the term should refer to "*something which is related at the same time to the municipality but also to the citizens and local entrepreneurs around almost three axes like energy, climate conscientiousness and environment-friendly technology*". Others highlight the role of information, communication, or transportation too. By the end to framework the efforts I decided the start the operationalization of the term from the following definition: „Smart cities should be regarded as systems of people interacting with and using flows of energy, materials, services and financing to catalyse sustainable economic development, resilience, and high quality of life; these flows and interactions become smart through making strategic use of information and communication infrastructure and services in a process of transparent urban planning and management that is responsive to the social and economic needs of society." (EU2013 : 5)

4 In deep the term of smart city

Mircea Eremia and his colleagues derive in their research the concept from 'garden city' (Ebenezer Howard 1998) stating that from around 2009 smart city began to substitute 'digital city' as synonym of 'future oriented city' linking sustainability and vision on where to develop. (Eremia 2017: 13-17.) From etymological point of view smart city with its mutations for regions or smaller settlements, villages it's a complex policy framework competing with other like 'competitive', 'liveable' or 'green' cities. Where the second member of the term define the administrative unit while but the but the first member strange word opening broad space to discussions. For L.G. Antropoulos (Antropoulos 2017: 5) in a conceptual analysis of the term smart everything modern and flexible. Which is in fact, a good maneuver to force to it intelligence, innovation, and technology. However, the smooth term of 'smart' include meanings from physical, technical word to responsiveness to other challenges of surround social and economic world, but also that co-operation and co-creation of the of future in strong, multiway linked with local community. From determinate point of view, it is a tautology given for example the definition of local governance of Anwar and Sana Shah introducing new vision on local governance state "Local governance, therefore, includes the diverse objectives of vibrant, living, working, and environmentally preserved self-governing communities. Good local governance is not just about providing a range of local services but also about preserving the life and liberty of residents, creating space for democratic participation and civic dialogue, supporting market-led and environmentally sustainable local development, and facilitating outcomes that enrich the quality of life of residents." (Shah A.-Shah S. 2006 p. 2)

The success of the concept or paradigm of smart city is due to its complexity and integrative character and as it third, but somehow flagship characteristics it introduces a tool to handle technological revolution in city management. The complexity of problem to be harmonised by contemporary city policies are mainly challenges presented by the multiplicity of city services, the climate change, and continuous concentrations of people in cities and finally to respond in some way the competition of urban centres. We shouldn't forget that from the late 1990's in societal context we deal with concepts digital and knowledge base society and in the economy with that of the 4th industrial revolution as effect of digital technology evolution, its penetration of all areas of the social life and its character of transforming domains and forms of human activities. (Lóth 2019) Despite simultaneous changes of these domains, smart city goes further harmonizing different duties of city policy. At this point we can invoke Prof. Dr. Ilona Pálné Kovács, member of Hungarian Academy of Sciences determining pillars of good governance as democratic quality, performance of public policy and its fact-based character. (Pálné 2014 : 9)

Boyd Cohen theory on smart city stages looks for the motor of smart city development starting with technology companies (mainly at the early 2010's with IBM or Telekom) and going municipalities (2nd half of 2010's think to Barcelona or Rio de Janeiro) till becoming community-driven developments in these last years (e.g. Wien, Amsterdam or Medellin). (Boyd 2015) In this context smart city is not exclusively a city policy but more a city development concept. However, hardly but still we can differentiate between motors and owner of programs. The example of Amsterdam Smart City shows that also a community driven program needs coordination and harmonization. However, municipalities should have some role even in the so-called 3rd phase smart cities and technology firms also keep their tier with innovations and investment or funding. Valid economic development model and their effective partnership scheme (cf. government - science – industry triple helix [Ranga-Eskovitzand

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[7] Previously known as Digital Europe Agenda (https://ec.europa.eu/digital-agenda/en/content/defining-smart-cities) takes part of European Digital Strategy with four special focuses as Digital Society (including digitalization of public services), Advanced Digital Technology, International Cooperation in Digital and Digital Economy.

2013, Farina-Fereira 2012] or Porter diamond [Porter 1990] and clusters concept [Porter-Stern 2001] should be considered).

5 Smart cities as city development strategy in a special framework

In summary smart cities are a special kind of local development program. They are complex local policies, strategic plans. However, we could see early smart cities initiated by technological compagnies which were more pilot and CSR projects. The strategic planning kind began when local public sector takes to initiative. This change in smart city content is a fundamental shift from a partial, private interest-based approach to that built on complex understanding of local needs initiating a large local cooperation assuring a better local future.

The shift from private to public, from pilot project to city strategy is big change. For technologic companies smart and intelligent city projects had to be a way to open city markets to their products. When local authorities began to initiate smart city policies the term became or a label, a kind of identification card. To deal with effects of technological changes was not a nothing new for them. Computers, networks, the internet arrived earlier to this sector. E-government and m-government projects showed up that modern technology is not merely new engines arriving to offices and workplaces, but they change to way of working, bureaucratic processes etc. Another important aspect is the use of public funds instead of private ones. We call rent-seeking when private companies try to canalise as much public money as they can, an easier way to make profit instead of selling products in private markets. For ICT technology the picture becomes more complicates considering the incompatibility and exclusiveness of ICT solutions which translates in economic terms in monopolies, limitation, and exclusion of competition. These conditions increase the responsibility public sector in spending tax-payers money. In my understanding smart local governance is more than a local public entity realising smart city policy. It is smart city policy, but also a responsible, transparent, liable, and future-, and community-oriented way of serving citizens (good governance).

Following the logic of local developments planning and operating realise in partnership of public, private sector and local citizens representatives (stakeholders, civic organizations, or even academic and innovative sectors etc.). This is somehow a variety of model of Porter and the triple helix used more for local decision making on development strategy. The involvement of local entrepreneurs and citizens is the interest of local authorities to increase the legitimacy of the local development plan and assure it as expression of local common will, relying independent from partial concerns. The character of local development plan, strategy of smart cities explain also how they can answer local and global challenges, and how the different answers are coordinated.

Why do we speak of a special smart city framework of the local development plan, and why call it smart. It could happen that among the challenges in front of the city the smart city policy gives special highlights those related to technologic revolution, as well as among resources helping to answer challenges technologic kinds gets priority. But we saw previously that it is not really the case. Smart cities in fact are local policies summarizing local policy experiences of the last hundred years and trying to be responsive, resilient, innovative, strategy and community-based, climate and environmentally friendly etc. Smart, intelligent but necessarily digital. It's a contemporary answer to contemporary problems using contemporary methods.

Mircea Eremia with its team simultaneously analyses how evolution of the city highlight the problems of internal and regional management. They show with facts that a fast-growing share of humanity is living in urban centres which can rich the 80% by 2050 in the European Union. (EU2016a, Eremia et al. 2017, Pálné 2017) At regional territorial organization level, we could see efforts from the 1960's to counterweight fast-growing big cities by creating a circle of reinforced cities the "Villes Nouvelles" or new cities. (Benevolo 1994) Between many measures' decentralization seems give more effects. At city level, without any intervention on one hand we see the effect of 'oil patch' which describes the expansion of the city following main roads, highways and public transport lines and unused areas in the middle, disfunctions in use of the city space (daytime – night use, residential, commercial administrative or other functional use etc.). All these problems can have handled with careful city planning as well as operating modern city services, by integrated city policies from which smart city is one of the dominant frameworks.

Smart city conception renews solutions by use of new, innovative technologies, involvement of wider range of actors and broader cooperation schemes. Now paradigm of city planning models surge harmonizing and integrating independent, civic innovative programs. The example of Amsterdam Smart City show how these open civic initiatives need some coordination from local authority which final touch lead it to win finally the Innovative Capital award of the European Commission in 2016. The valuable solution of Amsterdam was a multi-stakeholder

platform dealing governmental, entrepreneurial, citizens' and academic partners, solving cases like the everywhere conflicting Airbnb. Amsterdam efforts and partnership are well documented at its web site: http://amsterdamsmartcity.com.

Figure 1 - Project of Amsterdam Smart City LINK: https://amsterdamsmartcity.com/
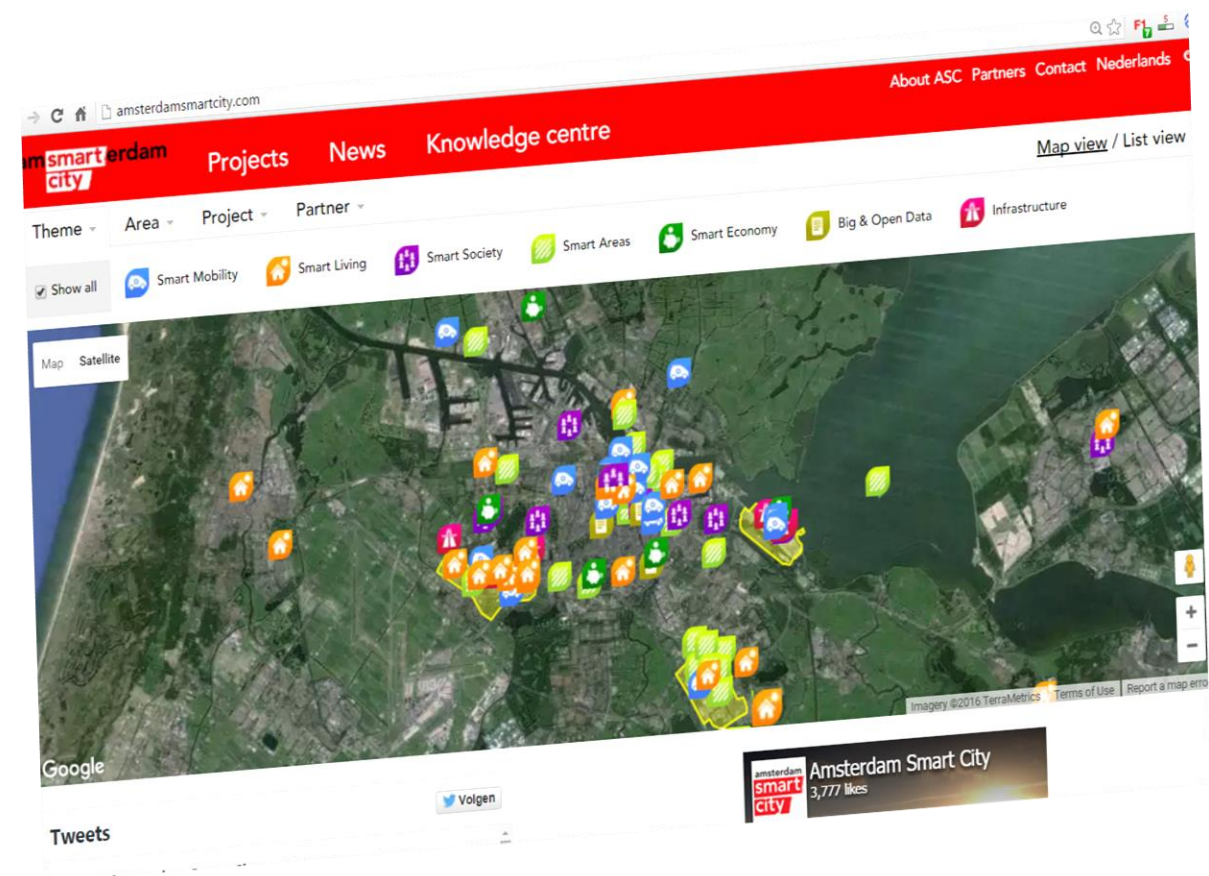
Source: Amsterdam Smart City

Simultaneously with local and national levels the European Union itself seems to contribute with strategies, action plans, methodology and funding to initiate local and national efforts over the old continent. E.g., most of the point if not all point of the Pact of Amsterdam signed in 2016 (see References) harmonizes with smart city policies. We find their as domain to deal with social integration of migrants, air quality, urban poverty, housing, circular economy works and skills in local economy, climate conscientiousness, energy transition, sustainable land use and nature-based solution, urban mobility, digital transition, and innovative and responsible public procurement. (Szuchy 2018: 204) These domains or objectives correspond to the expansion of the goals to achieve by 2020 by the European Union: smart, sustainable and inclusive growth. Shrink use of energy with renewable higher share.

If we look for motor of smart city programs as far as they have a strong technological background, we will have found also technological companies interested in their turnover and competitiveness and for that in innovations (public and private, see: Amsterdam case). Anikó Sükösd analyses the environment of innovations, the interaction of its individual and social component like the contribution of innovators and institutions. (Sükösd 2019).

6 Efforts to measure

6.1 Policy effectiveness

While trying to identify smart cities essence we can look for measuring tools which somehow define in detailed form goals to get. These tools can measure *(1) effects of city policy like use or availability ICT or digital literacy, but it can test (2) strategy development and management to get goals or strategic efforts to do so*.

To measure effect is of smart policies very important, in fact it shows policy effectiveness and performance, the reasons of inverting public money on these developments. The most common instrument for this is symbolised

with the weal cut in six pieces: smart mobility, smart people, smart living, smart environment, smart government, and smart economy (see: Figure 2) Also, they evaluate general picture infrastructure, penetration or use of technologies or social and economic capacities which needs more time to reflect political efforts. In general term these data help to evaluate policy with some distance due to their 2-3 years delay. As critic for this method, it can be mentioned that the 'results' are not exclusively effect of the policy to be measured.

Originally DESI Index is measuring digital economy and society with a special technologic focus. It is recent tool from 2016. (DESI 2016) In the earliest efforts Professor Rudolf Griffinger and its team ranked medium-sized European cities measuring with special survey their smart city preparation and determining phases like pioneers to followers. (SFR 2007) By now use data collected by European statistical office, the Eurostat is available at different territorial level in standardized form, and it is used to measure policy performance all over Europe. Also, in Hungary Lechner Knowledge Centre (see: References) recommend this method for Hungarian cities.

Figure 2 - Smart City Programs main areas in European Union
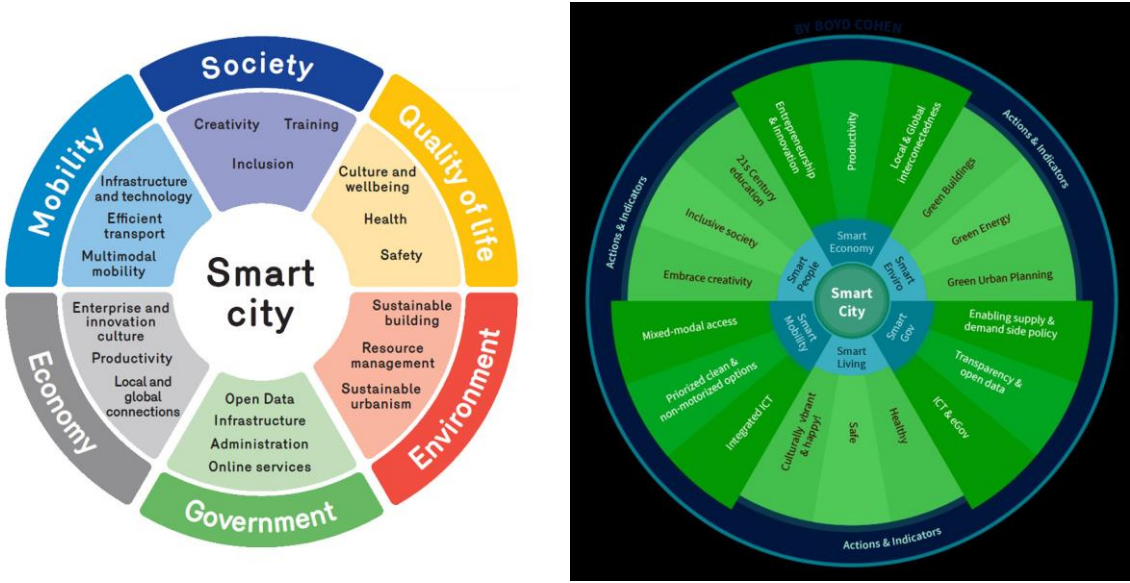
(a) Brussel Smart City model   *(b) Boyd Cohen: 'The Smart City Wheel'*

Source: (a) Smart City Brussels LINK: https://smartcity.brussels/graphics/projet_def_en.jpg
(b) SmartCityCycle.org LINK: https://www.smart-circle.org/smartcity/blog/boyd-cohen-the-smart-city-wheel/

6.2 Strategy design, management and problem covering

The second and third option don't bring direct information performance Policy or only on goals, design, and management. Strategy analyses gives up to date information on efforts inverted in creating smart city. Smart city strategy should still be measured. The in framework of this research three main challenges to answer by smart policies in base of the European Innovation Partnership on Smart Cities and Communities Strategic Implementation Plan' smart city definition (EU2013: 5), which are sustainable development (in environmental, social and economic sense) and technologic revolution from one hand and governance (resilience and transparency) in the other. The special areas of answers of smart city conception should deal with environment (a link to the origins of the term, see Eremia et al. 2018), innovation (capacity to renew local environment), and community (active, inclusive and capable), but as the fourth core element with energy. These would pillar of smart city program to test. (See: Figure 3 - Conceptual elements for Smart City . Finally, the essence of local governments is to organize community, its activities and life. We also included quality of governance as far as modern welfare state public administration, and services are becoming more and more a formal and they lose its democratic relationship with local people. For this, under smart city paradigm appaired involvement (community actions, planning, budgeting etc.) of local citizens but are effective key element also for innovations. (See Figure 3)

Figure 3 - Conceptual elements for Smart City strategy measuring
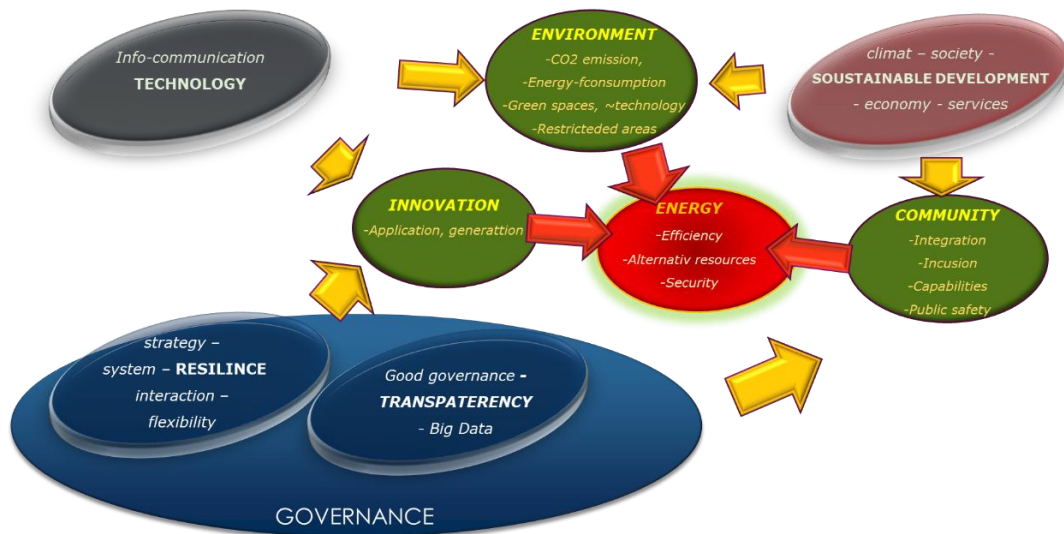
Source: Own work

In fact, evaluating local development strategy's smart city character it should be checked at what extent and how these pillars are present while developing local functions. (See Figure 4) Indicators developed will test how local government transforms itself, creates new circumstances in partnership with local citizens and enterprises. This vision gains new importance with terrorist acts or China's efforts to use digital technology to strength authoritarian regime control over citizens (safety data and privacy). A pilot testing model consisted of 44 indicators and a 99 question some of them with sub-questions.

Figure 4 - Example to the development of indicators by cells of the matrix

	Community	Innovation	Sustainability	Energy
Communal services				
Mobility			← *What programs, local resources exist in this topic*	
Safety			*in the do the municipality to develop it.*	
Human infrastructure				
Administrative functions				
Democracy				
Capacity building				
Competitiveness				

Source: Own work

6.3 Case study: Hungary

Similarly, to worldwide trends smart city programs appeared in Hungary, in last years of the 2000's and first years of the 2010's with technology companies pilot programs (See digital City in Szolnok or the IBM's research program for seven cities), but these were stopped at the ending of the pilot period. (Pukler 2015, Dirk-Keeling 2009, Lados-Horváthné 2011). Integrated city development city development plans of the 23 biggest cities (prepared between 2012-14 for the 2014-2020 EU budget cycle) contained only in few cases reference to smart cities. From 2014 the central government initiated the development of a national digital program (finished in 2017) and charged from 2015 its institution, the Lechner Knowledge Centre got to develop methodology and help cities becoming smarter. (See Reference) A Modern Cities Program of the Hungarian government was initiated by Hungarian government in 2017 concentrating to traditional development, However, during the revision of integrated development plans in 2018 a mandate chapter on smart city planning had to be included, and Smart Villages program in 2019 had a strong smart focus. The Digital Well-being program do not focus on settlements, but from 2017 includes smart city projects. Independent initiatives also surged like Digital Settlement Network or Smart City Lab, and we can find micro-regions municipal associations trying to find smart future. In a previous study I looked over this problem in detail. (See Kovács 2020) The result of all these efforts is still a country poor in smart cities.

It can be identified to main reasons of the lack of expansion of smart cities in Hungary: 1) The first is the new political philosophy (from 2010) hostile against any autonomy like that of local government which waken significantly Hungarian local authorities: 2010 and 2014 lost important functions, around 40% of their annual budget, and the process did not stop (lastly the garbage collection was centralized). This process practically paralized local governments, they lost their innovative character. Secondly the central government controlling most of the financial resources did some important step the help the expansion of smart city model but don't bring financial resources.

Figure 5 - Performance of European Union member state' innovation system (EIS), 2023
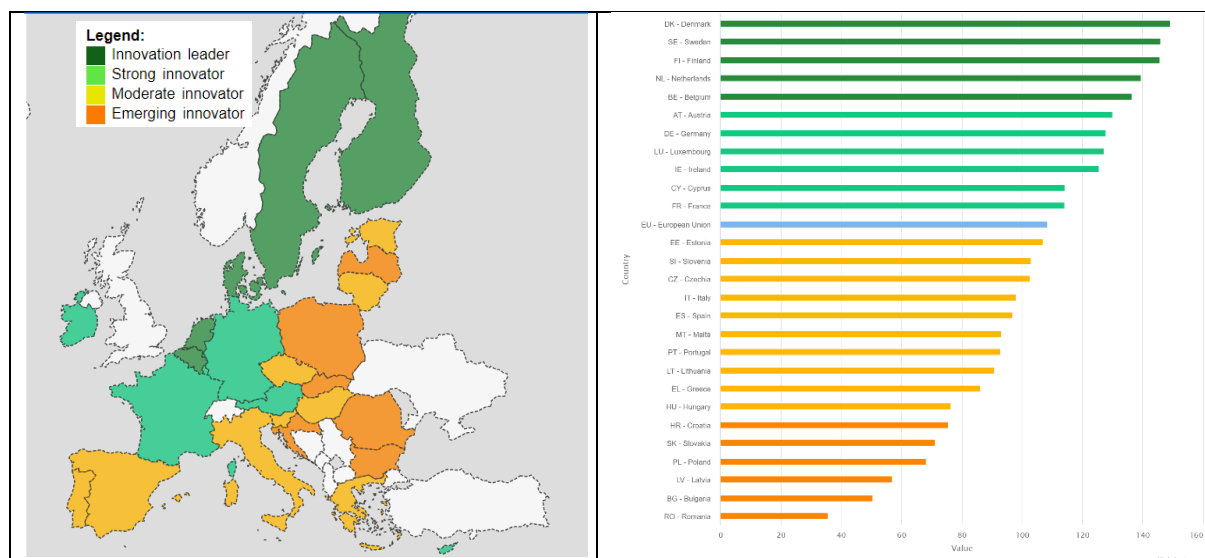
Source: European Innovation Scoreboard (Hollanders et al. 2019) LINK: https://interactivetool.eu/EIS/index.html

Table 1 – Indicators of the European Innovation Scoreboard 2019, 2022 for Hungary

Scale of performance	Performance Changes			Performance relative to EU			
	2015-2022 (average change / year)	2021-2022 one year change	2022-2023 one year change	2011	2018	2022	2023
Summary Innovation Index	**7,1** (1,01)	**3**	**2,4**	**66,2**	**69,0**	**69,8**	**70,4**
Human resources	**0,0** (0,00)	**0**	**3,6**	57,0	53,7	45,1	47,0
Attractive research system	**38,3** (5,47)	**11,5**	**-0,1**	37,1	55,9	78,8	77,8
Innovation-friendly environment (2011, 18) / Digitalisation (2022)*	**3,2** (0,46)	**3,2**	**8,1**	68,8	144,7	71,8	72,5
Finance and support	**9,5** (1,36)	**1,3**	**0,5**	36,5	46,2	79,7	77,6
Firm investments	**-6,3** (0,90)	**5**	**9,2**	74,3	98,0	68,3	74,1
Use of information technology			**10,4**				79,5
Innovators	**46,7** (6,67)	**13,7**	**13,7**	28,9	30,9	49,3	49,3
Linkages	**61,5** (8,79)	**8,7**	**3,5**	81,6	57,1	96,1	95,5
Intellectual assets	**2,5** (0,36)	**1,6**	**-4,8**	36,6	40,1	52,3	47,7
Employment impacts	**14,0** (2,00)	**9,3**	**0**	127,1	124,2	59,4	60,1
Sales impacts	**-7,6** (1,09)	**-2,6**	**-3,3**	111,1	84,1	84,9	86,2
Environmental sustainability*	**-19,0** (2,71)	**-3,1**	**-5,2**			70,4	70,1

Source: European Innovation Scoreboard 2019-23 LINK: https://interactivetool.eu/EIS/index.html
Note: Categories are change over time which take difficult the comparison with older publications
Comment:* Digitalisation and environmental sustainability categories have changed over time

Figure 6 - Results of the pilot survey
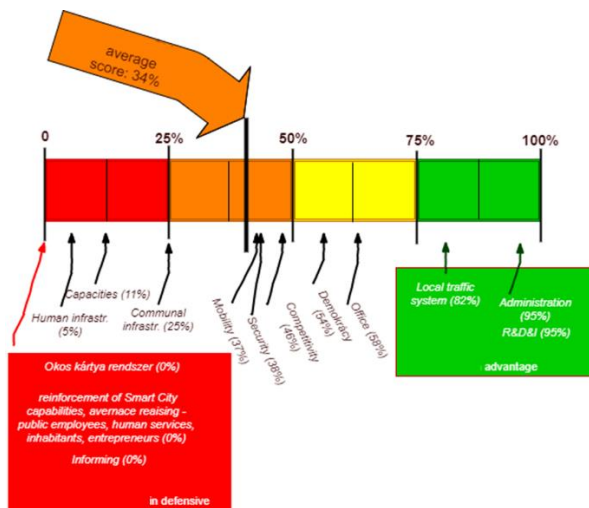
S1-CODES	N1-MODULS	I1-INDICES
N100	COMMUAL INFRAST.	24,96
N200	MOBILITY	37,49
N300	SAFETY	37,53
N400	HUMAN INFRSTRUCT.	4,63
N500	ADMINISTRATION	57,57
N600	DEMOCRACY	54,17
N700	CAPABILITES	11,13
N800	COMPETITIVENESS	45,50

Source: Own work

The centralization of intellectual, financial etc. resources and the frozen of local level did not stop all innovation potential in Hungary. The level Following the European Innovation Scoreboard Hungary is moderate innovator which correspond to the position of many other countries of the region. However, pioneers of Central East European countries, like Czechia or Slovenia are attempted the level of moderate innovator from immerging innovator. (See Figure 5) It increased 7.7 percentage points between 2016 and 2023 less than European average (8.5 percent point). Its strength is foreign doctoral students and government support to business, and its weakness are design applications or business process of innovations.

A pilot survey testing the presented local strategy analyses method in one of Hungarian country seats. We saw that pilot city even of being a city in advantageous situation from many points of view it must invest efforts to become stronger from smart city perspective. Its strength was the better prepared administrative areas and the use of smart technics for local democracy and develops some elements of mobility, but the city did not made to match efforts to increase digital capabilities.

7 Conclusions

Smart city is dominant paradigm for local development strategies, but its content is difficult to synthesize. It's a special framework by its nature reflect an answer to the most important contemporary defeats like sustainability related problems, technology changes and democratic challenge. The origins of the can be found in green cities but also in the effort of technologic companies creating pilot city projects. To in deep knowledge on smart cities its interesting how smart cities policies are measured. In one hand measuring smart policy effiency it can be tested the advance in areas of social, economic life, governance etc. Alternative way is to look for strategy management effectiveness or see at what extent local policies covers in their special areas what a smart city could be.

The empirical test was a case study of a very special experience, that of Hungary. We saw a very similar starting point to other European countries which was stopped by the loss of potential of local authorities in the country, a new centralization wave. Even if local capacities were stopped but the country innovation performance represent an intermediate level among CEE and former communist countries, but it is slower than European average. A pilot research show that cities got most of technological need but citizens preparation, capacitation to the digital future or present is missing.

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Development of the Quality of Electronic Records within Public Administration

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Abstract: The paper deals with one of the most important tools of European public administration, namely the record, in its electronic form, which is an increasingly used form within the development of eGovernment. Compared to an electronic signature, the general qualities of electronic records are much less formalized and standardized. The proof of this is our research of the quality of electronic records created by public authorities in the Czech Republic over the last 6 years, which was focused mainly on data formats and their resistance to format obsolescence and user-friendliness also associated with technological neutrality. Based on the fact that the public administration may only act on the basis of the law and within its limits, we conclude that it would be appropriate to strengthen the legal embedding of the rules that electronic records, especially in the role of public records, have to achieve to be more acceptable by their recipient, more beneficial for them, and last but not least more resistant to different obsolescence.

Keywords: eGovernment, electronic records, electronic records management systems, data formats

JEL Classification: H11, K24, H43, D73, H83

1 Introduction

A record is defined by ISO 15489 as information created, received, and maintained as evidence and information by an organisation or person, in pursuance of legal obligations or in the transaction of business. In the context of public administration, which decides on the rights and obligations of persons, the records are the essential tool for preserving these decisions. That is why the quality of records, which has to be assessed from many points of view, is important. This quality includes their content, informational value, and technical aspects of creation [11, 22]. The content of records has a legal dimension linked to the nature of the stored information. The technical side is connected with the form of records. In connection with the development of the electronization of public administration, more and more records are created in electronic form [6, 14, 17], and therefore it is important to examine how this transformation is carried out.

Electronization of public administration (eGovernment) is a continuous process just like the development of information society [25]. It has some specific borders and restrictions in comparison with private sector [7]. In spite of the fact that it opens new ways of interaction with public bodies, which could be more beneficial for citizens, businesses, and other clients of eGovernment in comparison with classical ones [21, 12], the essential role of records and records delivery systems still remains very important within this process [10].

According to the study [12], there is a nascent linkage between eGovernment performance and citizen satisfaction, and eGovernment performance, which is connected with the quality of online services and other components on which eGovernment services are built. Evaluation of the success of eGovernment projects could be measured by many different indicators, such as a number of users or transactions [5, 7, 18], economic impacts [5, 9] or citizen satisfaction and perceived benefits [12, 21]. But the quality of the individual building elements of these projects remains a basic assumption, without which there would be nothing to measure [8, 18].

In terms of legislation in the European context, transformation of records into electronic form is supported by the Regulation No. 910/2014 of the European Parliament and of the Council on electronic identification and trust services for electronic transactions in the internal market and repealing Directive 1999/93/EC, which is commonly called the eIDAS Regulation [4, 10]. This Regulation describe also electronic signatures, which is important for ensuring the trustworthiness of stored information. It is important to mention, that the electronic record is described and standardized only very weakly compared to the electronic signature. That is why it is useful to deal with the issue of electronic records and show what the necessary qualities of them are and how public administration in the Czech Republic approaches them and whether and how this approach changes over the time.

This research follows our previous basic survey of the current situation in the beginning of the year 2023 [14], which, however, could not provide sufficient answers due to its time (only 3 months) and quantity (only 200 investigated public authorities) limitations. That is why we decided to increase time scale to more than 6 years (since the version of the National standard for electronic records management systems [19] has been valid) and to take into account more than 750 public authorities.

1.1 Public Records

Records are frequently used means of evidence to prove certain facts related to a certain moment in time. In the Czech law they are divided into private and public ones, while this division is essential from the perspective of the burden of proof. If someone refers to a private record, it is up to them to prove the authenticity and correctness of the record [26]. On the contrary, it applies to a public record that the fact confirmed in the public record constitutes full proof against everyone of the origin of the record, of the time of its acquisition and of the fact about which the author of the public record confirmed that it took place or was carried out in their presence, as long as until proven otherwise [26]. Simply put, it is a presumption of the correctness of such a record. In order for a public record to have such characteristics, it must be issued by a public authority within the scope of its authority and, which is often neglected in primary approaches, it must fulfil the corresponding qualities.

According to the study [2], the definition of quality in public administration is not clearly given, however, the theory of quality in the conditions of the Czech Republic defines it as the degree of fulfilment of legitimate demands of customers for the required public service or of citizens for the quality of life in a given municipality, county or region. Quality has several dimensions [1]. The quality of public documents can be assessed in terms of content, information, or technical aspects [11, 22].

The content aspect includes the mandatory elements of a public record given in particular by procedural legal regulations (e.g. administrative procedure code) or in general by the Act No. 499/2004 Coll. on Archiving and Records Management Systems and on Amendments to Some Acts (Act No. 499/2004 Coll.), and its implementing Decree No. 259/2012 Coll., on Details of the Records Management System (Decree No. 259/2012 Coll.) [11]. The informational value of documents is linked to their content, although from a general point of view it is built on the theory of information based on three basic relevancies, specifically syntactic, semantic and pragmatic relevance [11].

The technical quality then depends on the medium on which the record is stored. These bearers can currently be divided according to their form into a paper form and an electronic form. The technical quality of the paper form of the record includes the chemical properties of the paper and the ink, which was used for writing [22]. Moreover, in some cases of specific public records, the technical quality is further increased by the use of other security elements. For example, identity cards of Union citizens issued by Member States shall follow security standards, formats, and specifications according to Regulation (EU) 2019/1157 of the European Parliament and of the Council on strengthening the security of identity cards of Union citizens and of residence documents issued to Union citizens and their family members exercising their right of free movement.

1.2 Electronic Records

In general, it is discussed that electronic records held over a long-term face technological risks from three directions media degradation, hardware obsolescence, and format obsolescence [3]. In short term the media degradation and the hardware obsolescence are covered by various storage and delivery services, such as data mailboxes (see below). However, the correct choice of data format, which can be defined as „the internal structure and/or encoding of a record or component which allows it to be presented into human-accessible form" [3], is already very important at the time of the creation of the electronic record to prevent format obsolescence.

From the point of view of the quality of the preservation of electronic records, the Act No. 499/2004 Coll. establishes requirements for ensuring the credibility of the origin of records, the inviolability of their content, their readability, and the creation of metadata belonging to these records and connection of data proving the existence of a record in time. All this is to be provided for electronic records by the electronic records management system [11].

The ISO 15489 standard distinguishes between the terms document and record. A record means recorded information or object which can be treated as a unit. A record may incorporate one or several documents (for instance when one document has attachments). These definitions are also used in the European standard called MoReq2 [3]. A key feature of a record is that it cannot be changed [3]. The current definition of an electronic document is in the eIDAS Regulation [4]. According to this Regulation electronic document means any content

stored in electronic form, in particular text or sound, visual or audiovisual recording. The Czech translation of this Regulation mixes these terms, therefore we should combine both definitions in electronic form, electronic records and electronic documents [11, 19].

The quality of electronic records could also be evaluated according to their usability value. From the point of view of human rights some electronic rights have started to be discussed, such as rights of digital services [15] or rights of technological neutrality [16]. Technological neutrality of electronic records should be positively correlated with mentioned usability value, because more recipients of these records can display it on more different digital platforms. That is why technological neutrality is one of the aspects of quality of electronic records, and it is also connected with data format.

Evaluation of quality of data format from different points of view is typically done by libraries [13] and archives [23]. Their aim is to support the accession and long-term preservation of electronic records held by them. The quality is evaluated from both a long-term [20] and a short-term [13] perspective. This evaluation includes sustainability factors and quality and functionality factors. Sustainability factors cover disclosure, documentation, adoption, licensing and patents, transparency, self-documentation, external dependencies, and technical protection considerations [13]. Quality and functionality factors include normal rendering, integrity of document structure, integrity of layout and display, support for mathematics and formulae, and functionality beyond normal rendering [13]. Based on this research, there are defined so-called output data formats by the Decree No. 259/2012 Coll. [11]. They are summarized in Table 1. However, from a legal point of view, the use of output data formats is enforced only in cases when an electronic record is created by the electronic records management system, or an electronic record is stored in the registry, which is part of the electronic records management system, or an electronic record is transferred to the digital archive.

Table 1 – Output data formats

Name	Sign	Standard or comment
Portable Document Format for the Long-term Archiving	PDF/A	ISO 19005
Portable Network Graphics	PNG	ISO/IEC 15948
Tagged Image File Format	TIF/TIFF	Revision 6
Joint Photographic Experts Group File Interchange Format	JPEG/JFIF	ISO/IEC 10918
Graphics Interchange Format	GIF	
Moving Picture Experts Group Phase 1	MPEG-1	ISO/IEC 11172
Moving Picture Experts Group Phase 2	MPEG-2	ISO/IEC 13818
Moving Picture Experts Group Phase 4	MPEG-3	IEC 14496
MPEG-1 Audio Layer II or MPEG-2 Audio Layer II	MP2	
MPEG-1 Audio Layer III or MPEG-2 Audio Layer III	MP3	
Waveform audio format	WAV	
Extensible Markup Language Document	XML	
Information System Document	ISDOC	Subformat to XML for electronic invoice

Source: Decree No. 259/2012 Coll. on Details of the Records Management System

1.3 Data Mailboxes

Data Mailboxes is the name for an electronic registered delivery service between public authorities and private bodies, which was created in the Czech Republic in the middle of the year 2009. This system is based on the Act No. 300/2008 Coll. on Electronic Acts and Authorized Record Conversion (Act No. 300/2008 Coll.). The main reason for Data Mailboxes creation was to provide safe electronic communication between public authorities and private bodies and between public authorities themselves [17].

The group of data formats, which can be delivered by Data Mailboxes, is specified by the Decree No. 194/2009 Coll. on Details of the Use and Operation of the Data Mailboxes Information System. This group is wider than the output data formats group defined by Decree No. 259/2012 Coll. That is why Data Mailboxes can transfer electronic records, which are not in output data formats either. But if public authority accepts electronic application in the form of an electronic record, which is not in output data formats, it should convert it into output data format. This process is not always successful, and it is connected with transaction costs, which include machine time, labour costs for the person responsible for checking the result, costs for electronic security elements such as a qualified electronic seal and a qualified electronic time stamp. It means that if one public authority sends an electronic record in the non-output data format to another public authority, it brings some unnecessary expenses of public administration.

Data Mailboxes can be of four types [17]:

- A data mailbox of natural person
- A data mailbox of entrepreneurial natural person
- A data mailbox of legal person
- A data mailbox of public authority

In the Czech Republic there are approximately 19 thousand public authorities, which are registered in the basic register of public authorities, and which have a data mailbox of public authority [2]. Their list is presented in the form of open data by Digital and Information Agency. The first definition of these authorities was in the Act. 300/2008 Coll. [17] and covered typical authorities such as ministries, courts, other state authorities, and municipalities, but it has been later extended to entities that were entrusted with responsibilities in the field of public administration, such as schools. This diversity of public authorities will be also taken into account in the research in this paper.

2 Methods

The analysis method based on data provided by electronic records management systems was used. There were not investigated electronic records produced by some chosen public authorities, because this would only show the quality of electronic records produced by these selected bodies. That is why it is better to use the statistics of data formats of received electronic records via Data Mailboxes from other public authorities, which can cover a much wider range of public authorities. Even just five statistics sets provided by municipalities contained electronic records sent from 766 different all kind public authorities, which is approximately 4% of all public authorities having data mailbox.

The analysis included statistical outputs created by electronic records management systems due to the requirement 2.1.15 and 8.2.3 letter b) of the National standard for electronic records management systems [19]. Only those components of electronic records that were received from the data mailbox of another public authority were selected, in order to shield the outputs of the format conversion according to the Act No. 499/2004 Coll., which is carried out directly by the authority itself, and secondly, so that the statistics are not burdened by electronic records received from entities, which are not subject to the obligation to create electronic records in the output data format.

The structure of statistical outputs files contains date of application, identification of the data mailbox and the output format of the received electronic record. The identification of the data mailbox was linked to the open data register of public authorities [2], so that there could be categorized a sender and possibly assigned to one of the specially selected groups of public authorities, which could be interested in leading a separate investigation as well. These categories are ministries, courts, police, municipalities, and schools.

2.1 Data

The 46 580 electronic records were examined. They were received from 766 different public authorities in the period from January 2017 to March 2023. The Table 2 shows total numbers of different data formats, which were in statistical file.

Table 2 – Total numbers of data formats

Data format	Number of received electronic records	Ratio frequency	Is it output data format?
PDF	25517	54.78%	No
PDF/A	15305	32.86%	Yes
XML	2616	5.62%	Yes
JPG/JPEG/JFIF	690	1.48%	Yes
DOCX	424	0.91%	No
TXT	417	0.90%	No
FO/ZFO	395	0.85%	No
XLSX	332	0.71%	No
DOC	326	0.70%	No
XLS	213	0.46%	No
HTML/HTM	178	0.38%	No
PNG	49	0.11%	Yes
RTF	38	0.08%	No
PPTX	23	0.05%	No

P7S	22	0.05%	No
CSV	9	0.02%	No
TST	8	0.02%	No
TIF/TIFF	7	0.02%	Yes
ODT	4	0.01%	No
PPT	4	0.01%	No
MP2/MP3	3	0.01%	Yes
Total	**46580**		

Source: Own calculation

Since our research is based on investigation of electronic records created by 766 different public authorities, it does not make sense to focus on absolute numbers, but on percentage usage of output data formats. Its development over the time for all investigated public authorities is summarized in the Figure 1.

Figure 1 – Development of percentage usage of output data formats
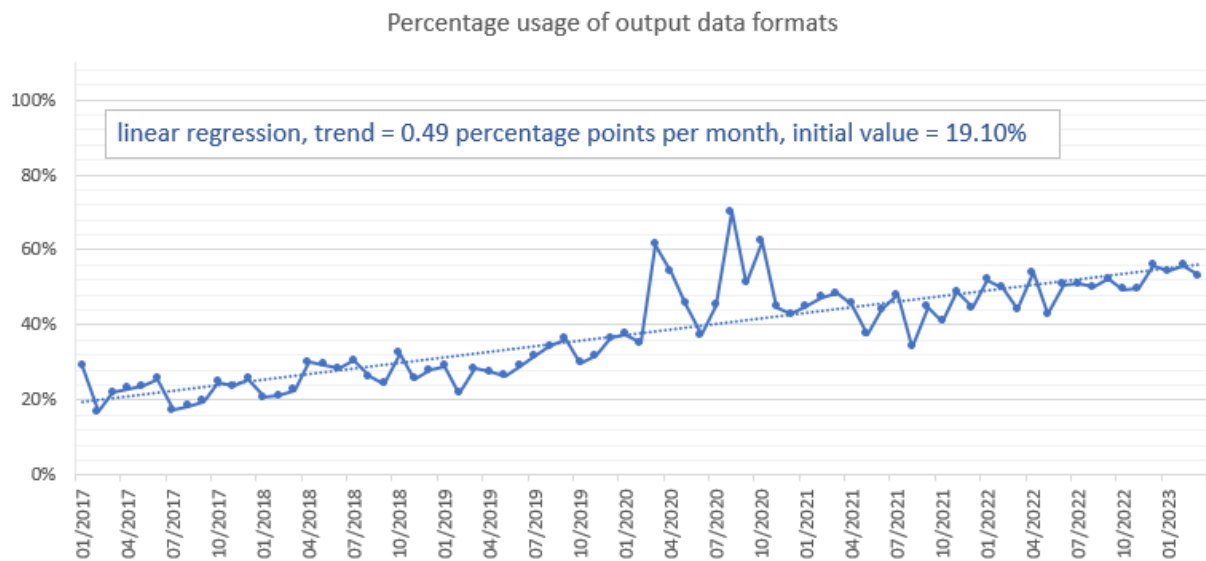
Source: Own calculation

Thanks to the open data register of public authorities [2], it was possible to distinguish between different kinds of public authorities. We chose ministries, courts, police, municipalities, and schools. The Figure 2 shows their proportionate occurrence in in the entire statistical set.

Figure 2 – Proportional number of selected groups of public authorities in statistical set
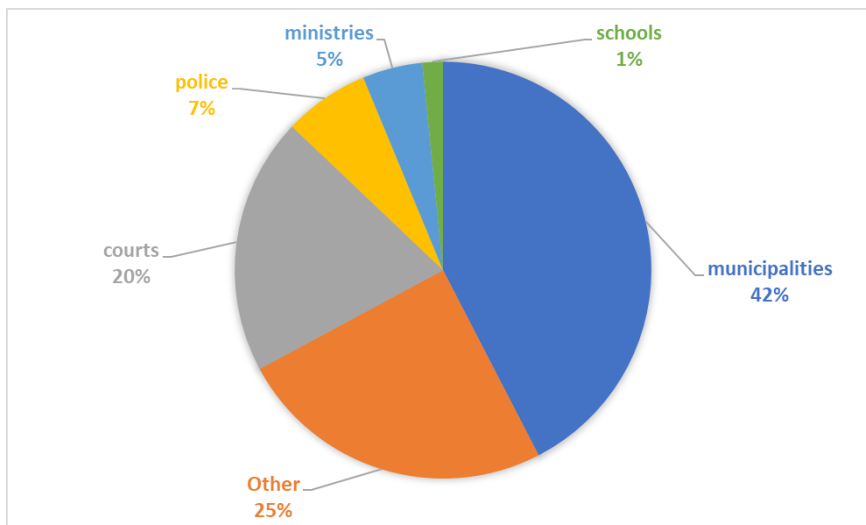
Source: Own calculation

The Figures 3, 4, 5, 6 and 7 respectively shows the development of researched percentage usage of output data formats in the monitored period.

Figure 3 – Development of percentage usage of output data formats by ministries

Percentage usage of output data formats by ministries

linear regression, trend = 0.49 percentage points per month, initial value = 19.09%
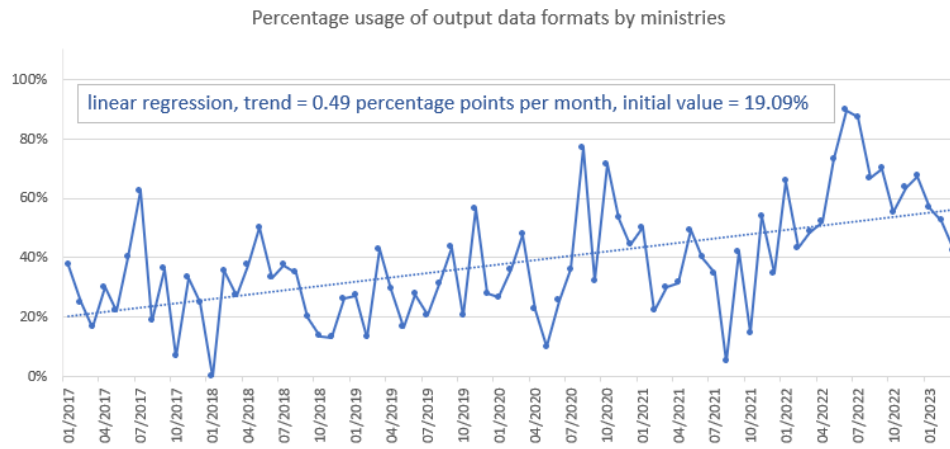
Source: Own calculation

Figure 4 – Development of percentage usage of output data formats by courts

Percentage usage of output data formats by courts

linear regression, trend = 0.09 percentage points per month, initial value = 0.88%
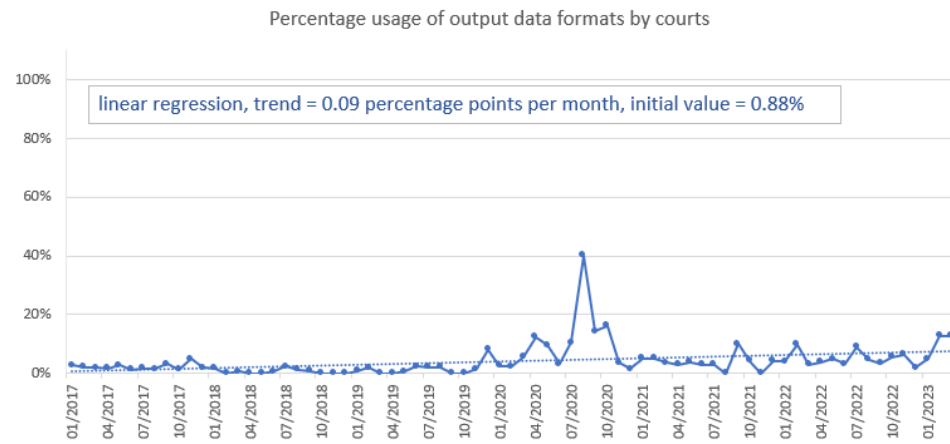
Source: Own calculation

Figure 5 – Development of percentage usage of output data formats by police

Percentage usage of output data formats by police

linear regression, trend = 0.22 percentage points per month, initial value = 20.42%
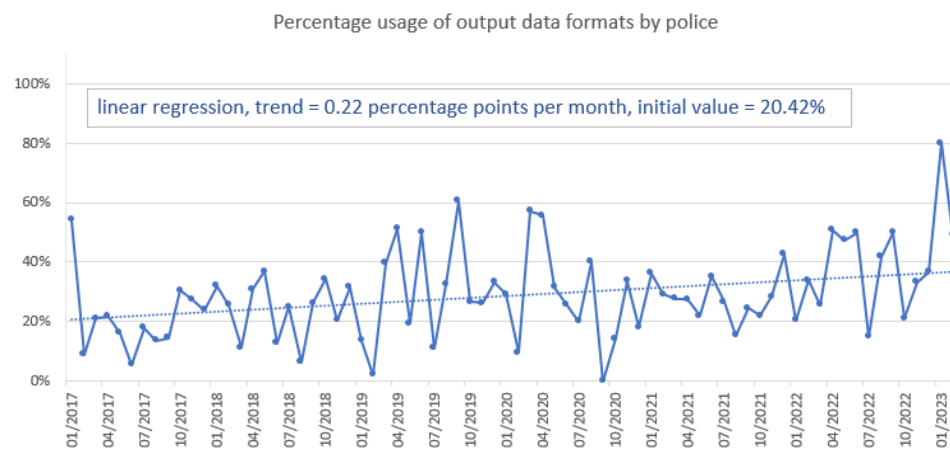
Source: Own calculation

Figure 6 – Development of percentage usage of output data formats by municipalities

Percentage usage of output data formats by municipalites

linear regression, trend = 0.26 percentage points per month, initial value = 39.69%
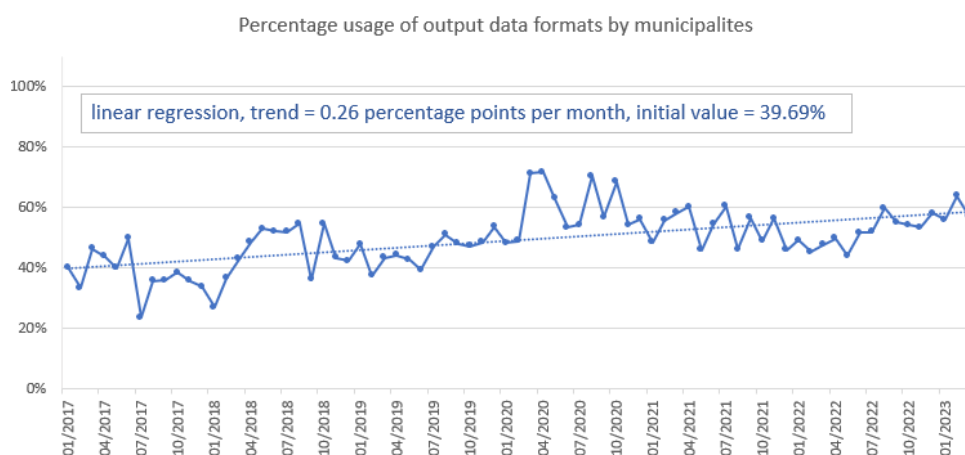
Source: Own calculation

Figure 7 – Development of percentage usage of output data formats by schools

Percentage usage of output data formats by schools

linear regression, trend = 0.36 percentage points per month, initial value = 8.43%
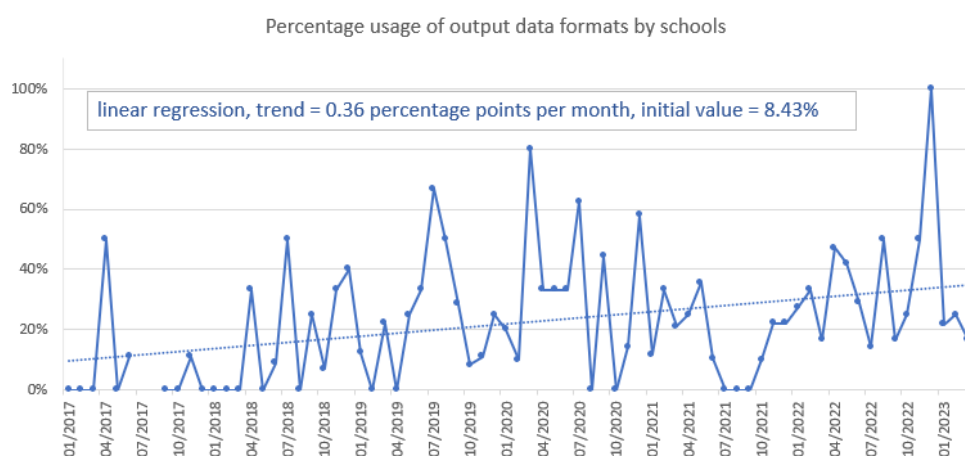
Source: Own calculation

3 Results and Discussion

It can be seen from the Table 1, that almost all electronic records, which are sent via Data Mailboxes from different public authorities to municipalities are almost static text or static combined text and image records. Only 3 records were sound recordings, and no record was a visual nor audiovisual recording. The most used data format is some kind of PDF, almost 88%. It must be emphasized that it is very important to distinguish between PDF and PDF/A.

The general PDF may not be but can be depending on the display device, e.g. from the point of view of the correct display of Czech characters. The PDF/A was specially created for a long-term preservation of electronic documents and their independence on the display device [17]. But from the point of view of the ability to capture certain content they are very similar. In other words, there is no reason for using only PDF instead of PDF/A, but there are a lot of reasons for using PDF/A instead of a simple PDF. Thus, the first step in improving the quality of electronic records would be the strict use of PDF/A in cases where documents from the PDF format family are created.

The structure of electronic records senders, which is shown in the Figure 2, depends on the chosen recipients, i.e. municipalities. This creates some boundaries for the reporting ability of the investigated results related to specific groups of public authorities, but does not significantly limit the reporting ability of the overall development of the use of output data formats by public authorities, as shown in Figure 1. The quality of electronic records is gradually improving, but unfortunately this improvement is not satisfactory at all. We use linear regression to find growth coefficient, which is approximately 5.9 percentage points per year. If we extrapolate this development into the future assuming constant growth, an ideal situation could come in the year 2029.

In the Figure 1, we can see two peaks in the spring and autumn of the year 2020, when the restriction caused by covid pandemic were in effect. These peaks were not caused by increased production of quality records, but by an overall reduction in record production, in which the production of low-quality records played a much more pronounced role. The same peaks are the most significant in the Figure 4, where the development of percentage usage of output data formats created by courts is shown.

In the Figure 3, some development waves can be seen, but they are rather caused by measurement error given by the relatively small representation of ministries among electronic records senders in our statistical set than by some external reasons. The same situation is seen in the case of schools (Figure 7). We could only say that both categories show an improving trend. Similar results follow from Figure 5, which has better reporting ability caused by greater representation of police among electronic records senders in our statistical set.

The worst situation is in the case of courts, as it can be seen in the Figure 4. There is no significant trend, and the usage of output data formats is continuously lowest from all selected groups of public authorities. It means a completely significant disregard of legal regulations regarding records management service on the part of the courts. Our research cannot answer if it is caused by deficiencies on the part of the used information systems or insufficient technical knowledge of the users.

Communication between municipalities is the most numerous in our statistical set. There can be seen improvements in the covid pandemic period, which shows the slowest decline of all selected groups of public authorities. Let's be reminded that these improvements were not caused by an increase in number of quality records, but by a decrease in the creation of low-quality records. The growth rate for municipalities is lower than overall growth rate, it is only 3.1 percentage points per year. But the quality of electronic records created by municipalities was approximately 40% in the beginning of the investigated period, which is the best of all selected groups of public authorities. On the other hand, the current situation is average.

Let us ask a question, why the quality of electronic records is so unsatisfactory and why the development of the quality is positive albeit very slow. Since there has not been any change in the legal regulations concerning rules for the creation of electronic records during the entire examined period, this slow positive development cannot be explained by changes in external law conditions, but it must be pushed by some other effect, such as the general development of information society and connected digital skills of clerks. The duties of creating electronic records in output data formats are only specified for electronic records management systems, thus the first explanation why so many records are created in non-output formats may be that they are created in other information systems. In that case, the recommendation is to extend these rules to all public administration information systems that create records. If records in non-output formats are created in electronic records management systems despite obligations, then these systems are of poor quality and should be changed or improved. Another reason may be the lack of user knowledge on how to use all these information systems and create records correctly. In that case, the recommendation is to increase user skills. The last reason can be that defining obligations only in the decree is too weak, and it should be incorporated into procedural legal regulations or general regulations at the European level, such as the eIDAS regulation.

4 Conclusion

It has been proven that the overall quality of electronic records created by public authorities is relatively poor from the point of view of the choice of data formats, only less than 60% of the electronic records are in the output data format. The current situation is the result of a very slow improvement in the period of years 2017-2023, only 5.9 percentage points per year. The worst situation is in the case of courts, where no significant trend was found. Because there has not been any change in law regulation in the area of electronic records management systems concerning output data formats during the investigated period, this small improvement must be caused by other reasons. We cannot say, which one, but we can give several measures, which can be recommended for more significant improvement: A better choice of information systems including records management systems to be able to create electronic records in output data formats, which also means more precise conditions in tenders, a greater emphasis on education in the field of technical requirements of electronic records and, in particular, the specification of technical rules for the quality of electronic records produced by public authorities in procedural legal regulations or general regulations at the European level, such as in the case of an electronic signature.

Acknowledgements

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The effect of the amount of the invoiced volume on the ability to self-finance water infrastructure assets in the Czech Republic

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Abstract: Small and mid-size cities are closely connected to their water sources, requiring cooperation beyond citizens and businesses. Shared ownership with regional authorities and water authorities is crucial. Market atomization hampers quality and self-financing, causing price differences and limiting care. The Ministry initiated cooperation with major operators to ensure a stable water supply. Self-financing is the goal, striking a balance between service price and provision costs for stability and effective adaptation.

Keywords: Water utilities, Service productivity, water infrastructure self-financing, Operation of Water Supply Systems

JEL Classification: H4, H54, J18, L95, Q25

1 Introduction

Water security is an emerging new concept that has been receiving extensive consideration of both academicians and policymakers in recent years.[5] Enhancing drinking water and sanitation service quality has been a key priority for water utilities and regulators.[1] The results of [1] also confirm that technological change, not efficiency change, is the driver of productivity growth experienced. The water innovation sector takes part in the global concept of the circular economy.[3]

Drinking water is one of the critical public goods that must be managed and regulated by the state and its components. Public administration, including all activities and services provided by the state or its agencies for citizens and businesses, touches in the field of water, including the management of water supply and sewerage systems, the creation of laws and regulations, planning and management of urban development, environmental protection and many others. Drinking water supplies are a critical part of public infrastructure that is essential to ensure the health and safety of residents. The management and regulation of drinking water supplies falls under public administration and includes many aspects such as water quality monitoring, infrastructure planning and financing, prescription and enforcement of drinking water regulations, and more. The role of the state is to ensure the availability of high-quality drinking water for all residents and to protect public health from risks associated with water shortages or violations of quality requirements. The state plays a key role in this area and is usually involved in the regulation, monitoring and financing of drinking water supply systems.

The drinking water security system of the area usually consists of several sub-systems, namely water sources, its treatment, distribution, quality control, consumption itself, and the subsequent drainage and treatment of wastewater. Water can be obtained from various sources such as rivers, lakes, underground springs and reservoirs. Water from sources must be treated and modified to ensure quality requirements after being acquired. This process includes, for example, the removal of impurities, possibly adjusting the pH and hardness of the water, etc. The treated water is then distributed into a network of pipes that transport the water to places of consumption (households, industry, services and other areas). Water quality is continuously monitored and tested at various points in the distribution network to meet defined drinking water standards. In the process of water consumption, the vast majority turns into wastewater, which is then drained through the sewer network and collected in wastewater treatment plants, treated in the cleaning process in such a way as to minimize its negative impact on the environment, and then released back into nature.

1.1 Brief context of the problem in the Czech Republic

One of the necessary responses to the problem of drought in some parts of the Czech Republic is the interconnection of water supply systems. In previous years, cooperation between the Ministry of Agriculture and critical operators related to this issue was initiated. Where necessary, the Ministry plans financial support to ensure a stable supply of potable water for the given region. In general, it is often forgotten that more than 90% of the

infrastructure is owned by municipalities, while only a tiny part is owned by a water company with foreign participation (Beroun, and a significant part of the Moravian-Silesian Region only). The fact to what extent the water price covers the minimum theoretical amount of renewal funds is one of the most critical issues affecting the level of self-financing of the water infrastructure. The water supply industry is generally very atomized, which could be one of the reasons for the problem with the self-financing of infrastructure, which the contribution tries to prove statistically.

1.2 Legal regulations of the Czech Republic in the field of drinking water supply

Below are listed some of the main legislation that may apply to drinking water supplies are, it is for example>

- 274/2001 Sb. Zákon o vodovodech a kanalizacích - this law usually applies to all water supply and sewerage infrastructure, including the provision of drinking water and wastewater.
- Zákon o vodách - this law usually relates to the management of water resources, including drinking water, and includes water quality protection, flood management, and drought management.
- 110/1997 Sb. Zákon o potravinách a tabákových výrobcích - this law usually concerns food and drinking water safety, including rules for ensuring water quality and water hygiene in food production.
- Směrnice Evropského parlamentu a Rady 2020/2184 o jakosti vody určené k lidské spotřebě - this directive sets minimum water quality standards for human consumption within the European Union and provides a basic framework for monitoring and evaluating water quality.
- Regional and local regulations - depending on the specific area and country, there may be other regional and local regulations that relate to the supply of drinking water, such as regulations on the provision of drinking water in towns and villages, on the removal and disposal of waste and others.

Pursuant to § 29 of 274/2001 Sb. Zákon o vodovodech a kanalizacích for public use and on the amendment of certain laws, the Ministry of Agriculture is responsible for regulating the field of water pipes and sewers. One of the tasks arising from the "Proposal of a conceptual solution for regulation in the water industry", approved by Government Resolution No. 86 of February 9, 2015, is to introduce permanent benchmarking of owner and operator entities in the Czech Republic with the aim of providing objective information from the field of water supply and sewerage and the lay public.[2] The Water Framework Directive 2000/60/EC (WFD) is arguably the most important directive on water, with the focus on environmental sustainability.[3] The European Economic and Social Committee (EESC) considers that "It is absolutely necessary to achieve the highest level of coordination of innovation processes at the European level, so that human and financial resources are used in the most efficient way possible to ensure innovation and to improve the population access to water resources and to use it more rational." [3]

1.3 Aim of the research

Policy attention mostly needs to be focused on underpinning the efforts of drinkable water providers through financial investments and legal support.[3] On the other hand, the mandatory extension or replacement of used or old distribution networks could become a priority for the responsible authorities in order to encourage the application of sustainable eco-innovation in drinking water management.[3]

In this contribution, the issue of self-financing is elaborated in more detail. The self-financing of the infrastructure in the case of the water supply and sewerage sector for public use (VaK) is a state where the funds of the owners of the water management infrastructure assets (VIM) obtained from the water, sewage, or from the rent they cover not only the related costs but also an adequate amount of funds for the restoration of VIM so that there is no need for subsidy funds. Benchmarking of ownership entities carried out by the Ministry of Agriculture [2] long-term evaluates the sufficiency of the creation of funds for the restoration of VIM from water, or from the sewer. The methodology of this evaluation is basically based on a comparison of the annual theoretical amount of minimum recovery funds and their actual amount generated in water and sewage. Both of these values are separately calculated for each entity and measured on the basis of averages into groups according to the volume of invoiced water of the divided service providers. In the contribution, however, the data linked to self-financing obtained from sources of the Ministry of Agriculture [2] are visualized and compared in more detail, including the analysis of variance (ANOVA) to determine the statistical significance of the differences between individual groups of providers (for groups where this comparison was possible considering the input boundary conditions of this method).

2 Material and Methods

Publicly available data for the year 2020 was used to determine the statistical significance of the differences between individual groups of providers [2]. For this article, it was not necessary to analyze the entire complex data set. Regarding the focus defined in Chapter 1.2 only the data connected to the level of self-financing determination was necessary. For analysis, the data is divided into groups according to the volume of invoiced water. The groups were established in accordance to the Ministry of Agriculture benchmarking methodology [2] so that the conclusions of a simple comparison of the averages performed by the Ministry of Agriculture could be supported or refuted by the analysis itself. In total, the data of 2114 subjects divided into 8 groups were analyzed, see Table 1.

Table 1 – Division into groups according to the volume of invoiced drinking water

Group	Subject number
I. group (> 30 mil. m³)	3
II. group (> 10 mil. m³)	3
III. group (> 4 mil. m³)	15
IV. group (> 2 mil. m³)	19
V. group (> 0,4 mil. m³)	58
VI. group (> 0,04 mil. m³)	409
VII. group (> 0,012 mil. m³)	714
VIII. group (< 0,012 mil. m³)	893
Total	2114

Source: Ministry of Agriculture [2]

The procedure for calculating the annual amount needed to cover the renovation is based on Decree No. 428/2001 Coll., which implements Act No. 274/2001 Coll., On Water Pipes and Sewers for Public Use, as amended. (1,2,3) The calculation is based on the lifetimes specified in this law, i.e. 80 years for water mains, 45 years for water treatment plants, or water sources and from the value of the property in the replacement purchase price listed in the data source Selected data of the property register (VÚME) [2].

$$\%_{OBN} = \frac{1}{\frac{\check{Z}_1 \times H_1 + \check{Z}_2 \times H_2}{H_1 + H_2}} \tag{1}$$

$\%_{OBN}$ - percentage of property value to be accumulated in 1 year [%]

$\check{Z}_n$ - theoretical lifetime of the infrastructure [years]

H_n - the value of the property at the replacement purchase price (H1 - water supply network and H2 - water treatment plants) [$mil.\ K\check{c}$]

$$P_{OBN} = \%_{OBN} \times H \tag{2}$$

P_{OBN} - funds that need to be accumulated in 1 year [$mil.\ K\check{c}$]

H - the value of the total assets at the replacement purchase price [$mil.\ K\check{c}$]

$$P_{OBN} = \frac{1}{\frac{\check{Z}_1 \times H_1 + \check{Z}_2 \times H_2}{H_1 + H_2}} \times H \tag{3}$$

The values of the funds that need to be accumulated, i.e. the amount of the minimum VIM recovery funds, were subsequently subtracted from the determined values of the actually obtained VIM recovery funds. Any negative difference is then related to 1 m³ of invoiced water and processed as the main analyzed variable "Missing means of VIM renewal per 1 m³ of potable invoiced water".

2.1 Model and Data

From the obtained data, the key parameter "Missing VIM renewal resources per 1 m³ of potable invoiced water" was determined by the above procedure. This parameter was determined for all entities divided into 8 groups according to the volume of invoiced water, see Table 1. Many orders of magnitude differences in invoiced water

between the groups make it impossible to clearly display in the classical scale of the XY-point graph, and therefore the logarithmic scale of the x-axis was used for greater clarity.

Figure 1 – XY plot of evaluated data
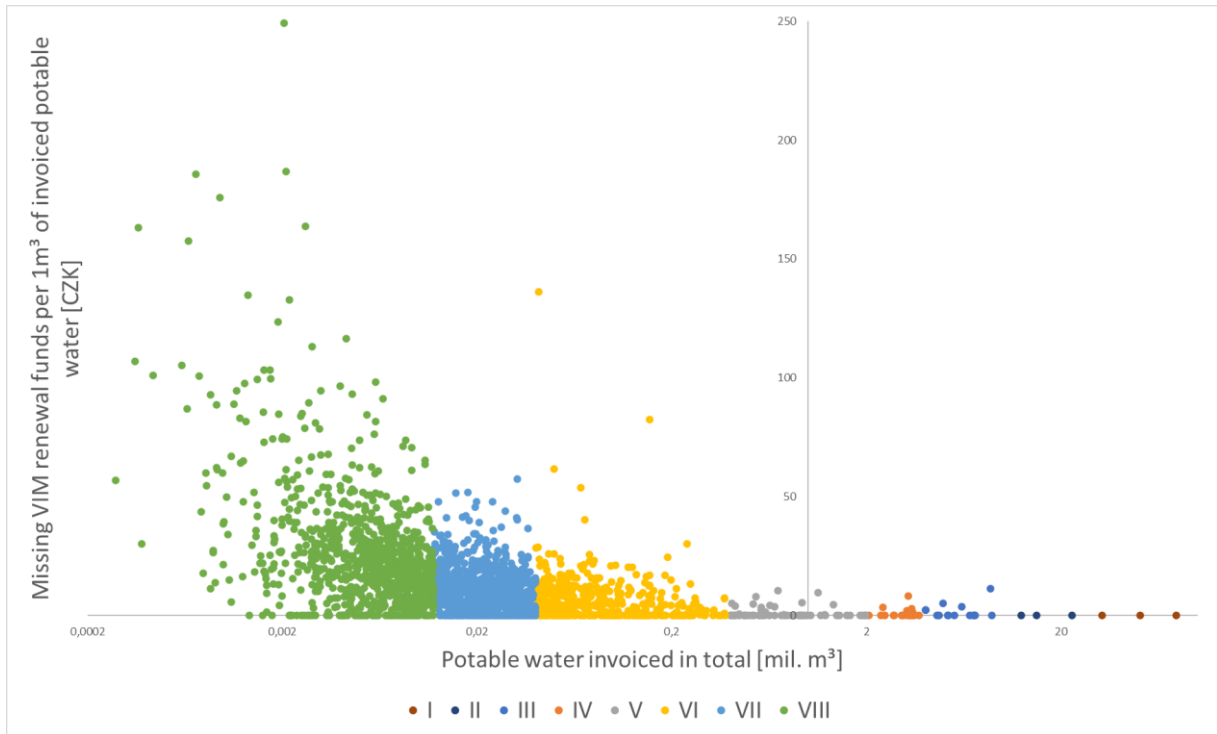
Source: Own processing

In the first step, a basic statistical evaluation of the sets of individual groups was carried out. Among other things, the initial analysis shows that when comparing all eight groups, the ratio between the smallest and the largest standard deviation is greater than 3:1. This fact can cause problems because the analysis of variance assumes that the standard deviations are approximately the same in all sets.

Table 2 – Basic statistical evaluation of groups

Group	Sample Size	Average	Standard deviation	Kurtosis	Skewness
I. group	3	0	0	0	0
II. group	3	0	0	0	0
III. group	15	1,64926	3,11011	3,8039	4,99731
IV. group	19	1,00455	2,06354	4,92911	7,62936
V. group	58	1,19392	2,4964	7,09819	7,42719
VI. group	409	7,27915	10,7013	48,7444	241,076
VII. group	714	11,6013	9,93351	12,3921	9,27887
VIII. group	891	26,4771	24,9889	28,9563	53,6658
Total	2114				

Source: Own processing

In the next step, only groups VI., VII. and VIII. were compared using the ANOVA method.

Table 3 – ANOVA Table

	Sum of Squares	Df	Mean Square	F-Ratio	P-Value
Between groups	139297,0	2	69648,3	208,17	0,0000
Within groups	672834,0	2011	334,577		
Total	812130,0	2013			

Source: Own processing

The ANOVA table decomposes the variance of the data into two components: a between-group component and a within-group component. The F-ratio, which in this case equals 208,168, is a ratio of the between-group estimate to the within-group estimate. Since the P-value of the F-test is less than 0,05, there is a statistically significant difference between the means of the 3 groups at the 95,0% confidence level.

Figure 1 – Box-and-Whisker Plot
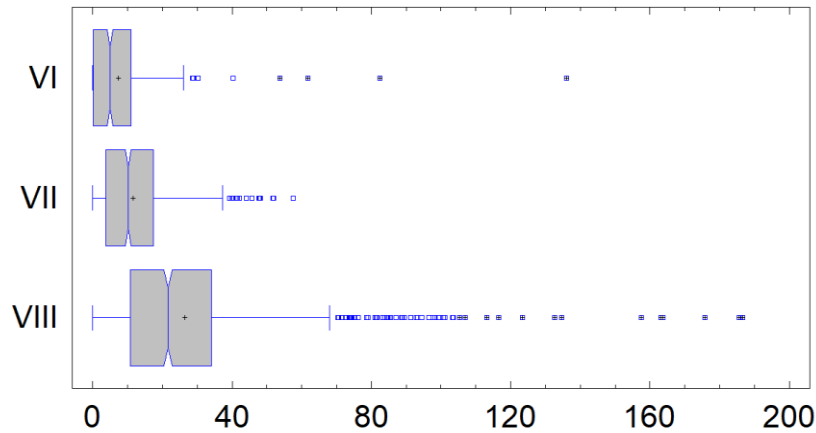
Source: Own processing

As the standardized skewness and kurtosis were outside the range of -2 to +2 for 3 groups some significant nonnormality in the data was identified, therefore the Kruskal-Wallis test was also performed to compare the medians instead of the means.

Table 4 – Kruskal-Wallis Test

	Sample Size	Average Rank
VI. group	409	618,416
VII. group	714	875,42
VIII. group	891	1291,95
Test statistic	434,064	
P-Value	0,0	

Source: Own processing

The Kruskal-Wallis test tests the null hypothesis that the medians within each of the 3 groups are the same. The data from all the groups is first combined and ranked from smallest to largest. The average rank is then computed for the data in each group. Since the P-value is less than 0,05, there is a statistically significant difference amongst the medians at the 95,0% confidence level.

To determine which means are significantly different from which others, Multiple Range Tests was also performed.

Table 5 – Multiple Range Tests

```
-------------------------------------------------------------------------------
Method: 95,0 percent LSD
                Count      Mean              Homogeneous Groups
-------------------------------------------------------------------------------
VI              409        7,27915           X
VII             714        11,6013            X
VIII            891        26,4771             X
-------------------------------------------------------------------------------
Contrast                                    Difference         +/-  Limits
-------------------------------------------------------------------------------
VI - VII                                    *-4,32219          2,22319
VI - VIII                                   *-19,1979          2,14125
VII - VIII                                  *-14,8757          1,80072
-------------------------------------------------------------------------------
```

Source: Own processing

Table 5 applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. An asterisk has been placed next to 3 pairs, indicating that these pairs show statistically significant differences at the 95,0% confidence level. At the top of the page, 3 homogenous groups are identified using columns of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Fisher's least significant difference (LSD) procedure. With this method, there is a 5,0% risk of calling each pair of means significantly different when the actual difference equals 0.

3 Results and Discussion

It follows from the variance analysis and the Kruskal-Wallis test that the data grouped according to the total volume of invoiced potable water into groups VI. - VIII. show statistically significant differences at the 5% level of significance. Based on the Multiple Range test, the occurrence of more homogeneous groups was not detected, so we can confirm the effect of the total volume of invoiced water on the size of the missing VIM recovery funds.

The analysis carried out for the needs of this contribution confirms the conclusions contained in the benchmarking of the MZe. [2] Missing VIM renewal funds per 1m³ of invoiced potable water depends on Potable water invoiced in total [mil. m³]. Therefore, operators with a small volume of invoicing have the problem of self-financing the renewal of the water supply infrastructure.

A suitable way may be to combine assets into larger units and apply a uniform so-called solidarity price. Furthermore, it is important to motivate municipal owners to operate VaK in the form of economic activity based on Act No. 455/1991 Coll., on trade and business, which would enable municipalities to generate profit for the development and renewal of VIM, or they have the opportunity to consider the use of different models of operation (mixed, partitioned, combined and their variations). Larger property units would also enable the expansion of stable and erudite operating companies that have sufficient financial and human resources to ensure the required quality of services and the fulfillment of legislative requirements.

4 Conclusion

In the Czech Republic, more than 90% of the water infrastructure is owned by the municipalities, only a small part is owned by the water companies. [7] Compared to major cities, small and mid-size cities are highly connected to their water catchments and surroundings. To come to a successful adaptation strategy there is a great need for both to cooperate. This cooperation goes far beyond the involvement of citizens, experts and businesses. It requires shared ownership with regional authorities, other municipalities and water authorities, which all have their own

perceptions and responsibilities. Achieving an adequate quality of operation in the entire VaK sector is hindered in particular by a high degree of market atomization. This further adversely affects the possibility of self-financing of VIM, causes high price differences and, last but not least, limits the level of care for VIM.

Cooperation between the Ministry and major operators regarding this issue has been initiated. Where this interconnection appears to be too economically demanding and does not make economic sense, the Ministry will be ready to support it in the event that it is an effective tool for ensuring a stable supply of drinking water to the given region. Because stability is the most important before sudden changes. Therefore, the main goal is to achieve self-financing in the field - finding a balance between the price of the service and the costs of its provision.

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The role of the university as an organization requiring sustainable diversity management in the context of aid provided to Ukrainian refugees – the example of Opole University of Technology

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Abstract: In February 2023, one year had passed since the conflict in Ukraine started. Poland emerged as a significant supporter of Ukrainian refugees, offering assistance through various means. Among those, universities played a crucial role by extending help not only to Ukrainian students and scientists but also by providing dormitories to refugees. Opole University of Technology, being an influential institution in the Opole region, not only supported Ukrainian students but also indirectly facilitated their professional growth, encouraging them to stay in the region, start families, and contribute to the development of new social capital. This approach aligns with the concept of diversity management and sustainable socio-economic development. The main objective of the article is to analyze the humanitarian aid provided by Opole University of Technology to Ukrainian refugees. It aims to emphasize the significance of professional management within the university as an organization, which implements sustainable activities to support the refugees effectively. Additionally, the article seeks to explore the potential development of Ukrainian migration and the integration of Ukrainians into Polish society in the future. The analysis revealed that during the initial days of the conflict, grassroots initiatives by individuals played a crucial role. In conclusion, the war in Ukraine highlighted the importance of having well-established refugee assistance procedures and comprehensive guidelines in place.

Keywords: Diversity management, grassroots initiatives, organizational culture, refugee migrations, sustainable management, systemic aid, Ukraine

JEL Classification: F22, J00, M14, Z1

1 Introduction - The importance of refugee migration issues in the context of war in the Ukraine

The field of refugee migration and associated research is constantly evolving in response to public interest and policy debates [Ambrosini, Schnyder von Wartensee, 2022]. According to Jørgen Carling and Kerilyn Schewel [2018], migration is driven by aspirations for a better life and the ability to migrate, whereas the term "refugee" refers to individuals who are compelled to leave their home country due to factors such as foreign residency or political reasons, including armed conflicts.

Although a majority of refugees are either internally displaced or seek refuge in neighboring countries, a significant portion of refugees reside in developed nations. Europe, including Turkey, has emerged as a primary destination for refugees, particularly following the Arab Spring and the subsequent Syrian civil war, resulting in a staggering 6.5 million refugees. These figures highlight the immense challenges faced by recipient countries in accommodating and integrating millions of refugees. Upon their arrival in host nations, refugees encounter disadvantages in terms of assimilation into the labor market, overall well-being, and social inclusion, when compared to both other migrants and the native population [Brell, Dustmann, and Preston, 2020]. These difficulties arise from the traumatic experiences of war and persecution prior to migration and during their escape [Walther et al., 2020], disrupted educational and employment histories, as well as a lack of institutional and cultural knowledge due to the unplanned nature of their migration, separation from family members, and limited social support networks [Nickerson et al., 2010; Löbel, 2021]. In 2022, the number of asylum seekers from Ukraine but also from Syria, Afghanistan, Pakistan and Egypt and the number of irregular crossings of EU borders increased sharply. By October 2022, Frontex, the European Border and Coast Guard Agency, had registered around 280,000 irregular entries – 77% more than in 2021. This is also the most since the peak of the refugee crisis in 2015 and 2016, and we do not know the number of unreported cases. Moreover, for the next few years until 2032 Frontex predicts that

migratory pressure will increase [Frontex]. The current migration and refugee crises at the EU's southern and eastern borders indicate that the EU is likely to experience more such events. The interplay of complex geopolitics, rapidly changing security conditions and trends in an increasingly hostile multipolar world results in circulations that fundamentally change many regions and countries of origin.

Currently, the war in Ukraine stands as one of the most pressing issues, leading to a significant migration of women and children.

The outbreak of armed conflict in Ukraine has had far-reaching consequences on various political, economic, and social aspects. Particularly, the mass displacement of individuals from war-affected regions has dramatically transformed the migration landscape within Ukraine and several European Union (EU) countries, including Poland. Poland has played a crucial role in providing refuge to victims of the Ukrainian war, with an estimated 3.5 million people having arrived in the country from February 24 to mid-May 2022 [Duszczyk and Kaczmarczyk, 2022].

It should be noted that a decade ago, Poland was not considered an attractive destination for immigration. In fact, the country experienced a negative migration balance, with a significant number of people emigrating to Western countries after 2004 [Górny et al., 2010; Okólski, 2012; King and Okólski, 2018]. Additionally, in 2015, Poland had one of the lowest proportions of immigrants among the member states of the European Union.

However, this situation underwent a fundamental change after 2014, particularly following the outbreak of the first war in eastern Ukraine. Within a short period of time, Poland emerged as the leading country in Europe in terms of newly issued residence permits, and even globally when considering seasonal foreign workers. Available estimates indicate that the number of immigrants in Poland increased from approximately 100,000 in 2011 to over two million in 2019 [Statistics Poland, 2020]. The majority of this immigrant population consisted of Ukrainian citizens, and the significant shift in Poland's migration situation can be attributed to the influx from Ukraine. This transformation was made possible by a combination of factors operating on both sides of the migration process [Górny and Kaczmarczyk, 2018, 2019; Górny, 2017].

The Russian invasion of eastern Ukraine in 2014 and the resulting socioeconomic developments in Ukraine created a significant potential for migration. However, the transformation of Poland into a country of immigration was primarily driven by its rapid economic growth and the continuous and increasing demand for labor in the Polish labor market. Contrary to the expectations of some observers, this migration potential did not manifest primarily as humanitarian migration. Instead, Poland experienced a large influx of labor migrants, facilitated by a simplified procedure that made it one of the most open countries in terms of employing foreigners. Additionally, the fast-growing recruitment sector in Poland further contributed to the expansion of labor migration.

As a result, and contrary to the expectations of some observers, the above-mentioned potential did not turn into humanitarian migration. Rather, there was a massive increase in labour migration in Poland, especially based on a simplified procedure that made Poland one of the most liberal regimes in terms of employment of foreigners (in addition, the fact that there is a rapidly growing recruitment sector also contributed to the increase in the volume of labour migration).

In general, the armed conflicts in the Donetsk and Luhansk regions of Ukraine that began in 2014 caused numerous population movements, mainly toward Russia, Belarus, and, in third place, Poland [Rimpilaeinen, 2020]. However, the war started by Russia on February 24, 2022, made Poland the main receiving country of Ukrainian refugees. Thus, the year 2022 is the beginning of the third period of migration from Ukraine, this time not to earn money or get an education, but to save lives. The citizens of Ukraine can now freely move between the Member States of the European Union for up to 90 days, and a directive on temporary protection has also been adopted [Marchese et al., 2022].

In this regard, universities are taking a resourceful program to support Ukrainian refugees, which is systematically enriched with new aid programs and mechanisms. Opole University of Technology as an important entity in the Opole region also cares about sustainable socio-economic development, because its program not only supports students from Ukraine, but also indirectly enables them to continue their professional development and stay in the region in order to start a family, which translates into building a new social capital. In fact, an important element distinguishing the activities of the Opole University of Technology is also individualization, which consists in adapting the offer of the educational service provided to the needs of its new beneficiary – a Ukrainian student, in the context of market requirements.

Overall, the aim of the study is to analyze the humanitarian aid provided to the Ukrainian refugees by the Opole University of Technology. In this context, the aim of the paper is to show the importance of universities as an organization requiring professional management and introducing sustainable activities.

The research method is the analysis of the literature on the subject and existing research, as well as the analysis of aid mechanisms provided to Ukrainian refugees by the Opole University of Technology.

2 Ukrainian refugee crisis from the regional perspective

One of the first and most massive consequences of Russian aggression against Ukraine was the refugee crisis. In the first 60 days of the war, 28% of the population was directly affected by the refugee crisis. The country that received the most refugees during this period was Poland, which took in over 2.6 million people. As of January 2023, the share of refugees from Ukraine in the entire population of Polish is 6%. From a Polish perspective, the way in which the refugee crisis was handled in the first few weeks is particularly noteworthy. In the early days, humanitarian assistance was provided by NGOs and private individuals. Local and regional self-government and state administration needed time to work out optimal mechanisms. Universities also had a significant share in providing help, including the Opole University of Technology, which reacted very quickly and adapted to the existing conditions.

Although the Opole Province is located far from the Polish-Ukrainian border, like other regions of Poland, it has permanent and strong contact with Ukrainian cities and regions, mainly Ivano-Frankivsk and Lviv.

Under the Special Act, war refugees from Ukraine who have reached Poland since 24 February 2022 may legally stay in Poland. They can also receive a PESEL number. During the first week, over 250,000 PESEL numbers were assigned. However, as of May 2022, applications for a PESEL number for refugees from Ukraine were submitted in total 1075.16 thousand [Chancellery of the Council of Ministers, 2022].

According to estimations of Voivodship Office, there are about a dozen thousand refugees in the Opole Province, of which 7-10 thousand in Opole city (as of May, 2022).

The first aid operations took place on the second and third day of the war. On the initiative of individuals and associations, a fundraising campaign was launched and food and medicine were collected. In Opole, the scouts organizations coordinated, among other things, the transport of medicines to Ukraine, the operation of the municipal refugee aid center, and organized an aid center directly on the border in Medyka.

Ukrainian students living in Opole and entrepreneurs who employed Ukrainians organized transportation, housing, and a Ukrainian-language call center. This first phase, which lasted several days, was a spontaneous, mass, grassroots, and uncoordinated initiative. With the arrival of more and more refugees, it was necessary to coordinate activities and involve local authorities and uniformed services on a large scale.

Currently, the burden of caring for refugees from Ukraine is almost entirely left on the shoulders of local governments. They are responsible for housing policy, access to the most important services, education and health care for new residents.

3 Analysis of aid provided to the Ukrainian refugees by the Opole University of Technology

Universities of the countries receiving refugees, including Polish universities, see the need to provide support to refugees from Ukraine, including students and scientists - citizens of Ukraine. In February 2023, 21,000 Ukrainian studied in Poland, of whom 60% started their studies in October 2022. In this group, 6% of students studied remotely due to the lack of opportunities to study full-time, while 3% participated in foreign exchanges (Głos nauczycielski, 2023). In Poland, nationwide support for Ukrainian refugees covers, among others [Ministerstwo Nauki i Edukacji, 2022]:
- applying solutions ensuring the possibility of smooth adjustment of internal university regulations to the situation related to the effects of the war in Ukraine, in particular making changes facilitating the admission of students from Ukrainian universities and adapting the way of organizing classes to the situation related to it,
- no fees for full-time studies in the Polish language during the temporary protection of Ukrainian citizens,
- financing recognition fees for job seekers,
- opportunities to apply for social grants and student loans,
- the possibility of employing academic lecturers without conducting a competition.

In addition, universities belonging to alliances of European Universities under the NAWA program "Solidarity with Ukraine" may receive a total of PLN 16 million to support cooperation with Ukrainian universities [NAWA, 2022]. Apart from the above-mentioned organizational solutions, Polish universities most often support refugees by offering them free dormitories as well as financial and psychological assistance [RP, 2022]. One example of a university that is additionally actively involved in helping refugees from Ukraine is the Opole University of Technology. This university currently educates 200 students and employs 14 Ukrainian scientists and administrative staff.

The aim of the study was to analyze the humanitarian aid provided by the Opole University of Technology to Ukrainian refugees from the point of view of the importance of professional management at the university as an organization that implements sustainable activities for the effective support of refugees. To specify the forms of assistance to refugees from Ukraine, in April 2023, the content of materials published in Internet was analyzed. The Google Internet search engine of Google LLC was used. The main source of information was the university's website. Materials appearing in other searches were mainly an interpretation of information available on the Opole University of Technology website. The list of support activities for refugees is shown in Table 1A-B.

Table 1A - Forms of aid provided to Ukrainian refugees by Opole University of Technology in 2022

[1] Publication date of the materials	Aid Mechanism
02.2022	Psychological help for students from Ukraine studying at the Opole University of Technology.
02.2022	Flexible approach to the learning process, including: - the possibility of obtaining a dean's leave for students residing in Ukraine, - the possibility of running courses in asynchronous mode, - justification of the student's absence based on his/her statement in connection with staying on the territory of Ukraine, - postponement of the deadline for paying the tuition fee.
02.2022	Financial support: - the possibility of obtaining aid for students who are temporarily in a difficult life situation, - the possibility of obtaining a social grant.
24.02.2022	Collection of clothes, food and hygiene and cleaning products. The collection took place within all departments and was donated to the needy Ukrainians staying in Opole.
01.03.2022	Launching a reception point in the Sokrates dormitory with 120 rooms for 300 refugees from Ukraine.
09.03.2022	Opening the Sokrates dormitory to the citizens of Ukraine (181 adults and 150 children).
07.03.2022	Organization of the Opole University of Technology march. Its goal was to show solidarity with Ukraine and support the Polish Humanitarian Action.
11.03.2022	The community of the Opole University of Technology raises PLN 4,500 (USD 1,046) for the Polish Humanitarian Action.
11.03.2022	Organization by the Language Center of the Opole University of Technology of free Polish language lessons for refugees from Ukraine.
24.04.2022	Organization of an Orthodox Easter breakfast for 150 refugees from Ukraine - residents of the Sokrates dormitory. It included traditional Ukrainian Easter dishes and surprises for the youngest.
25.05.2022	Sharing information related to other financial support opportunities from the Perspektywy Education Foundation and Amazon, which allocated funds to support students from Ukraine studying at technical universities. "Amazon - Perspektywy Scholarships for Ukrainian Students" include a one-time grant of PLN 1,000 (USD 232) for 500 Ukrainians studying in Poland at universities associated as part of the Conference of Rectors of Polish Technical Universities.
01.06.2022	The action of planting trees (viburnum and rowan) in front of the dormitory was made available to refugees from Ukraine, which is a symbol of Polish-Ukrainian friendship.
02.06.2022	Beginning of cooperation with the Institute of Telecommunications and Global Information Space in Kyiv. Cooperation with the research centre is to enable participation in scientific internships, joint scientific and research projects, organization of scientific conferences and establishment of contacts between employees.

Table 1B - Forms of aid provided to Ukrainian refugees by Opole University of Technology in 2023

Publication date of the materials	Aid Mechanism
24.02.2023	Publication of accounts of refugees from Ukraine staying in Poland related to their experiences and the current situation one year after the start of the Russian-Ukrainian war.
02.03.2023	Providing information related to additional opportunities for financial support by the Perspektywy Education Fouandation and Goldman Sachs. The support concerns the possibility of granting one-time scholarships in the amount of PLN 1,000 (USD 232) for 38 Ukrainian citizens studying at the Opole University of Technology.

Forms of support listed in Table 1A-B, in addition to elements related to housing, psychological support, organization and collection of clothes, food and hygiene products [Kułynycz, 2022], also include elements important from the point of view of organizational culture. These include, among others:

- making elements of Polish culture more accessible to foreigners - organizing and conducting Polish language courses facilitating acclimatization in a new living and work environment,
- activities emphasizing the possibilities of support and solidarity from the environment of the Opole University of Technology (e.g. through joint marches, planting trees),
- activities sensitizing the environment of the Opole University of Technology to the situation of people in need and enabling ongoing acceptance of changes in the work environment of the local population (e.g. through information activities presenting the situation of refugees in Poland, conducting interviews with refugees and publishing accounts from joint meetings, as well as organizing fundraisers for the Polish Humanitarian Action).

However, there is a notable disproportion between the number of forms of support offered in 2022 (Table 1A) and 2023 (Table 1B). This is due to the fact that immigration reached its highest level in the first months of the war - from March to May 2022. Since August 2022, the number of refugees from Ukraine has been gradually decreasing, according to Eurostat.

It is also worth emphasizing that assistance from higher education institutions directed towards refugees is linked to the grassroots initiatives. To support this highly vulnerable group, in recent years, local bottom-up initiatives proliferated to support refugee integration in hosting communities [Jaschke et al., 2022].

These initiatives are usually community-driven efforts, often initiated by individuals, non-governmental organizations (NGOs), or local community groups, to address the needs and challenges faced by refugees. Grassroots initiatives provide immediate and direct assistance to refugees, filling gaps in basic needs such as food, shelter, clothing, and healthcare. They often work in close proximity to refugee communities, which allows them to identify and respond to the specific needs and vulnerabilities of refugees in a timely manner.

What is more, grassroots initiatives raise awareness about the plight of refugees and advocate for their rights and protection. They engage in public education campaigns, organize rallies and protests, and work to change public perceptions and policies regarding refugees. By amplifying the voices of refugees and sharing their stories, grassroots initiatives aim to promote empathy and understanding in the broader society.

In fact, grassroots initiatives facilitate the integration of refugees into the local community by creating opportunities for interaction and fostering social cohesion. They organize cultural exchange events, language classes, mentorship programs, and recreational activities that bring refugees and host community members together. These initiatives help bridge gaps between different communities, reduce discrimination, and promote mutual understanding. Grassroots initiatives recognize the importance of empowering refugees with skills and knowledge to rebuild their lives. They provide vocational training, entrepreneurship support, and educational programs to enhance refugees' abilities and self-reliance. By equipping refugees with skills, grassroots initiatives contribute to their long-term integration, resilience, and economic independence.

Grassroots initiatives often collaborate with other stakeholders, such as NGOs, government agencies, and international organizations, to maximize their impact. They form networks and partnerships to leverage resources, share knowledge and best practices, and advocate for improved policies and services for refugees. Through these collaborations, grassroots initiatives can have a broader reach and influence.

In general, grassroots initiatives bring a sense of humanity and solidarity to the refugee crisis by addressing the immediate needs of refugees, advocating for their rights, and supporting their long-term integration. Their proximity to refugee communities, flexibility, and community-driven approach make them well-suited to understand and respond to the specific challenges faced by refugees, complementing the efforts of larger organizations and institutions.

To sum up, it is worth emphasizing that government assistance for refugees is often insufficient and bottom-up initiatives play a huge role in this matter, as shown by research conducted in Germany [Jacobsen, Eisnecker, and Schupp, 2017]. Government programs aimed at supporting and integrating refugees sometimes struggle to meet their needs. For example, the influx of over 1 million asylum seekers in Europe in 2015 alone resulted in a severe shortage of housing, integration programs, and language courses [Speth and Bojarra-Becker, 2017; Van Ballegooij and Navarra, 2018]. Non-governmental initiatives stepped in to fill some of these gaps, often relying heavily on volunteers to provide their services. In 2016, 6% of the population in Germany volunteered directly to support refugees [Jacobsen, Eisnecker, and Schupp, 2017]. A relatively new but rapidly expanding form of grassroots support emerged, namely the refugee mentoring programs. In Germany, by 2019, these programs brought together approximately 100,000 refugees and local volunteers. These privately organized initiatives, partially funded by the government [BMFSFJ, 2019], match refugees with local mentors, intentionally creating bridging connections that link networks with limited connections, proving valuable for resource and information transmission. Participants in these programs gain access to material, informational, and motivational resources that are typically limited to them [Ooka and Wellman, 2003; Lancee and Hartung, 2012]. Moreover, non-government mentoring programs offer more personalized support on a more equal basis, better attuned to individual needs.

4 Conclusion - The importance of the university as an organization requiring professional management and introducing sustainable activities

Opole University of Technology is an educational institution that aims to provide learning opportunities and knowledge to a diverse range of stakeholders. Its primary clients consist of individuals and entities within the socio-economic environment, and the institution strives to meet their needs by offering a wide range of educational activities.

As an organization, Opole University of Technology operates within a traditional management framework encompassing functions such as planning, organizing, directing, and controlling. However, the university's operations have been significantly influenced by the process of globalization, which necessitates embracing substantial changes on various levels, including cultural, ethical, civilizational, and social values.

In recent years, it has become evident that stakeholders associated with Opole University of Technology have expanded beyond the conventional scope. One notable group of beneficiaries is comprised of individuals from Ukraine, presenting the university authorities with a notable challenge in terms of maintaining flexibility and consistent administrative practices.

Opole University of Technology demonstrates its commitment to sustainable socio-economic development by implementing a comprehensive aid program specifically designed for Ukrainian refugees. This program continues to evolve with the addition of new assistance initiatives and mechanisms. As a key institution in the region, the university not only provides support to Ukrainian students but also indirectly facilitates their long-term professional development and integration into the local community, thereby contributing to the formation of new social capital. This approach aligns with the concept of diversity management.

Moreover, individualization is a significant aspect of Opole University of Technology's activities, as it involves tailoring educational services to meet the specific needs of Ukrainian students in relation to market demands. Various programs are implemented to enhance their language proficiency, develop skills, and introduce them to Polish culture. This targeted approach strengthens the integration process for the refugees, enabling them to better adapt to conditions in the Opole Province. As a result, the overall process can be considered sustainable in its approach and outcomes.

In conclusion, the war in Ukraine highlighted the importance of having well-established refugee assistance procedures and comprehensive guidelines in place. It underlined the significance of proactive measures to ensure effective support for refugees during times of crisis.

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The dynamics of regional capacities of psychiatric care in regions of the Czech Republic between the years 2010 and 2021

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Abstract: Providing effective psychiatric care is essential in healthcare systems globally, given the challenges posed by mental health issues. This article examines the dynamics of regional capacities of psychiatric care in the Czech Republic between the years 2010 and 2021. The average growth coefficients and average absolute increase were used to evaluate dynamics in psychiatric care capacities. The data used for analysis were obtained from the Public Health Insurance Company (VZP) and cover outpatient and inpatient psychiatric care. The aim of this article is to assess the distribution of psychiatric care capacities at the outpatient and inpatient levels in the regions in the Czech Republic between the years 2010 and 2021.The results reveal that the number of outpatient facilities for adults increased nationally, while capacities for children and adolescents showed mixed trends among the regions. Moreover, the number of acute inpatient facilities decreased in most of the regions, while the number of beds increased in most of regions in the Czech Republic. The study also assessed the dynamics of psychiatric care professionals, where the number of physicians in outpatient care increased, but in inpatient care, it decreased.

Keywords: Capacities, dynamics, psychiatric care, mental health, Czech Republic

JEL Classification: H75, H41, H43

1 Introduction

Providing effective psychiatric care is a key component of healthcare systems worldwide, as mental health issues continue to present significant challenges for individuals and society (Wainberg et al., 2017). According to WHO (2004), mental health is defined as "a state of well-being in which the individual realises their abilities, can cope with the normal stresses of life, work productively and fruitfully, and is able to make a contribution to his or her community." While mental health services are designed to meet the diverse needs of the population, the dynamics of regional psychiatric care capacities play a crucial role in determining the availability, quality, and effectiveness of such services (Raboch and Wenigová, 2012).

Regional psychiatric care capacities relate to the distribution and availability of mental health resources, including facilities, professionals, and supportive services, within a specific geographic area. These capacities can vary significantly between regions due to factors such as population density, socioeconomic conditions, healthcare infrastructure, and political frameworks. Another crucial factor shaping regional psychiatric care capacities is the availability and distribution of mental health professionals. Psychiatrists, psychologists, psychiatric nurses, and other specialized mental health professionals are essential in providing comprehensive care. The development and proper dynamics of regional psychiatric care capacities are essential in achieving equal access to quality care for all the patients. This point is associated with the ongoing need to evaluate changes in the provision of psychiatric care in light of modern treatment approaches (Broulíková et al., 2020; Vrabková et al., 2023). As Gavurova and Vagasova (2018) in the study show, quality and affordable psychiatric care can extend residents´ life expectancy.

The dynamics of regional psychiatric care capacities in the Czech Republic is an important and current topic. In recent years, there has been an increasing interest in mental health issues and the need for the development of psychiatric care. Understanding and addressing the dynamics of regional psychiatric care capacities are crucial for the development of effective strategies to improve mental health outcomes (Broulíková et al., 2020). By identifying gaps in access, addressing disparities in resources, and promoting collaboration between different regions, policymakers and healthcare professionals can work to ensure that mental health services are accessible, equitable, and of high quality for all individuals, regardless of their geographical location (Schley, 2018). In response to addressing this and many other issues, a psychiatric care reform was implemented in the Czech Republic in 2013, aiming to "change the rigid system of institutional psychiatric care and ensure the full implementation of human rights for all mentally ill individuals" (Ministry of Health of the Czech Republic, 2013). Following the reform, the National Action Plan for Mental Health 2020-2023 was also adopted, summarizing five strategic priorities,

including the availability of mental health services in time and place. Mental health and mental health care is an ongoing topic on European level as well. A document "A comprehensive approach to mental health" issued by European Commission in the year 2023 showcases it, which aims to help in adopting measures to improve issues related to mental health. The document emphasizes, that mental health care cannot be viewed the same way as traditional medical care, but it is necessary to consider areas such as education, research, and others (European Commission, 2023).

The aim of this article is to assess the distribution of psychiatric care capacities at the outpatient and inpatient levels in regions of the Czech Republic between the years 2010 and 2021. The article is structured into four main parts. The first part is the introduction, the last part is the conclusion. The second part contains the data for the analysis, and the third part discusses the results.

2 Material and Methods

The methodology of this article was chosen with regard to the aim and research question (RQ1 and RQ2) that were chosen for this study:

RQ1: "How did the dynamics of regional capacities of outpatient psychiatric care in the Czech Republic evolve between the years 2010 and 2021 and how different was the development among the regions?"

RQ2: "How did the dynamics of regional capacities of acute inpatient psychiatric care in the Czech Republic evolve between the years 2010 and 2021 and how different was the development among the regions?"

2.1 Data

For data processing, data from the Public Health Insurance Company (VZP) were used, to which 5.91 million individuals from the Czech Republic were registered as of 2021, which represents approximately 56 % of the total population of the Czech Republic (VZP, 2022). VZP is the largest health insurance company in the Czech Republic, ensuring that the selected data sample is representative. The data were drawn from the VZP yearbooks, which are annually issued as supplements to the annual reports, from which a lot of important information can also be drawn. Compared to annual reports, yearbooks are focused on analytical and statistical data that map the network and activities of contracted healthcare facilities, information about VZP insured people and more. The data were analyzed for the years 2010 and 2021, which was chosen considering the data availability.

The examined data are divided into two main categories, namely to evaluation of the dynamics of capacities in psychiatric outpatient care and acute inpatient psychiatric care. In the analysis, outpatient care is further divided into outpatient care for adults and outpatient care for both children and adolescents. Within the outpatient psychiatric care, the number of facilities in Czech regions is assessed and their development during the observed years, as well as the number of full-time doctors working in the outpatient facilities by regions. The number of facilities in outpatient psychiatric care includes both the ambulatory care segment and the institutional care segment. The working time of one doctor working in outpatient psychiatric care is capped at a maximum of 1.0 working hours per workplace. According to VZP methodology, working time of 1.0 for outpatient psychiatric care doctors corresponds to 30 doctor´s office hours a week.

Within the acute inpatient psychiatric care, the number of facilities and the number of beds in Czech regions are assessed and their development during the observed period, as well as the number of full-time doctors working in the acute inpatient psychiatric care facilities by regions. Data related to capacities of facilities and beds include information about both adults, and children with adolescents included. The working time of one doctor working in acute inpatient psychiatric care is capped at a maximum of 1.0 working hours per workplace. According to VZP methodology, working time of 1.0 for acute inpatient psychiatric care doctors corresponds to 40 doctor´s office hours a week.

Data for the year 2010 and 2021 related to selected indicators in outpatient and acute inpatient psychiatric care are listed in appendix.

The assessment of the dynamics of regional psychiatric care capacities was performed using the growth coefficient (k_t), which captures the rate of growth of the chosen indicators. y_t stands for value of chosen indicator in time t.

$$k_t = \frac{y_t}{y_{t-1}},$$

(1)

The data is further evaluated based on the average growth coefficient ($\bar{k}$), which is calculated as the geometric mean of individual growth coefficients (k_t).

$$\bar{k} = \sqrt[T-1]{k_2 \cdot k_3 \cdot \ldots k_T} = \sqrt[T-1]{\frac{y_T}{y_1}} . \tag{2}$$

The results of the evaluation of the rate of dynamics are interpreted as follows. The dynamics are increasing if $k>1$, decreasing if $k<1$, and stagnating if $k=1$.

Another evaluative indicator is the average absolute increase ($\bar{\Delta}$), which expresses the change in the value over time T compared to the time $T-1$. The result is expressed in units of the original assessed dataset (Arlt a spol., 2002).

$$\bar{\Delta} = \frac{(y_2 - y_1) + (y_3 - y_2) + \ldots + (y_T - y_{T-1})}{T-1} = \frac{\sum_{t=2}^{T} \Delta y_t}{T-1} = \frac{y_T - y_1}{T-1} . \tag{3}$$

3 Results and Discussion

The results of the average absolute increase and the average growth coefficient of the dynamics of psychiatric outpatient care capacities are recorded in Table 1, the results of the coefficients for acute inpatient care are recorded in Table 2. A comparison of the dynamics of psychiatric care capacities across Czech regions for the years 2010 and 2021 is also presented in Figure 1 and Figure 2. The results of the average absolute increase and the average growth coefficient of doctor´s working hours in outpatient and inpatient psychiatric care are recorded in Table 3 and Table 4.

Table 1 – Comparison of the number of outpatient psychiatric care facilities for adults and children with adolescents between the years 2010 and 2021

Regions	Average absolute increase		Average growth coefficient	
	Adults	Children and Adolescents	Adults	Children and Adolescents
Prague	1.00	0.82	1.01	1.03
Central Bohemian Region	1.82	-0.09	1.03	0.99
South Bohemian Region	0.64	0.18	1.01	1.02
Plzeň region	0.55	-0.09	1.01	0.99
Karlovy Vary Region	0.73	0.00	1.04	1.00
Ústí nad Labem Region	0.45	0.00	1.01	1.00
Liberec Region	0.00	0.00	1.00	1.00
Hradec Králové Region	0.91	-0.09	1.02	0.99
Pardubice Region	-0.45	-0.27	0.99	0.95
Vysočina Region	-0.45	-0.09	0.99	0.99
South Moravian Region	0.91	0.09	1.01	1.01
Olomouc Region	0.09	-0.09	1.00	0.99
Moravian-Silesian Region	1.55	0.00	1.02	1.00
Zlín Region	0.64	0.00	1.02	1.00
Czech Republic	**8.36**	**0.36**	**1.01**	**1.00**

Source: VZP (2010-2021)

As can be seen from the results in Tab. 1, the average absolute increase in capacity of outpatient psychiatric care was positive at the nationwide level for both adult and child outpatient psychiatric care. In the case of outpatient psychiatric care for adults, the coefficient of average absolute increase at the nationwide level reached a value of 8.36, while for children and adolescents, the coefficient was 0.36. Between the years 2010-2021, the coefficient of average absolute increase in capacity of outpatient psychiatric care for adults in individual regions of the Czech Republic achieved positive values, with the exception of the Pardubice and Vysočina regions, where the coefficient reached negative values, and the Liberec region, where there was no change in the number of facilities in the observed period. In the case of outpatient psychiatric care for children and adolescents, only the South Bohemian and Prague regions achieved a positive coefficient of absolute increase, while in the other regions, there was a decrease or no change.

The average growth coefficient in the case of outpatient psychiatric care for adults during the period 2010-2021 ranged from 0.99 to 1.03. The declining growth coefficient was reached by the Pardubice and Vysočina regions, while the Olomouc and Liberec regions stagnated in terms of growth coefficient during the observed period. On the other hand, the remaining nine regions had a growth coefficient greater than 1. When looking at the national level, the coefficient reached a value of 1.01, indicating a slight increase of facilities.

In the case of outpatient psychiatric care capacity for children and adolescents, the average growth coefficient at the national level reached a value of 1.00 during the period 2010-2021, indicating no change. Within the regions, the coefficient ranged between 0.95 and 1.03. Growth was observed only in two regions, namely the South Bohemian region and the capital city of Prague, while other regions experienced stagnation or decline. The lowest value of 0.95 was reached by the Pardubice region.

From the results, it can be concluded that the capacity of outpatient psychiatric care for adults increased at a higher rate compared to the capacity for children and adolescents between the years 2010 and 2021. Most regions have an average growth coefficient close to the value of 1, indicating no change in the number of outpatient psychiatric care facilities.

Table 2 – Comparison of the number of facilities and beds in acute inpatient psychiatric care between the years 2010 and 2021

Regions	Average absolute increase		Average growth coefficient	
	Facilities	Beds	Facilities	Beds
Prague	-1.91	12.64	0.92	1.03
Central Bohemian Region	-1.09	2.73	0.84	x
South Bohemian Region	-0.09	3.91	0.97	1.05
Plzeň region	0.00	4.09	1.00	1.03
Karlovy Vary Region	0.00	2.91	1.00	1.05
Ústí nad Labem Region	-1.55	0.45	0.86	1.00
Liberec Region	0.09	0.00	1.07	1.00
Hradec Králové Region	0.00	0.00	1.00	1.00
Pardubice Region	-0.09	4.55	0.96	1.06
Vysočina Region	-1.73	8.36	0.83	x
South Moravian Region	-1.55	3.18	0.90	1.02
Olomouc Region	-0.45	-1.55	0.89	0.98
Moravian-Silesian Region	-0.73	9.36	0.90	1.08
Zlín Region	-0.73	2.27	0.82	x
Czech Republic	**-9.82**	**52.91**	**0.90**	**1.03**

Source: VZP (2010-2021)

Within the regional capacities of acute inpatient psychiatric care, the dynamics of the development of the number of facilities and beds were assessed. The results of the average absolute increase in facilities in Tab. 2 showed a decrease in the number of facilities in the regions between the years 2010 and 2021, with an average nationwide decrease of 9.82 facilities annually during the observed period. In Plzeň, Karlovy Vary, and Hradec Králové regions, there was no change in the number of acute inpatient psychiatric care facilities between the years 2010 and 2021. Liberec region was the only one in the Czech Republic that noticed an increase in the number of acute inpatient psychiatric care facilities, while in the other ten regions, there was a decrease. The largest decline in the average annual change was recorded in Prague with an average value of -1.91 facilities. On the other hand, in the case of beds for acute inpatient care at the national level, there was an increase between years 2010 and 2021, with an average of 52.91 newly established beds annually. At the regional level, in Liberec and Hradec Králové regions, there was no change in the number of beds during the observed period. Olomouc region was the only one in the Czech Republic with a year-on-year decrease in beds for acute psychiatric care, while in the other regions of the Czech Republic, the number of beds increased.

The presented results are also supported by the value of the average growth coefficient, which, in the case of acute inpatient psychiatric care facilities, reached a value of 0.90 at the national level, indicating a slight decline. The coefficient results within facilities in the regions ranged from 0.82 to 1.07. Zlín region experienced the greatest decline with a coefficient value of 0.82, while Liberec region recorded the largest increase and as mentioned before, was the only region with a growth in the number of facilities.

Regarding the average growth coefficient of beds for acute inpatient psychiatric care, the values ranged from 0.98 to 1.08. At the national level, the coefficient reached a value of 1.03, indicating a slight increase in the number of beds. Except for Olomouc region, which reached a value of 0.98 and thus experienced a decrease, all other regions in the Czech Republic had average growth coefficients of 1.00 or higher. Regions of Vysočina, Central Bohemia, and Zlín could not have their average growth coefficient of beds for acute inpatient psychiatric care evaluated due to the absence of such beds in these regions in the year 2010, which was the first year of observation.

It can be noticed that while the number of acute inpatient psychiatric care facilities decreased during the observed period from 2010 to 2021, the number of beds expanded in the regions. This suggests that the number of facilities decreased in the Czech Republic during the observed period, but at the same time, the capacity of existing facilities increased. The dynamics of the development of facilities and beds for acute inpatient care in the Czech regions were not symmetrical between the years 2010 and 2021.

The comparison of the average growth rate inpatient care (AGR IPC) of adults and children, and average growth rate outpatient care (AGR OPC) of facilities and beds is displayed in the Fig. 1 and in Fig. 2 for better understanding of differences among the regions in the Czech Republic.

Figure 1 – Comparison of the average growth rate IPC and average growth OPC by regions of the Czech Republic between the years 2010 and 2021

Source: Own processing

Figure 2 - Comparison of the average growth rate of inpatient care and average growth of outpatient care by regions of the Czech Republic between the years 2010 and 2021
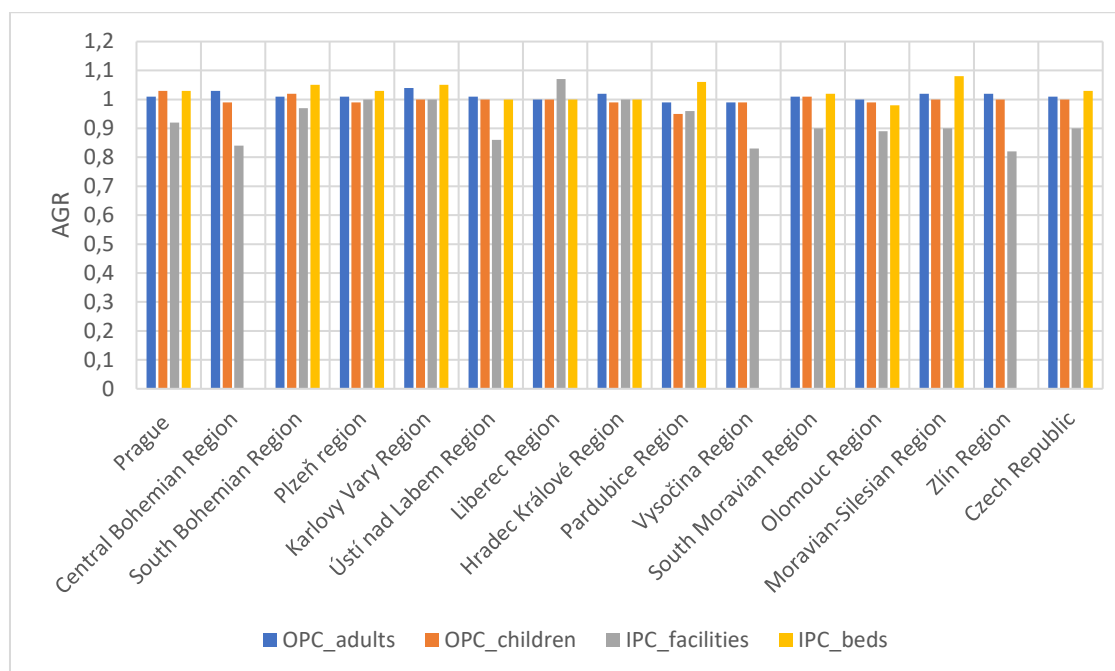
Source: Own processing

The following Tab. 3 and Tab. 4 present the average absolute increase and the average growth coefficient of working time of doctor´s in outpatient psychiatric care and acute inpatient psychiatric care between the years 2010 and 2021. In the case of outpatient psychiatric care, the data are divided into working time of doctor´s for adults and working time of doctor´s for children and adolescents. Working time of doctor´s are a key indicator that reflects the staffing of psychiatric healthcare facilities and can provide valuable information about potential changes in psychiatric healthcare in individual regions.

Table 3 – Comparison of working times of doctor´s of outpatient psychiatric care by regions between the years 2010 and 2021

Regions	Average absolute increase		Average growth coefficient	
	Adults	Children and Adolescents	Adults	Children and Adolescents
Prague	3.96	0.99	1.02	1.05
Central Bohemian Region	1.57	-0.05	1.03	0.99
South Bohemian Region	0.84	0.43	1.02	1.08
Plzeň region	1.55	0.16	1.04	1.04
Karlovy Vary Region	0.61	0.02	1.05	1.01
Ústí nad Labem Region	0.79	0.02	1.02	1.00
Liberec Region	0.05	-0.01	1.00	1.00
Hradec Králové Region	0.36	-0.11	1.01	0.97
Pardubice Region	0.22	-0.05	1.01	0.98
Vysočina Region	0.13	0.09	1.00	1.03
South Moravian Region	1.16	0.39	1.02	1.04
Olomouc Region	-0.10	0.04	1.00	1.01
Moravian-Silesian Region	1.68	0.16	1.03	1.03
Zlín Region	0.61	-0.04	1.02	0.99
Czech Republic	**13.43**	**2.03**	**1.02**	**1.02**

Source: VZP (2010-2021)

The average absolute increase in working hours of doctor´s in outpatient psychiatric care showed a positive trend between the years 2010 and 2021. At the national level, their number increased by 13.43 working hours per year in the case of doctors providing outpatient psychiatric care for adults. Prague recorded the largest absolute increase in the number of doctor´s working hours for adults (3.96 working hours), which may indicate a growing need for

medical care in this region. On the other hand, Olomouc region experienced a slight decrease (-0.10 working hours), being the only region in the Czech Republic where the number of working hours of doctor´s in outpatient psychiatric care for adults decreased during the observed period.

The average absolute increase in working hours of doctor´s in outpatient care for children and adolescents increased at the national level by a smaller number compared to positions for adults, specifically by an increase of 2.03 working hours. Central Bohemian, Hradec Králové, Pardubice, and Zlín regions experienced a decrease in the number of working hours of doctor´s in outpatient care for children and adolescents between the years 2010 and 2021.

The average growth coefficient of working hours of doctor´s in outpatient care reached value of 1.02 at the national level during the observed period, both working hours of doctor´s for adults and for children with adolescents. In the case of doctor´s working hours for adults, the values of the coefficient in the regions ranged between 1.00 and 1.05 showing a slight increase or stagnation in all regions of the Czech Republic. In the case of the average growth coefficient of working hours of doctor´s for children and adolescents, the values ranged between 0.97 and 1.08. Overall, there was a negative growth in 4 regions, Ústí nad Labem and Liberec regions experiencing stagnation, while the rest of the Czech regions showed growth.

Overall, it can be deduced from Tab. 3 that there was an increase in the number of working hours of doctor´s in outpatient care at the national level between the years 2010 and 2021, which could indicate an effort to improve healthcare accessibility for citizens. However, the increases and changes in individual regions may be influenced by various factors, such as demographic trends, financial resources, healthcare needs of the population, and other variables.

Table 4 records the average absolute increase and average growth coefficient of working hours of doctor´s in inpatient care in the individual regions of the Czech Republic, as well as the overall national average. The table provides information about changes in staffing in hospitals and inpatient facilities.

Table 4 - Comparison of working times of doctor´s of acute inpatient psychiatric care by regions between the years 2010 and 2021

Regions	Average absolute increase	Average growth coefficient
Prague	-6.22	0.96
Central Bohemian Region	-2.48	0.86
South Bohemian Region	-2.03	0.94
Plzeň region	-7.39	0.89
Karlovy Vary Region	-0.17	0.99
Ústí nad Labem Region	-4.52	0.90
Liberec Region	0.55	1.04
Hradec Králové Region	0.18	1.01
Pardubice Region	0.45	1.03
Vysočina Region	-7.14	0.84
South Moravian Region	-4.73	0.93
Olomouc Region	-3.28	0.91
Moravian-Silesian Region	-3.75	0.93
Zlín Region	-5.43	0.78
Czech Republic	**-45.95**	**0.93**

Source: VZP (2010-2021)

During the observed period, there was a decrease in the number of working hours of doctor´s in inpatient psychiatric care at the national level, with an average absolute increase of -45.95 working hours. The average absolute increase showed positive values only in Liberec, Hradec Králové, and Pardubice regions, while in the other regions of the Czech Republic, there was a decrease in the number of working hours of doctor´s. Vysočina region recorded the largest average absolute decrease (-7.14 working hours).

The average growth coefficient at the national level reached a value of 0.93, indicating that there was a slight overall decrease in the number of working hours of doctor´s in most regions of the Czech Republic during the observed period. The values of the average growth coefficient in the regions of the Czech Republic during the observed period ranged from 0.78 to 1.04. As previously indicated, the Liberec region (1.04), Hradec Králové region (1.01), and Pardubice region (1.03) achieved coefficients greater than 1, indicating an increase in working hours of doctor´s.

Differences in the results of the average growth coefficient can be observed among regions. For instance, the Central Bohemian, Plzeň, Zlín, and Vysočina regions showed more significant reductions in the number of working hours of doctor´s.

The results of the study obtained during the examined period have limited relevance due to data limitations, as they were evaluated only from the data obtained from one insurance company within the Czech Republic.

4 Conclusion

The analysis of the dynamics of psychiatric care capacity between the years 2010 and 2021 provides important information about changes in healthcare that can influence the availability and quality of services provided to patients with mental disorders. The aim of the study was to examine the dynamics of regional capacities of psychiatric care in the Czech Republic between the years 2010 and 2021. Data from the Public Health Insurance Company in the Czech Republic were used for the analysis. To assess the dynamics in psychiatric capacities, average absolute increase and average growth coefficient were used. These indicators allowed to compare the changes over time and among individual regions.

The results presented in Tab. 1 and Tab. 2 show that the capacity of outpatient psychiatric care for both, adults and children at the national level increased, but with different trends in individual regions. The increase in capacity for adults was higher than for children and adolescents. In outpatient psychiatric care for adults, the average growth coefficient at the national level was 1.01, indicating a positive trend of capacity growth. The highest growth was recorded in Karlovy Vary region with the average growth coefficient value of 1.04. On the other hand, Vysočina and Pardubice regions showed decreasing values, suggesting potential issues in these regions with providing the outpatient psychiatric care. Average growth coefficient for capacities of outpatient psychiatric care for children and adolescents was 1.00 at national level indicating a stagnation in the number of facilities between the years 2010 and 2021.

In the case of acute inpatient psychiatric care, different trends were identified. At the national level, there was a significant decrease in the number of facilities (average growth coefficient 0.90), but at the same time, there was an increase in the number of beds (average growth coefficient 1.03). The number of acute inpatient care facilities decreased in most regions during the observed period, suggesting a possible tendency towards centralization of psychiatric care. An exception was Liberec region, which recorded an increase in the number of facilities (average growth coefficient 1.07).

Overall, the dynamics or regional capacities in both acute inpatient and outpatient psychiatric care in the Czech Republic displayed trends of change during the observed period. Outpatient care capacity showed an overall positive trend, with variations across regions. Acute inpatient care showed a decrease in the number of facilities, a simultaneous increase in beds, and a reduction in working hours of doctors (see the RQ1). The dynamics of the development of capacities of acute inpatient and outpatient psychiatric care differed significantly among regions in the Czech Republic during the observed period. Some regions experienced growth, while others showed stagnation or decline (see the RQ2).

An important aspect of the analysis was also the examination of the staffing of outpatient and inpatient psychiatric care through working hours of doctor´s. In outpatient care, there was a positive average growth coefficient in working hours of doctor´s for adults (1.02) and for children (1.02), indicating an effort to increase the staffing in these facilities. However, in acute inpatient care, the average growth coefficient in working hours of doctor´s was smaller than 1, specifically 0.93, which may signal certain issues with the availability of physicians for care in hospitals and inpatient facilities. Only three regions in the Czech Republic had the growth in doctor´s working hours of acute inpatient psychiatric care, and those were Liberec region, Hradec Králové region and Pardubice region.

The limitation of the research is the fact that the analysis was based solely on data from one health insurance company in the Czech Republic, so all the results should be interpreted with caution. Various factors, such as demographic trends, financial resources, or organizational changes may also influence the results and developments in individual regions.

In conclusion, the analysis of the development of capacity and staffing in psychiatric care in the Czech Republic provides valuable information for assessing the availability and quality of services for patients with mental disorders. Continuous monitoring and further analysis are necessary for a comprehensive understanding of the situation, data, and their interrelations.

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Appendix

Number of outpatient psychiatric care facilities for adults, children and adolescents by regions for the years 2010 and 2021

Regions	Adults		Children and Adolescents	
	2010	**2021**	**2010**	**2021**
Prague	191	202	22	31
Central Bohemian Region	61	81	7	6
South Bohemian Region	40	47	7	9
Plzeň region	57	63	7	6
Karlovy Vary Region	17	25	4	4
Ústí nad Labem Region	50	55	7	7
Liberec Region	22	22	5	5
Hradec Králové Region	36	46	7	6
Pardubice Region	40	35	7	4
Vysočina Region	42	37	8	7
South Moravian Region	81	91	13	14
Olomouc Region	44	45	12	11
Moravian-Silesian Region	69	86	10	10
Zlín Region	26	33	5	5
Czech Republic	**776**	**868**	**121**	**125**
Minimum	17	22	4	4
Maximum	191	202	22	31
Mean	55.43	62.00	8.64	8.93
Median	43.00	46.50	7.00	6.50
Standard Deviation	41.32	44.21	4.43	6.71

Source: VZP (2010-2021)

Number of working hours of outpatient psychiatric care doctor´s for adults, children and adolescents by regions for the years 2010 and 2021

Regions	Adults		Children and Adolescents	
	2010	**2021**	**2010**	**2021**
Prague	181.40	225.00	14.40	25.20
Central Bohemian Region	52.00	69.30	5.40	4.90
South Bohemian Region	30.40	39.60	3.50	8.20
Plzeň region	35.60	52.60	3.10	4.80
Karlovy Vary Region	9.60	16.30	2.40	2.60
Ústí nad Labem Region	33.30	42.10	5.40	5.60
Liberec Region	17.00	17.50	3.70	3.60
Hradec Králové Region	23.10	27.10	4.50	3.30
Pardubice Region	19.20	21.60	3.10	2.60
Vysočina Region	25.40	26.80	2.50	3.50
South Moravian Region	70.70	83.40	9.20	13.50
Olomouc Region	41.80	40.70	6.70	7.10
Moravian-Silesian Region	48.20	66.70	5.40	7.20
Zlín Region	21.90	28.60	3.30	2.90
Czech Republic	**609.50**	**757.20**	**72.50**	**94.80**
Minimum	9.60	16.30	2.40	2.60
Maximum	181.40	225.00	14.40	25.20
Mean	43.50	54.10	5.20	6.80
Median	31.80	40.20	4.10	4.80
Standard Deviation	41.27	51.36	3.10	5.84

Source: VZP (2010-2021)

Number of acute inpatient psychiatric care facilities and beds by regions for the years 2010 and 2021

Regions	Facilities		Beds	
	2010	2021	2010	2021
Prague	35	14	337	476
Central Bohemian Region	14	2	0	30
South Bohemian Region	4	3	65	108
Plzeň region	3	3	101	146
Karlovy Vary Region	1	1	45	77
Ústí nad Labem Region	21	4	121	126
Liberec Region	1	2	76	76
Hradec Králové Region	5	5	111	111
Pardubice Region	3	2	55	105
Vysočina Region	22	3	0	92
South Moravian Region	25	8	189	224
Olomouc Region	7	2	103	86
Moravian-Silesian Region	12	4	84	187
Zlín Region	9	1	0	25
Czech Republic	**162**	**54**	**1287**	**1 869**
Minimum	1	1	0	25
Maximum	35	14	337	476
Mean	11.57	3.86	91.93	133.50
Median	8.00	3.00	80.00	106.50
Standard Deviation	10.11	3.31	84.88	108.07

Source: VZP (2010-2021)

Number of working hours of acute inpatient psychiatric care doctor´s by regions for the years 2010 and 2021

Regions	2010	2021
Prague	194.90	126.50
Central Bohemian Region	34.00	6.70
South Bohemian Region	45.60	23.30
Plzeň region	112.40	31.20
Karlovy Vary Region	12.90	11.00
Ústí nad Labem Region	70.60	20.90
Liberec Region	12.00	18.00
Hradec Králové Region	25.30	27.20
Pardubice Region	12.30	17.30
Vysočina Region	92.20	13.60
South Moravian Region	98.70	46.70
Olomouc Region	56.80	20.70
Moravian-Silesian Region	75.90	34.70
Zlín Region	63.70	4.00
Czech Republic	**907.40**	**401.90**
Minimum	12.00	4.00
Maximum	194.90	126.50
Mean	64.80	28.70
Median	60.30	20.80
Standard Deviation	48.15	29.24

Source: VZP (2010-2021)

Contracting out public services from a behavioural economics viewpoint

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Abstract: The conventional perception of contracting out from the viewpoint of the neo-classical principal-agent theory, where the relationship between the procurer and the supplier of a public service is seen as managerial or controlling, is now being replaced by a newer view through the lens of behavioural economics, which sees this relationship as a partnership based on flexible cooperation. In this view, the following factors stand out as determinants of the benefits of contracting: frequency of communication between the service provider and the service producer, joint problem-solving, mutual trust, shared values, and a move away from sanctions to bargaining. The paper aims to identify the nature of the relationship between the supplier and the procurer (managerial versus partnership) based on the findings of behavioural economics and the analysis of public service contracting out management. The results concerning the quality of contract management from the behavioural economics perspective were obtained from a questionnaire survey. The results of our investigation in Slovak municipalities show that the desired change towards partnership building has yet to occur. To a certain extent, this may result from already concluded contracts, where the municipality does not have enough opportunities to change the partner's behaviour and the services already provided.

Keywords: Behavioural economics, Nudge, Contracting, Municipality, Partnership

JEL Classification: H41, Q53

1 Contracting out - using insights from behavioural economics

Classical and neoclassical economic theory is based on the assumption that individuals behave (and, within its framework, make decisions) in a strictly rational manner, that they take into account all circumstances, and always try to achieve maximum utility (this presupposes viewing the relationship of procurer/principal versus supplier/agent through the lens of principal-agent theory as a competitive relationship).

Contractual governance of the relationship between the principal (public institution) and agent (supplier or external organisation) is built on formal and written definitions of the relationship, explicitly defining the parties' responsibilities and obligations (Cao, Lumineau, 2015; Ryall, Sampson, 2009; Halaskova et al., 2021; 2022). Contracts function as a guarantee in the event of ex-post problems with service delivery and reduce the risks arising from non-compliance by one party with the stipulated conditions (Luo, 2002). Contracts define precisely how each party should behave, what their roles and responsibilities are, and provide information on what outcomes should be achieved and how to act in case of unforeseen events or what sanctions to invoke in case of breach of the contract (Poppo, Zenger, 2002, Wang et al., 2011).

In reality, however, individuals do not behave entirely according to standard assumptions. They are influenced by pre-judgments, social environment, and various individual motives that have little to do with rationality. Thus, individuals behaving in this way rarely find an optimal solution. Downs (1957) draws attention to this discrepancy and explains the cause of the differences because individuals simply lack information and thus do not know all aspects of their decision-making (Thaler, 2017).

In contrast to the well-known classical or neoclassical notion of the rational individual (homo economicus), behavioural economics has developed the assumption of the so-called irrational individual, whose behaviour is not random, subject to irrational environmental influences (the so-called context effect), such as emotions, feelings based on short-term planning horizons, and many others (Ariely, 2009).

Contracting a public service is one such decision - 'make or buy'. The solution to the issue of public service production as a collective good with externalities is found in the neoclassical theory of market failure, which works with the assumption of "homo economicus", assuming rationality in the individual's decision making. However, as we explained above, this is limited or influenced by individual motives or the environment. This is a crucial point to which public institutions should respond and be agile concerning the citizen as a consumer of a public

service or concerning the contractor as a supplier of a service (Lin et al., 2006; Charbonnier-Voirin, 2011). Agility is understood as the ability to react quickly to change, but also to act and "master" the other, thanks to significant capacities to anticipate, innovate and learn" (Dubuisson-Quellier, 2004 in Dianoux).

Agility on the part of the public institution as the purchaser of the service is important because the conclusion of a contract does not guarantee 100% that there will be no breach of contract on either side. Cao, Lumineau (2015) state that according to social exchange theory, trust is the basis for forming social relationships and cooperation between partners. Existing literature defines two types of trust: trust based on good faith and "competence trust" (Das, Teng, 1998; Malhotra, Lumineau, 2011; Sako, 1992). Good faith-based trust is built on the assumption that co-working partners will fulfil their agreed role in the contract and that they will behave honestly despite the possibility of opportunism (Das, Teng, 2001; Lui, Ngo, 2004; Nooteboom, 1996). Competency-based trust stems from the fact that the contracting authority or public institution trusts that the contractor is capable of performing the task and has the capabilities to do so (Das, Teng, 2001; Lui, Ngo, 2004; Nooteboom, 1996). This refers to the contractor's technical, cognitive, organisational and community competencies, which are assessed by the public institution (Klein-Woolthuis et al., 2005).

When trust is based on goodwill between partners, research shows that there is a decrease in transaction costs, opportunistic behaviour is reduced, and, as a result, resources and energy can be deployed to create innovative solutions (Lane et al., 2001; Wang et al., 2011). When there is goodwill trust between partners, there is a closer degree of cooperation, a sharing of values and the formation of informal relationships between partners, which ultimately leads to the creation of innovations, improved service quality and efficiency in service delivery (Fryxell et al., 2002; Lui, Ngo, 2004; Wang et al., 2011). Competency trust reduces the need for repeated explanations of responsibilities, resulting in less frequent but higher quality communication in terms of content, which results in greater innovation (Nooteboom, 1996; Roy et al., 2004). In the presence of competence trust, both parties are more likely to listen to each other, absorb and take action based on the knowledge and information gained (Levin, Cross, 2004). On the other hand, as Roy et al. (2004) state, a lack of trust leads to a decrease in the rate of innovation.

As Dianoux et al. (2019) state, communication with public service suppliers as partners in the contractual relationship is critical in developing agility. However, classical persuasive techniques acting on attitudes to influence behaviour in the short or medium term take a long time to implement and, in some cases, need to be more reactive, particularly given their distance from the decision-making location.

According to Dianoux et al. (2019), nudges are among the relevant techniques that allow organizations to develop their agility in a constantly changing environment, either internally (in communication with employees) or externally (in communication with potential partners). According to Singler (2015), nudges are ideally suited to an agile innovation approach. According to Singler (2015), the flexibility of this approach rests on four main characteristics, which are the construction of a choice architecture aimed at changing the current behaviour of partners by promoting appropriate behaviour, communication that leaves the partner free to decide or choose a given alternative, communication that promotes behaviour that is appropriate for him/herself, for the community, and the like, and communication whose implementation costs are low and behavioural consequences are high.

Classical communication methods using the power of rational arguments, notes, meetings, and even coercive methods reveal certain limits that can be overcome by using communication aimed at social norms of behaviour. For example, when communicating with partners, communication usually focuses on the emotional, cognitive, conative and, in the case of public services, the social component (the impact of social norms on individual behaviour). The above components are mainly used because they can influence the behaviour of consumers or suppliers of public services (Thaler, Sunstein, 2010).

2 Methodology

The paper aims to identify the nature of the relationship between the supplier and the contracting authority (managerial versus partnership) on the basis of behavioural economics and the analysis of public service contracting management.

Research question 1: What is the relationship between the supplier and the purchaser of public services?

The results concerning the quality of contract management from the behavioural economics perspective were obtained from a questionnaire survey conducted from January to April 2022.

As behavioural factors are defined as qualitative characteristics, for the purpose of the research we transformed them into a quantitative form according to selected features.

Table 1 - Quantifying the determinants of the outcome effect of contracting out services in the public sector in relation to behavioural factors

Factor	Question	Scale	Code	MINDSPACE
x 1 - providing user-friendly public services	Supplier innovates the service delivery process (process innovation) - increases the efficiency of service delivery	totally agree	100	Significance (S), Preset option (D)
		I agree	80	
		neither agree nor disagree	60	
		disagree	40	
		completely disagree	20	
	Supplier innovates the service delivered (product innovation) - increases the quality of the service provided	totally agree	100	Preset option (D)
		I agree	80	
		neither agree nor disagree	60	
		disagree	40	
		completely disagree	20	
	The supplier innovates the management practices of its organisation (organisational innovation)	totally agree	100	Preset option (D)
		I agree	80	
		neither agree nor disagree	60	
		disagree	40	
		completely disagree	20	
	The supplier innovates the design or the way the service is offered (marketing innovation)	totally agree	100	Preset option (D), Feelings (A)
		I agree	80	
		neither agree nor disagree	60	
		disagree	40	
		completely disagree	20	
x 2 - mutual trust	The supplier and the contracting authority have confidence in each other to fulfil their contractual obligations	totally agree	100	Report (M), Incentive (I), Commitment (C)
		I agree	80	
		neither agree nor disagree	60	
		disagree	40	
		completely disagree	20	
	The supplier and the contracting authority trust each other to communicate openly	totally agree	100	Report (M), Incentive (I), Commitment (C)
		I agree	80	
		neither agree nor disagree	60	
		disagree	40	
		completely disagree	20	
X3 - value sharing	Supplier and procuring entity mutually identified with the values they espouse	totally agree	100	Standards (N), Significance (S)
		I agree	80	
		neither agree nor disagree	60	
		disagree	40	
		completely disagree	20	
	Supplier and procuring entity communicate and work together to resolve issues	totally agree	100	Standards (N)
		I agree	80	
		neither agree nor disagree	60	
		disagree	40	
		completely disagree	20	
	In resolving problems in the performance of contractual obligations, the supplier and the procuring entity prioritise negotiation over sanctions.	totally agree	100	Commitment (C), Standards (N)
		I agree	80	
		neither agree nor disagree	60	
		disagree	40	
		completely disagree	20	

Source: own elaboration

Factor (x1) - the provision of user-friendly public services is based mainly on the behavioural factor of the default option. Local authorities are likely to base their contracting on already concluded, standard contracts while only modifying their content to a certain extent. For certain types of local public services, such as the collection and disposal of wastewater, we assume that the service provider will also be an expert in the field. In the case of contracting, local authorities should therefore focus on finding out what innovations exist in the field or requesting this information from the contractor when drawing up the contract itself. Of course, we are not only referring to costly innovations (e.g. on-board weighing scales in refuse vehicles, purchase of eco-friendly cars) but also to

innovations in the form of nudges such as colour differentiation of waste bins, change of information graphics on waste bins, and the like. These innovations ultimately increase the efficiency and quality of the service provided.

Another factor monitored is factor x2 - mutual trust. As mentioned above, if we want to build trust more quickly, it is advisable to first inform the person about the negatives of the offer and then point out the positives. For this reason, when ex-ante evaluating bidders, local authorities should focus on the negatives of the offer, e.g. the lowest price. Omitting the negatives of a bid may ultimately lead to the failure of one of the partners to honour its commitments. In order to make sure that this situation does not arise, i.e. that there is no breach of trust and deviation from shared values (factor x3), the contract can state that, in addition to financial penalties, informational penalties (e.g. social exclusion, reputational damage, shame boards) can also be imposed.

3 Results and Discussion

The results concerning the quality of contract management from the behavioural economics perspective were obtained from a questionnaire survey conducted from January to April 2022 on a sample of 53 cities and municipalities in Slovakia. Individual local governments answered questions on behavioural factors of contract management, regardless of whether they provide the service internally or externally. In this case, we wanted to obtain information on whether specific service innovations also occur in the case of in-house service provision. At the same time, as mentioned above, the insights of behavioural economics can also be applied to our employees by changing how we communicate. Finally, it should be mentioned that due to the length of the questionnaire, the local authorities were allowed to decide whether to answer the question.

In the research, we observed the contracting of local services by local governments in Slovakia. In the following table (Table 2), we present an assessment of the quality of local service contract management from the behavioural economics perspective or an assessment of the relationship between the supplier and the contracting authority based on trust and cooperation.

Table 2 - Quality rating of local service contract management in % in 2021

Local service	x 1 - providing user-friendly public services	x 2 - mutual trust	x 3 - value sharing
Collection and removal of MSW	74.11	79.44	80.19
Maintenance of public lighting	80.61	80	80.83
Maintenance of local roads	72.83	79.23	78.97
Maintenance of public green spaces	80	80	80
Cemetery services	80.69	80	80.95
Average	**77.65**	**79.73**	**80.19**

Source: own elaboration

Table 3 - Quality rating of local service contract management in % in 2021

Factor	Question	Collection and removal of MSW	Maintenance of public lighting	Maintenance of local roads	Maintenance of public green spaces	Cemetery services
x 1 - providing user-friendly public services	Supplier innovates the service delivery process (process innovation) - increases the efficiency of service delivery	76.76	80.00	75.71	83.33	82.50
	Supplier innovates the service delivered (product innovation) - increases the quality of the service provided	76.22	82.22	73.85	80.00	80.00
	The supplier innovates the management practices of its organisation (organisational innovation)	72.22	80.00	72.31	76.00	80.00
	The supplier innovates the design or the way the service is offered (marketing innovation)	71.11	80.00	69.23	80.00	80.00
	Average	**74.08**	**80.56**	**72.77**	**79.83**	**80.63**
x 2 - mutual trust	The supplier and the contracting authority have confidence in each other to fulfil their contractual obligations	79.44	80.00	78.46	80.00	80.00
	The supplier and the contracting authority trust each other to communicate openly	79.43	80.00	80.00	80.00	80.00
	Average	**79.44**	**80.00**	**79.23**	**80.00**	**80.00**
X3 - value sharing	Supplier and procuring entity mutually identified with the values they espouse	78.29	80.00	76.92	80.00	80.00
	Supplier and procuring entity communicate and work together to resolve issues	81.71	82.50	81.54	80.00	82.86
	In resolving problems in the performance of contractual obligations, the supplier and the procuring entity prioritise negotiation over sanctions.	80.57	80.00	78.46	80.00	80.00
	Average	**80.19**	**80.83**	**78.97**	**80.00**	**80.95**

Source: own elaboration

The results show that there is trust between partners in contracting local public services, i.e. it can be assumed that there is competence trust between partners (van der Valk et al., 2016). As mentioned above, when there is competence trust, when the amount of opposition is eliminated, it is possible to achieve a higher rate of innovation in individual services. Our results suggest that from the perspective of local governments, suppliers (regardless of whether they are internal or external suppliers) of individual public services try to introduce innovations related to either process, product, organisation or marketing innovation.

The results further suggest that the contracting authority (local government) and the service supplier are trying to work together to solve problems.

The above raises the question of whether the relationship between the contractor and the contracting authority is transformed into a partner-partner relationship based on trust and cooperation, which results in innovation. We will try to answer this question by testing the correlation between how a given service is provided and the various behavioural factors of contract management quality.

For us, the mode of provision of a given service represents the dependent variable Y. The defined behavioural factors related to the quality of contract management are the independent variables (X) (Table 3). Based on the data obtained, we observe whether the relationship between the supplier and the contracting authority has been transformed from a competitive to a partnership relationship based on mutual cooperation and trust.

Table 4 - Behavioural factors of contract management quality as independent variables (X)

Supplier innovates the service delivery process (process innovation) - increases the efficiency of service delivery	Process innovation
Supplier innovates the service delivered (product innovation) - increases the quality of the service provided	Product innovation
The supplier innovates the management practices of its organisation (organisational innovation)	Organisational innovation
The supplier innovates the design or the way the service is offered (marketing innovation)	Marketing innovation
The supplier and the contracting authority trust each other to fulfil their contractual obligations	Confidence in meeting contractual obligations
The supplier and the contracting authority trust each other to communicate openly	Confidence in communication
Supplier and procuring entity identify with each other's espoused values	Identification in values
Supplier and procuring entity communicate and work together to resolve issues	Shared communication
In resolving problems in the performance of contractual obligations, the supplier and the procuring entity prioritise negotiation over sanctions.	Negotiation before sanctions

Source: own elaboration

We use the statistical method of Spearman's correlation coefficient to measure the degree of dependence. This coefficient indicates the statistical dependence (correlation) between two variables regardless of their magnitude. We arrived at our results by the following procedure:

We choose the null and alternative hypotheses:

H0: $\rho = 0$ (there is statistical insignificance between the observed variables);

H1: $\rho \neq 0$ (there is statistical significance between the observed variables); (1)

We set the significance level at which we test the hypotheses:

$\alpha = 0,1$ (2)

We reject H_0 if the corresponding value of Sig. (2-tailed) < α. (3)

In the case that we have accepted H1, we accept the claim that there is statistical significance between the observed variables, i.e. they have an effect on each other. When the variables are sorted into statistically significant and statistically insignificant, we can test the rate of interdependence between the observed variables on the first group using Spearman's correlation coefficient.

The resulting value of the Spearman's correlation coefficient takes values from the interval <-1,1>, where 1 represents direct dependence, -1 represents indirect independence, 0 indicates that there is no dependence between the observed traits. The results of the rate of interdependence of the observed variables are shown in the following Table 4 and 5.

Table 5 - Statistically significant behavioural factors of contract management

Service	Factor	Sig (2 tailed)	Correlation coefficient	Rate of dependence
Collection and disposal of municipal solid waste	Process innovation	0.154	-0.236	We reject H₁
	Product innovation	0.803	-0.042	We reject H1
	Organisational innovation	0.639	-0.080	We reject H1
	Marketing innovation	0.592	-0.091	We reject H1
	Confidence in meeting contractual obligations	0.210	-0.211	We reject H1
	Confidence in communication	**0.092**	-0.285	Indirect dependence
	Identification in values	**0.087**	-0.290	Indirect dependence
	Shared communication	0.123	-0.262	We reject H1
	Negotiation before sanctions	0.110	-0.271	We reject H1
Maintenance of public lighting	Process innovation	0.305	-0.386	We reject H1
	Product innovation	0.136	-0.505	We reject H1
	Organisational innovation	0.305	-0.386	We reject H1
	Marketing innovation	0.305	-0.386	We reject H1
	Confidence in meeting contractual obligations	0.305	-0.386	We reject H1

Service	Factor	Sig (2 tailed)	Correlation coefficient	Rate of dependence
	Confidence in communication	0.305	-0.386	We reject H1
	Identification in values	0.305	-0.386	We reject H1
	Shared communication	0.466	-0.280	We reject H1
	Negotiation before sanctions	0.305	-0.386	We reject H1
Maintenance of local roads	Process innovation	**0.045**	-0.523	Indirect dependence
	Product innovation	**0.035**	-0.565	Indirect dependence
	Organisational innovation	**0.049**	-0.535	Indirect dependence
	Marketing innovation	**0.069**	-0.500	Indirect dependence
	Confidence in meeting contractual obligations	**0.023**	-0.601	Indirect dependence
	Confidence in communication	**0.005**	-0.707	Indirect dependence
	Identification in values	**0.038**	-0.558	Indirect dependence
	Shared communication	**0.023**	-0.601	Indirect dependence
	Negotiation before sanctions	**0.023**	-0.601	Indirect dependence
Maintenance of public green spaces	Process innovation	**0.007**	-0.889	Indirect dependence
	Product innovation	**0.037**	-0.839	Indirect dependence
	Organisational innovation	0.110	-0.715	We reject H1
	Marketing innovation	**0.037**	-0.839	Indirect dependence
	Confidence in meeting contractual obligations	**0.037**	-0.839	Indirect dependence
	Confidence in communication	**0.037**	-0.839	Indirect dependence
	Identification in values	**0.037**	-0.839	Indirect dependence
	Shared communication	0.294	-0.516	We reject H1
	Negotiation before sanctions	**0.037**	-0.839	Indirect dependence
Management and maintenance of cemeteries	Process innovation	**0.011**	-0.794	Indirect dependence
	Product innovation	**0.016**	-0.803	Indirect dependence
	Organisational innovation	**0.016**	-0.803	Indirect dependence
	Marketing innovation	**0.016**	-0.803	Indirect dependence
	Confidence in meeting contractual obligations	**0.016**	-0.803	Indirect dependence
	Confidence in communication	**0.016**	-0.803	Indirect dependence
	Identification in values	**0.016**	-0.803	Indirect dependence
	Shared communication	0.206	-0.501	We reject H1
	Negotiation before sanctions	**0.016**	-0.803	Indirect dependence

Source: own elaboration

The statistical significance of the individual factors influencing the change in the supplier-customer relationship from competitive to partnership varies for the services studied. However, we did not have sufficient data for some services to establish the interdependence between these services. Process innovation, product innovation, marketing innovation, confidence in fulfilling contractual obligations, confidence in shared communication, negotiation before sanctions, and identification in values appear significant for several services. The results show that there is mainly an indirect dependence between the variables, meaning that ultimately there is no change in the relationship from competitive to partnership because if the service is outsourced, local governments are more likely to disagree on the given statements or behavioural factors. Conversely, if the service is provided internally, there is more likely to be user-friendly service provision, shared values and mutual trust. This is mainly because the local authority is more likely to be able to change the behaviour of its staff in favour of quality service provision rather than the staff of an external contractor.

4 Conclusion

The paper aims to identify the nature of the relationship between the supplier and the contracting authority (managerial versus partnership) based on behavioural economics and the analysis of public service contracting management. The aim is to validate the research assumption that the current practice of local public service contracting leads to a change in the relationship between supplier and contracting authority from a competitive to a partnership relationship based on mutual cooperation and trust. This assumption has yet to be confirmed in the actual conditions of Slovak local governments.

The current practice of contracting local public services does not create a partnership relationship between the entities involved, i.e. the contracting authority (public institution) and the supplier (external subject). This may be due to the terms and conditions of the contracts concluded between the different entities, which in most cases do not motivate the participating entities to build mutual trust and share values to create innovations in public services that promote efficiency and effectiveness in their delivery.

However, the conclusions of our research can be considered rather illustrative due to the size of the research sample. Nonetheless, the findings do highlight problems in contracting management. In addition to the problems already described in previous studies Beblavý et al., 2006; Meričková et al., 2010; Meričková et al., 2008; Mikušová Meričková et al., 2020, Mikušová Meričková et al., 2023, Nemec et al., 2020; Nemec et al., 2005) in the form of unsystematic nature of decision-making processes on the form of provision of these services, lack of monitoring of external production, another problem appears in the form of insufficient agility of public institutions in building partnerships with external service providers.

Acknowledgements

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Impact of inflation on crime in the Czech Republic

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Abstract: The connection between inflation and crime is not very common in the literature, and moreover, studies to date have not reached clear conclusions. Nowadays, when practically all of Europe and the Czech Republic in particular are experiencing high inflation, this topic deserves more attention. Inflation is a monetary phenomenon that reduces the purchasing power of money and people´s real incomes, and this facilitates their transition from legal to illegal activity, as crime seems more attractive. Since a large proportion of crimes are committed by people with low incomes, who are most affected by inflation, crime can be expected to increase as inflation rises. The aim of the article is to verify the validity of the hypothesis that crime increases with the growth of inflation based on data from the Czech Republic. For this purpose, regression analysis is used, which works with annual data covered the period for 1993-2022. It examines the effect of inflation on total, property, violent and economic crime and on theft, which is the most common crime committed in our country. It was found that in the Czech Republic, inflation has a statistically significant effect on crime, for all types of crime except violent crime.

Keywords: Crime, property crime, rate of inflation, rate of crime, violent crime

JEL Classification: A12, E31, K14, K40

1 Introduction

The connection between economics and crime occurred in the 1960s, when G. S. Becker, a representative of the new institutional economics, wrote the article Crime and punishment: an economic approach, in which he used cost-benefit analysis to explain the behaviour of criminals. Criminals behave rationally and compare the expected costs and expected returns of crime when deciding to engage in crime. Since then, the influence of economic factors on crime has been investigated in various studies. The most frequently cited factor causing crime is inequality in the distribution of income, but most studies to date link unemployment and crime. It also examines the effect of economic output (GDP) on crime, the effect of the business cycle and, to a relatively lesser extent, the effect of inflation on crime. There are not many studies that would purely monitor the effect of inflation on crime, and no clear conclusions have been reached so far. I believe that the effect of inflation on crime is neglected and that this topic deserves more attention right now, when practically all of Europe and the Czech Republic in particular are experiencing high inflation, the highest since 1993, when price liberalization took place. The causes of the current high inflation can be seen primarily in the growth of aggregate demand after the end of the COVID-19 pandemic, in the war between Russia and Ukraine which caused the fuel prices to rocket sky high, in the energy crisis and energy tariffs increasing in the cost of living, which is also increasing in general.

Inflation is a monetary phenomenon that reduces the purchasing power of money and peoples´ real income, and this facilitates their transition from legal to illegal activity, as crime seems more attractive. Since a large proportion of crimes are committed by people with low income, who are most affected by inflation, crime can be expected to increase as inflation rises. The aim of the article is to verify the validity of the hypothesis that crime increases with the growth of inflation based on data from the Czech Republic. For this purpose, a regression analysis is used, within which the influence of inflation on total, property, violent and economic crime and on theft, which is the most frequently committed offense in our country, is examined. This relationship is examined in the long and short terms.

2 Material and Methods

2.1 Literature overview

According Henderson (2022), every American has felt the effects of rising inflation. Inflation does not impact everyone equally, research finds that inflation impacts low-income families more severely. Inflation inducted economic hardship can produce a greater need to protect one´s wellbeing. Especially violent crime began

increasing around the time inflation began to increase. The link between inflation and violent crime is not a unique phenomenon to the United States. A cross-national analysis that spans 50 years found that inflation is a meaningful predictor of homicide rates. Inflation is an important economic correlate of variation in homicide trends. A separate study that used cross-national data over 30 years to examine this relationship found that higher rates of inflation had significant effects on homicide, robbery and burglary rates in several European nations and the United States.

Rafique (2021) focused on link between crime and various economic factors like unemployment and inflation in the context of Pakistan. His research study is based on a quantitative research method. Since the analysis studies have indicated that unemployment causes an explicit proportion of crime. There is a converse connection between inflation and joblessness. In this research, study results show that there is a positive relationship between unemployment and crime. As unemployment increases the crime rate in that country also increases, and then the matter of unemployment has to be resolved. The government includes a vital role in dominant the speed of unemployment among the youth. Trained young men ought to be actively engaged in revenue-generating activities that can occupy them and, at an equivalent time, give a supply of financial gain.

Rosenfeld, Vogel and McCuddy (2019) follow relationship between crimes committed for monetary gain and inflation in a sample of 17 U.S. cities between 1960 and 2013. Their estimates yield significant and positive effects of inflation on acquisitive crime rates in the 17 cities, controlling for income, unemployment, police strength, and other conditions associated with macro-level crime rates. Their model produces individual regression coefficients for each of the 17 cities, which indicate the range of variation across the cities in inflation effects on acquisitive crime. City-specific coefficients reveal nontrivial variation across the cities in the significance, size, and impact of inflation on acquisitive crime. Base on their findings continued low inflation rates should restrain future crime increases in many US cities.

Nunley, Stern, Seals and Zietz (2015) analyze to what extent inflation raises the incidence of property crime using U.S. data from 1950 to 2010. Authors consider different types of property crime (larceny, burglary, motor vehicle theft and robbery) and broad and narrow definitions of inflation separately. They control for the state of the business cycle and demographic changes over time explicitly. They found a robust statistical link between inflation and each of the four property crime rates. Their findings are robust to alternative definitions of inflation and the inclusion or exclusion of different control variables. In the short run, a variety of different policies and events can lead to inflation. However, in the long run, inflation is typically believed to result from growth in the money supply. According authors an overly expansive monetary policy is the primary public policy of interest, which has the unintended consequence of increasing property crime via a rise in the price level. In terms of policy, authors findings suggest that monetary policy that creates inflation has costly spillover effects.

Tamayo, Chavez and Nabe (2013) analyzed relationship between crime and inflation rates in the Philippines. Their study able to establish the serial relationship of crime and inflation rate as when the lowest of crime incidence recorded, the smallest inflation rate was also observed. It was also observed that the highest crime occurred when the inflation rate was high. The time-series test revealed that crime rates and inflation rates are stationary in order of differencing equal to two. This is interesting because although the two series were observed to be correlated, yet the order of co-integration is established at a higher differencing order indicating gradual impact one variable to the other. Thus, any effort to reduce crime incidence does not immediately lead to an increased confidence in peace and security, and thus lower market activities. On the other hand, efforts to improve market activities do not necessarily lead to increased criminal activities. The authors concluded that the inflation rate is useful to predict the changes occurring in the crime volume.

Tang (2009) tried examine the linkages among inflation, unemployment and crime rates in Malaysia. The sample period covered annual data from 1970 to 2006. The Bartlett corrected trace test was employed as being appropriate form small sample study. The corrected trace test affirmed the existence of long run equilibrium relationship between crime rate and its determinants. The estimated cointegrating vector revealed that inflation and unemployment are positively related to crime rate. This implied that inflation and unemployment are two important criminal motivation factors in Malaysia. This empirical evidence may throw some light that the policymaker could reduce the crime rate Malaysia by controlling the two macroeconomics evils – inflation and unemployment. In addition, supply-side economy may be a good policy to simultaneously reduce both inflation and unemployment rates and ultimately, reduces the crime rate in Malaysia. However, inflation is not significant in the short run. Author´s empirical evidence suggests that the causality direction is running from inflation and unemployment to crime, but there is no evidence of reverse causality.

Gillani, Rehman and Gill (2009) investigate the relationship between crime and various economic indicators such as unemployment, poverty and inflation in Pakistan. Their study covers the period for 1975-2007. The stationary properties of the time series data are examined by using Augmented Dickey-Fuller test. Johansen Maximum Likelihood Cointegration and Granger Causality tests are applied to find out long-run relationship along with causality among the variables. The findings of the tests provide evidence of the existence of long-run cointegration relationship among crime unemployment, poverty and inflation. The causality results show that crime is Granger caused by unemployment, poverty and inflation in Pakistan.

Tang and Lean (2007) reexamine the relationship between crime and inflation and unemployment in the United States from 1960 to 2005 using the modified Wald causality test. Their results suggest that inflation and crime rates are cointegrated with a positive relationship and the causal link is from inflation and unemployment to crime. Supply-side economic policy, reducing both inflation and unemployment rates simultaneously, could be one of the alternatives to reduce crime rate. Crime function in the United States was stable over the sample period. Results imply that inflation and unemployment rates cause crime rate, but there is no strong evidence of the reverse causality. An individual will engage in criminal activities because of their inability to maintain a particular level of living as a consequence of inflation and unemployment. Inflation causes the purchasing power to reduce while increasing the cost of living. As a result, crime rate may increase because an individual is unable to maintain his or her standard of living as before.

Teles (2004) investigates how fiscal and monetary policies affect crime based on studies on the effect of unequal distribution of income, poverty and unemployment on crime. The monetary and growth literature has indicated a relation between crime and inflation, if the real effects of inflation are considered. In this context, if the Tobin effect is verified, then inflation would have a positive effect on production (negative on unemployment), which could have a negative effect on crime. On the other hand, if the anti-Tobin effect is verified, then inflation may be criminally friendly. Teles found out that monetary policy affects crime if the agents´ utility function is no additively separable. It means that if the quantity of money held by an agent does not affect the marginal utility of crime, then inflation will not affect the incidence of crime in the economy. Thus, the link between monetary policy and crime that is constructed with author´s model is the relation between currency and crime in its utility function.

2.2 Model and Data

The relationship between inflation and crime in the Czech Republic is examined using two hypotheses, within which the assumption that the growth of inflation will increase crime and that this dependence will be stronger in short-term period is verified. To verify the validity of these hypotheses, a regression analysis was used. The reporting period is from 1993 to 2022 in the case of long run (annual data) and from 2018 to 2022 for short run (monthly data). The effect of inflation on selected types of crime was examined in accordance with the classification used by the Police of the Czech Republic, namely total, property and violent crime. Furthermore, the effect of inflation on theft, as it is the most common crime, and also on economic crime, as it reaches the highest level of damage, was examined. Specifically, the relationship between the inflation rate and the crime rate was examined. The inflation rate expresses the growth rate of the price level, and the values of the average annual inflation rate were used. The crime rate is expressed as the growth rate of offenses committed in one year in the territory of the Czech Republic. Regression analysis is made in MS Excel through ANOVA. Input data are drawn from the Czech Statistical Office and the Police Presidium of the Czech Republic.

The two hypotheses are verified:

1. hypothesis – as the rate of inflation increases, crime increases
2. hypothesis – the positive effect of inflation on crime is stronger in the short run

The economic model looks like this:

rate of (crime, property crime, violent crime, economic crime, theft) = f (rate of inflation)   (1)

    (+)   (+)   (+)   (+)   (+)   (+)

3 Results and Discussion

Until 1989, crime in the Czech Republic was stable and was reaching around 125,000 offenses per year. Economic transformation and the transition to a market economy created the conditions for an increase in crime, causing crime to exceed 420,000 offenses per year by the end of the 1990s. However, it has shown a downward trend since 2000, and a further decrease in crime, especially traditional crime, occurred due to the COVID-19 pandemic in 2020-2021, which can be seen in Figure 1.

The structure of crime is expressed in Figure 2, from which it follows that in 2022 property crime accounted for the largest share, namely 55 % of total crime, followed by economic crime with 8 % and violent crime with 7 %. On the contrary, violent crime had the greatest clarity, i.e. 62.1 %, while property crime only 26.6 %. In 2022, the clarity of economic offenses amounted to 43.8 %. Regarding damage caused by crime, the biggest damage was caused by economic crime, namely CZK 9 billion, which is 45.8 % of the total damage caused by crime, and the second largest damage caused came from property crime, namely CZK 7.4 billion, which is 37.7 % of the total damage done.

Inflation in the Czech Republic during the observed period was moderate and relatively stable, only in 1993, when price liberalization was catching up in our country in connection with the privatization of the Czech economy, and in 2022, for the reasons stated at the introduction of the article, it reached double-digit values and it was a case of galloping inflation. The evolution of crime and the rate of inflation is shown in Figure 1. It can be seen that the falling crime rate is accompanied by low inflation and when inflation has increased in 2022, crime has also increased, and experts predict that it will get even worse, especially expecting a rice cybercrime.

What is the link between inflation and crime? Inflation may be connected to crime through the dynamics of markets for stolen goods. As price rise, the demand for cheap stolen goods grows, which strengthens incentives to increase the supply of stolen merchandises. The increase in inflation rates ultimately forces people to trade down their spending habits, and can lead them to the hot market – stolen goods for a considerably lower price. Criminal tend to weigh the costs and benefits of the crimes they commit, and the cost of living has created a huge opportunity for them to make a quick dollar, selling stolen goods on the black market. The underground and shadow economies are pointed as one meaningful mechanism of crime encouraged by high inflation. (Rosenfeld, 2014). Inflation also reduces the purchasing power and increases the cost of living. Hence, crime rate may increase when an individual is unable to maintain their standard of living as before. (Tang, 2009).

Figure 1 – Crime and inflation

Figure 2 – Crime structure in the Czech Republic in 2022
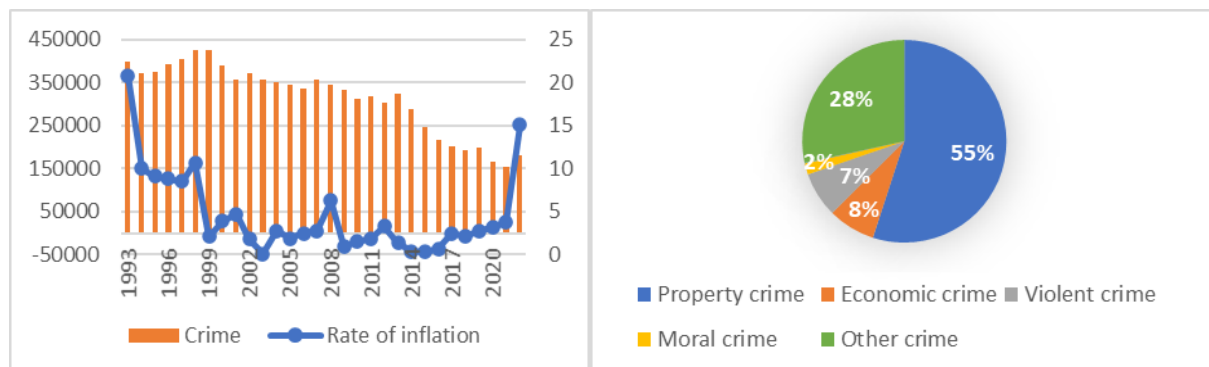
Source: Czech Statistical Office, Police Presidium of the Czech Republic, own processing

3.1 Impact of inflation on crime in the long run in the Czech Republic

It can be seen from Figure 3, that regression analysis confirmed the hypothesis that crime increases with increasing inflation, and for all types of crime except violent crime, the relationship between these variables is statistically significant at the 5% level of significance. In all five monitored cases, there is a medium strong dependence between the variables. In the case of total crime, the correlation coefficient is $R^2 = 0.6369$, and the index of determination shows that crime is caused by inflation by roughly 40 %. In the case of property crime and theft, the correlation coefficients are almost identical $R^2 = 0.5859$ and $R^2 = 0.5827$, which can be explained by the fact that theft makes up the largest part of property crime (roughly 60 %). The determination indices are also consistent, saying that 34 % of property crime and theft is caused by inflation. Economic crime is caused by inflation of 31 % and the correlation coefficient is $R^2 = 0.5604$. It was found out that of all the selected types of crime, inflation has the least effect on violent crime, despite the fact that even here it is a medium dependence between the variables, as the correlation coefficient is $R^2 = 0.4103$. The coefficient of determination R = 0.1683 implies that roughly 17 % of violent crime can be explained by inflation. However, in this case the relationship between the variables is statistically inconclusive.

Figure 3 – The impact of inflation on crime – long run - 1993-2022
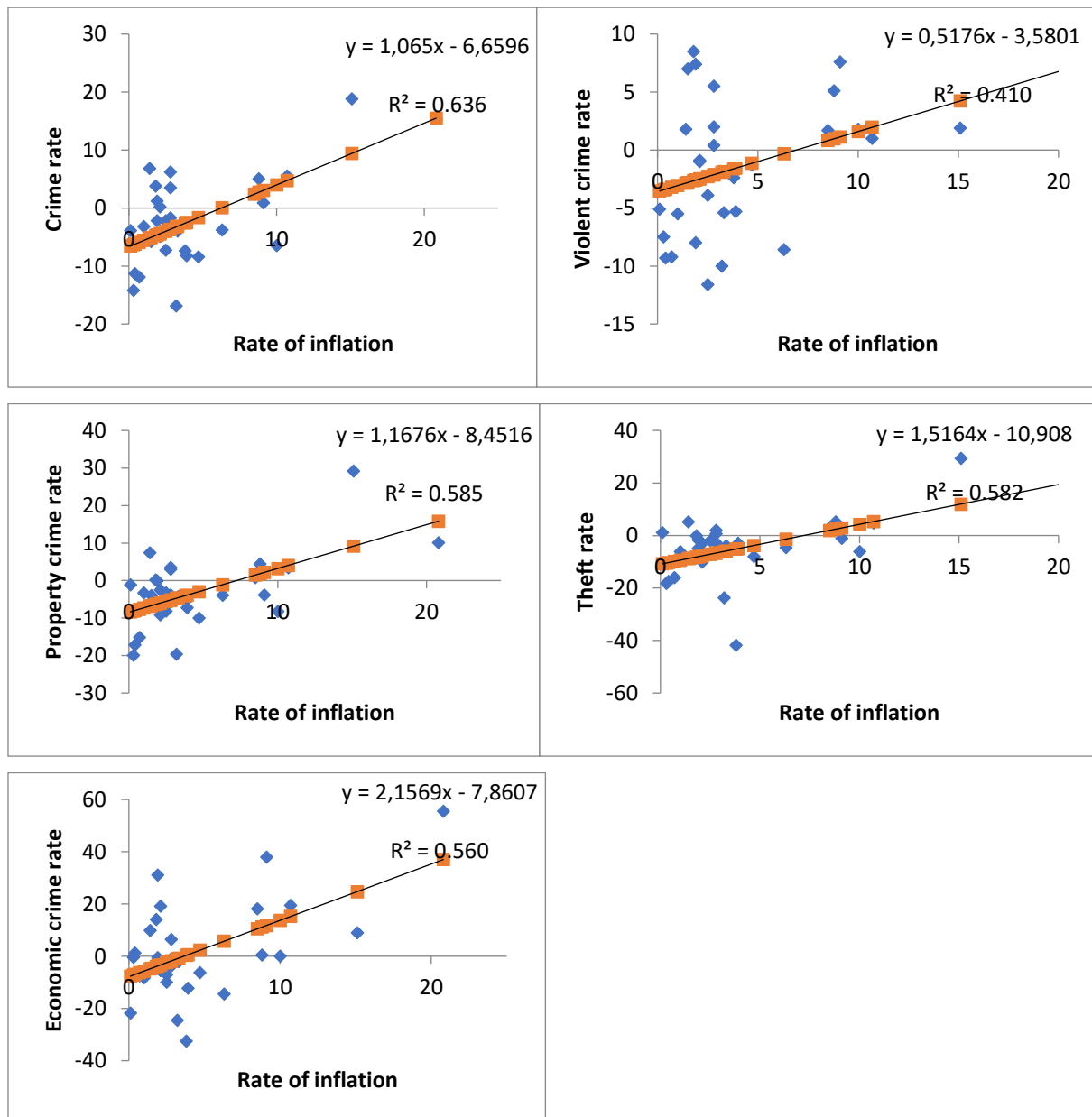
Source: Czech Statistical Office, Police Presidium of the Czech Republic, own processing

3.2 Impact of inflation on crime in the short run in the Czech Republic

The same analysis was also carried out in a short run with the aim of finding out the impact of inflation on crime in recent years or rather months, when the Czech Republic has recorded the highest inflation since 1993, and to find out whether this fact was reflected in crime. It is assumed that in the last years or months especially, inflation will have a greater influence on crime, because otherwise throughout the monitored period inflation was stable and did not show any fluctuations. Monthly data from the period 2018-2022 was used for the regression analysis. The rate of inflation is expressed by the monthly values of the annual index of consumer price indices according to the ECOICOP classification. The crime rate is expressed by the increase in crime compared to the same month of the previous year, i.e., monthly data on the percentage change in the number of offenses in the reported month of a given year compared to the same month of the previous year.

Figure 4 – The impact of inflation on crime – short run - 2018-2022
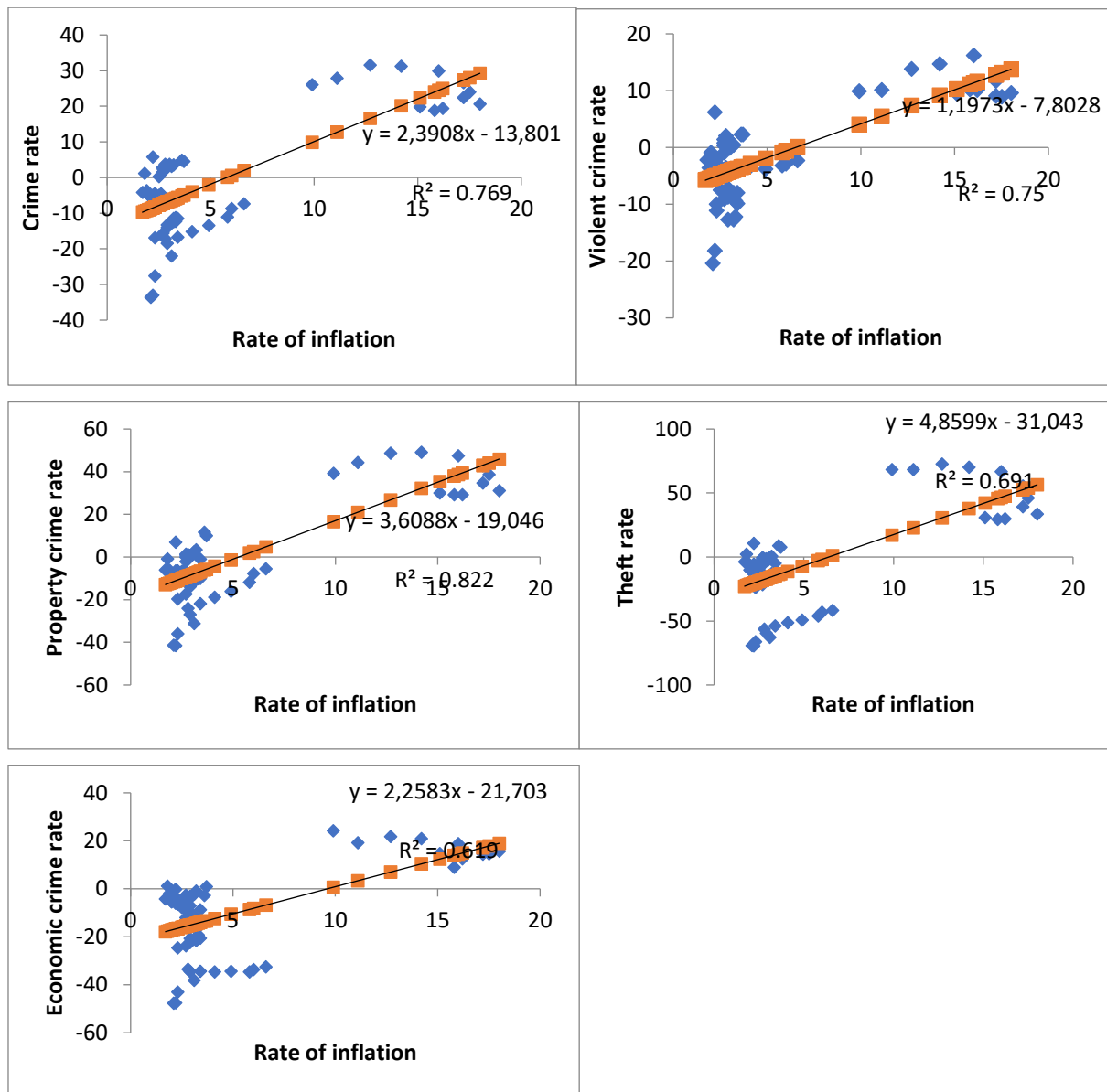
Source: Czech Statistical Office, Police Presidium of the Czech Republic, own processing

The results of the short-term regression analysis, displayed in Figure 4, show some differences. The relationship between crime and inflation shows a positive dependence and, moreover, in all cases it is statistically significant at the 1 % level of significance. In the case of total crime $R^2 = 0.7695$, violent crime $R^2 = 0.7564$ and property crime $R^2 = 0.8222$, this is a strong dependence. From the determination indexes, it can be seen that 59 % of total crime, 57 % of violent crime and 68 % of property crime can be explained by inflation. The relationship between theft and inflation shows a medium strong dependence with a correlation coefficient $R^2 = 0.6914$ and an index of determination $R = 0.4781$. A medium strong dependence also exists in the relationship between economic crime and inflation, where the correlation coefficient is $R^2 = 0.6191$ and the determination index $R = 0.3833$, which means that economic crime is caused by 38 % of inflation. The second hypothesis was confirmed too.

3.3 Impact of inflation on property crime in the Czech Republic

The regression analysis shows that inflation has the greatest effect on property crime, both in the short and long terms. Why inflation affects property crime the most? The explanation can be as follows. As prices rise, consumers tend to trade down, or substitute cheaper goods and services. But for individuals who were already buying the cheapest goods (for example, shopping at discount outlets), the market in hot goods may be the only place where they can find what they need at prices they can afford. Increased demand for goods sold off the backs of trucks incentivizes thieves to create supply. The result, the theory goes, is a rise in property crime. (Rosenfeld, 2019)

For this reason, the effect of inflation on selected types of property crime is further examined, while the types with the largest number of crimes were chosen, namely motor vehicle theft, bicycle theft, theft of things from cars, pickpocketing, residential theft and fraud. The relationship between inflation and property crime is statistically significant only for fraud at the 1% significance level and for theft of things from cars at the 5% significance level. In both cases, there is a medium strong dependence, namely $R^2 = 0.5554$ in the case of fraud and $R^2 = 0.3665$ in the case of theft of things from cars. The correlation coefficient is also medium strong in the case of the effect of inflation on residential theft $R^2 = 0.4193$, but this relationship is not statistically significant. Regression lines expressing the relationship between inflation and selected types of property crime are shown in Figure 5.

Figure 5 – The impact of inflation on property crime – 1993-2022
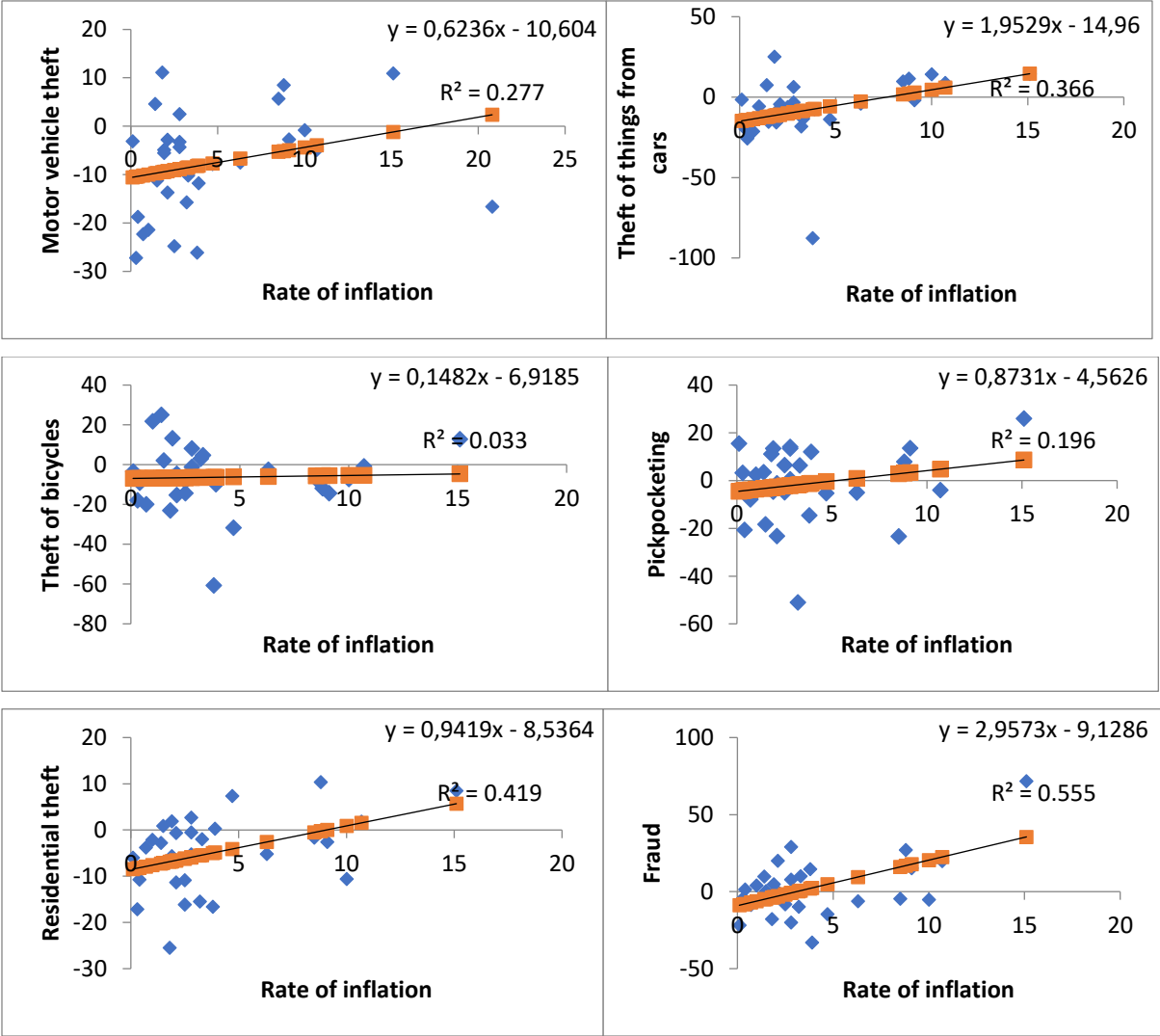
Source: Czech Statistical Office, Police Presidium of the Czech Republic, own processing

3.4 Impact of inflation on crime in the regions of the Czech Republic

The subject of interest was also the investigation of the impact of inflation on crime in regions of the Czech Republic, while the impact of inflation on total crime, violent crime, property crime, economic crime and the effect of inflation on theft was monitored again. Table 1 summarizes the results of the regression analysis carried out in regions of the Czech Republic, including Prague, for the period 2005-2022. (Even though the current higher territorial administrative organization of the Czech Republic has been valid since 2001, the Police Presidium of the Czech Republic reports data for this division of regions only since 2005, therefore the time series only begins in 2005.) It is clear from the Table 1 that inflation had a statistically significant impact on crime in thirteen cases, as well as on property crime. On the other hand, inflation had the least impact on economic crime, when the relationship between these variables was statistically significant in only two cases, namely in the Karlovy Vary Region and Jižní Morava Region. The same was true for the effect of inflation on violent crime, where this

relationship was statistically significant in four cases. Inflation had the greatest impact on crime in the Jižní Morava Region, for all types of crime, and in all cases, there was a strong dependence. For the three types of crime, a strong dependence was also manifested in the Plzeň Region, the Liberec Region and the Zlín Region. Inflation had the least influence on crime in the Vysočina Region, where this relationship is not statistically significant in any case. Overall, it can be said that inflation had a greater impact on crime in the Moravian regions than in the Czech regions.

Table 1 – The impact of inflation on crime in the regions of the Czech Republic – 2005-2022

Region		Crime	Violent crime	Property crime	Economic crime	Theft
Prague	R^2	0.4932	0.7548	0.5161	0.1207	0.4674
	F	0.0442**	0.0004***	0.0339**	0.6442	0.0584*
	Coef.	1.3945	2.0134	1.6456	0.4852	2.3815
SC	R^2	0.3015	0.0978	0.6862	0.0755	0.4862
	F	0.2394	0.7087	0.0023***	0.7731	0.0477**
	Coef.	1.2513	-0.4009	2.3593	-0.2854	1.9335
JC	R^2	0.6481	0.4893	0.6775	0.0038	0.5865
	F	0.0048***	0.0461**	0.0028***	0.9883	0.0133**
	Coef.	1.6905	1.6442	2.9967	-0.0147	2.5664
PZ	R^2	0.6938	0.0831	0.7996	0.2157	0.6512
	F	0.0020***	0.7511	0.0001***	0.4057	0.0046***
	Coef.	1.9316	0.2696	3.3590	0.8181	3.1571
KV	R^2	0.5706	0.1213	0.4576	0.6481	0.3068
	F	0.0167**	0.6427	0.0647*	0.0049***	0.2309
	Coef.	2.3067	0.5583	3.5369	4.9889	1.3906
UL	R^2	0.5673	0.6872	0.6072	0.3982	0.1462
	F	0.0175**	0.0023***	0.0097***	0.1134	0.5754
	Coef.	1.4565	1.9887	2.1986	1.4269	1.0320
LB	R^2	0.6995	0.3767	0.8273	0.0288	0.7658
	F	0.0017***	0.1361	4.18E-05***	0.9126	0.0003***
	Coef.	2.2232	0.8491	4.6033	-0.1158	4.8683
HK	R^2	0.6353	0.3295	0.8716	0.1255	0.5824
	F	0.0061***	0.1966	5.18E-06***	0.6311	0.0142**
	Coef.	2.1121	0.9625	4.2514	0.5278	3.0306
PA	R^2	0.6652	0.0163	0.7257	0.2735	0.5049
	F	0.0035***	0.9503	0.0009***	0.2880	0.0386**
	Coef.	1.7205	0.1241	2.6075	-0.9789	2.0711
VY	R^2	0.5518	0.0083	0.3800	0.1667	0.5688
	F	0.0216**	0.9745	0.1324	0.5225	0.0171**
	Coef.	1.5663	0.0183	3.8465	-0.5326	2.7935
JM	R^2	0.8654	0.7877	0.8878	0.7560	0.8846
	F	7.22E-06***	0.0001***	1.98E-06***	0.0004***	2.41E-06***
	Coef.	20.8364	10.6569	37.7251	11.3186	35.7125
ZL	R^2	0.7029	0.0072	0.8273	0.0126	0.6095
	F	0.0016***	0.9781	4.18E-05***	0.9615	0.0093***
	Coef.	1.8138	-0.0192	4.2303	0,0435	2.8451

MS	R^2	0.6474	0.3309	0.5937	0.1225	0.6261
	F	0.0049***	0.1944	0.0119**	0.6392	0.0071***
	Coef.	1.9880	0.6321	2.9862	0.4953	3.1253

Source: Czech Statistical Office, Police Presidium of the Czech Republic, own processing

4 Conclusion

The aim of the article was to verify the validity of the hypothesis that as inflation increases, so does crime, based on data from the Czech Republic. For this purpose, a regression analysis was used, which worked with annual data from the period 1993-2022. The impact of inflation on total crime, property crime, violent crime, economic crime and theft was examined. Regression analysis confirmed a positive relationship between the variables. For all types of crime, with the exception of violent crime, a statistically significant relationship was found at the 5% level of significance, and this was a medium strong dependence. From the determination index, it was found that crime in the Czech Republic is caused by inflation of 40 %.

The same analysis was also performed in a short run using monthly data from the period 2018-2022. The hypothesis was verified that in the short run, especially in the period of the last months, when inflation in the Czech Republic is high, the impact of inflation on crime will be stronger compared to the long run when inflation was relatively low and stable. This hypothesis was also confirmed by regression analysis. In this case, the relationship between crime and inflation was statistically significant at the 1% level of significance in all cases, with a strong dependence for total, violent and property crime. In the short run, 63 % of total crime can be explained by inflation.

The regression analysis showed that inflation had the greatest effect on property crime and that is why the effect of inflation on selected types of property crime was further examined whereas types with the largest number of crimes were chosen, namely motor vehicle theft, bicycle theft, theft of things from cars, pickpocketing, residential theft and fraud. The relationship between inflation and property crime was statistically significant only for fraud at the 1% significance level and for theft of things from cars at the 5% significance level. In both cases, there was detected a medium strong dependence. The correlation coefficient was also medium strong in the case of the effect of inflation on residential theft but this relationship was not statistically significant.

The subject of interest was also the investigation of the impact of inflation on crime in the regions of the Czech Republic, including Prague, for the period of 2005-2022. Regression analysis found a statistically significant impact of inflation on total crime in thirteen regions, as well as on property crime. On the other hand, inflation had the least impact on economic crime, when the relationship between these variables was statistically significant in only two regions, namely in the Karlovy Vary Region and Jižní Morava Region. The same was true for the effect of inflation on violent crime, where this relationship was statistically significant in four regions. Inflation had the greatest impact on crime in the Jižní Morava Region, for all types of crime, and in all cases, there was a strong dependence. For the three types of crime, a strong dependence was also manifested in the Plzeň Region, the Liberec Region and the Zlín Region. Inflation had the least influence on crime in the Vysočina Region, where this relationship is not statistically significant in any case. Overall, it can be said that inflation had a greater impact on crime in the Moravian regions than in the Czech regions.

In conclusion, it can be stated that in the Czech Republic, inflation significantly affects crime, especially in times with high inflation. This information can be useful for economic policy makers, who can use restrictive monetary and fiscal policies to reduce inflation and thus crime. That is why monetary policy should be evaluated with respect to its effect on crime.

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Ageing of the Slovak population and its impact on public finances

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Abstract: Population ageing is not only a European problem, but is now becoming a global problem. Such a change in demographic potential brings with it an increase in pressure not only on the provision of services, particularly in the social and health sectors, but also significantly affects public finances. In 2022, the population of post- productive age in Slovakia accounted for 17.85% of the total population and the ageing index reached 110.95, which corresponds to a degressive age structure of the population. Compared to 2011, the number of pensioners in Slovakia increased by 40.31%. The aim of this paper is to evaluate the impact of the aging of the Slovak population on public expenditures through expenditures on old-age pensions. We evaluated selected demographic characteristics as well as old-age pension expenditures. The results of the analysis showed that the total expenditure of the social insurance company increased by 57.9% in 2022 compared to 2011, while the expenditures of the old-age insurance fund increased by 59.6% in 2022 compared to 2011. Per capita expenditure on old-age pensions in 2022 amounted to €1,246, while in 2011 these expenditures was €747 per capita.

Keywords: Ageing of population, old-age pensions, public finances, social insurance

JEL Classification: H55, J14, G22

1 Introduction

Population ageing is not only a European problem but is now becoming a global problem. Population ageing will occur in virtually every country over the coming decades, albeit at different rates and levels. It is a process through which the proportion of older people in the population is increasing. Population ageing is usually described as an increase in the proportion of people over 65 in the population (Payne et al., 2007). The openness of an economy and its degree of globalisation has less impact on welfare compared to a closed economy. This stems from demographic conditions, which are similar in developed countries. Most of them are experiencing rapid population ageing. Retirement is not a psychological phenomenon; it is a historically constructed stage in an individual's life. By depending on the political, economic and demographic situation of a given country, it takes many forms and is subject to reform (Bačová Viera, 2019). Carone et al. (2005) argue that a decline in the labour force will lead to lower investment needs, as the quantity of capital more or less reflects the evolution of gross domestic product. The result will be a global savings surplus, despite the decline in savings associated with an ageing population. Higher savings will cause a worldwide fall in interest rates, implying an increase in investment. Through changes in interest rates, savings and investment will be equalised at the global level. An effective solution to this problem is therefore to raise the retirement age combined with effective human capital management through investment in education (Chybalski, 2021). An ageing society increases the demand for services, especially social and health services, increasing costs and spending on specific services. Most older people have physical and health problems that slightly impair their ability to live independently in the community (Rosenbloom, 2022). Vettori et al. (2010) argue that an ageing population affects the rate of economic growth through changes in consumer preferences. They argue that a larger share of older people in the population will lead to a shift in consumption towards non-tradable goods as seniors spend more on health care and household services. Of total spending, older people spend 1.5 times more on services compared to younger households. As a result, there is a structural transformation

towards the service sector and production is concentrated on non-tradable goods instead of the production of goods provided by technological progress. The focus of production on services has a negative impact on exports, whose decline is accompanied in the long run by a slowdown in economic growth. At the same time, the rate of economic growth is negatively affected by the absence of technological progress. In this context, central governments have formulated various public policy measures in the context of an ageing population. Generating economic growth and improving cost-efficiency and productivity are often identified as vital but very general policy measures in response to developments. A notable and general reform directly linked to these objectives is the reform of the pension system (Valkama & Oulasvirta, 2021). The aim of the pension system is to create a set of arrangements that will provide financial security for the population of post-productive age. This implies the need to reflect demographic changes, changes in the structure of the economy and employment. The last two decades have seen reforms of pension systems in several European countries in response to gradual demographic changes (Urbaníková & Štubňová, 2018). The main accelerator of changes in pension systems around the world has thus become not only ageing, but also the impact of the economic crisis and the consequent need to consolidate public finances. The simplicity and resilience of pension systems to political interference have become key success factors. The world's pension systems differ to a greater or lesser extent in terms of their set-up, parameters, and, of course, the types of risks involved and the ways in which they are redistributed (Švejnová Höesová & Krchová, 2019). Withers (2002) states the economic impact of an ageing population on government finances as follows: reduced labour force participation and flexibility due to the ageing of the labour force itself and the rising percentage of people retiring; reduced savings and investment due to the lower savings rate that is typical for people of retirement age; associated with less money spent on housing and education and more money spent on current consumption, including personal care; an increase in social spending provided by the government, especially on health care, pensions and direct care services; a reduction in tax revenues collected by the government as a result of the decline in the taxable income of retired people. In the past, there has been limited support for older people, usually provided through informal family and social arrangements. Most support for the elderly in contemporary advanced societies is provided by public and private pensions. The various pension systems have successfully closed the income gap between citizens of retirement age and those of working age. At the same time, poverty rates among pensioners have fallen significantly. However, the cost of a widely implemented pay-as-you-go pension system that relies on transfers from younger to older generations is becoming increasingly burdensome for contributors, and will eventually become unsustainable due to the ever-increasing dependency index (Bongaarts, 2004). The role of the state in this regard should be to ensure an effective system for older people to engage in active life and remain in the labour force for as long as possible. The first option for keeping older people in the labour market is to continuously raise the retirement age. However, this option does not take into account the health of the population. This often results in citizens in poorer health who are forced to take early retirement receiving a lower pension. One way of addressing these and other related problems is to create flexible working conditions for the elderly (Škrovánková et al., 2019).

Another area is health and long-term care spending. It is therefore important that the rules for balancing the state budget are respected. At the same time, in order to establish the government budget balance and net debt, pension expenditure must be addressed in parallel, applying the principle that the working-age generation should cover the increase in age-related expenditure in advance (Oksanen, 2003). The ageing of the population leads to an expansion of the pension system, which should be understood as having the same impact on private saving as the original introduction of the pure pay-as-you-go system. As the population ages, total public debt increases, leading to a negative impact on total savings (Feldstein, 2005). While maintaining the assumption of perfect markets, according to Oksanen (2005) the obvious alternative assumption is that people plan their savings over their lifetime. Then, not only does deficit spending by the government reduce overall savings, but the introduction of a pure pay-as-you-go pension scheme also reduces private saving as people save less for their own retirement. According to Bloom, et al. (2010) the savings rate depends on a country's pension system, with savings rates rising with longevity in countries with universal pension coverage and retirement incentives, but not in countries with pay-as-you-go pensions and high replacement rates. Achou et al. (2022) note that Canada's aging population could have serious economic consequences, including slowing tax revenue growth. For example, personal income taxes are disproportionately levied on working-age taxpayers, while excise taxes are paid more uniformly across the age distribution. Thus, the impact of ageing on public revenues may ultimately depend on the relative weight of each tax as a share of total revenues.

2 Material and Methods

The ageing of the population in Europe has become more pronounced in recent decades. This trend is reflected in changes in the age structure of the population and is reflected in an increasing proportion of older people, combined with a declining share of working-age people in the total population. Therefore, an important aspect for the future is to look for ways to promote active ageing as one of the possible ways of building a sustainable society.

An attempt to forecast future trends in population ageing is Eurostat's latest set of demographic projections (EUROPOP2015), which cover the period 2015 to 2080. The EUROPOP2015 projections assume that the population of the EU-28 will increase to a peak of 528.6 mill. around 2050 and then gradually decline to 518.8 mill. in 2080. This is confirmed by the evolution of the age pyramids for 2015 and 2080 (Figure 1), which shows that the EU-28 population will continue to age. In the coming decades, a large number of baby boomers will join the ranks of the elderly. By 2080, however, the pyramid will become more of a rectangle as its centre (around age 45- 54) narrows considerably (Eurostat, 2017).

Figure 7 - Population pyramids, EU-28, 2016 and 2080 (% of the total population)
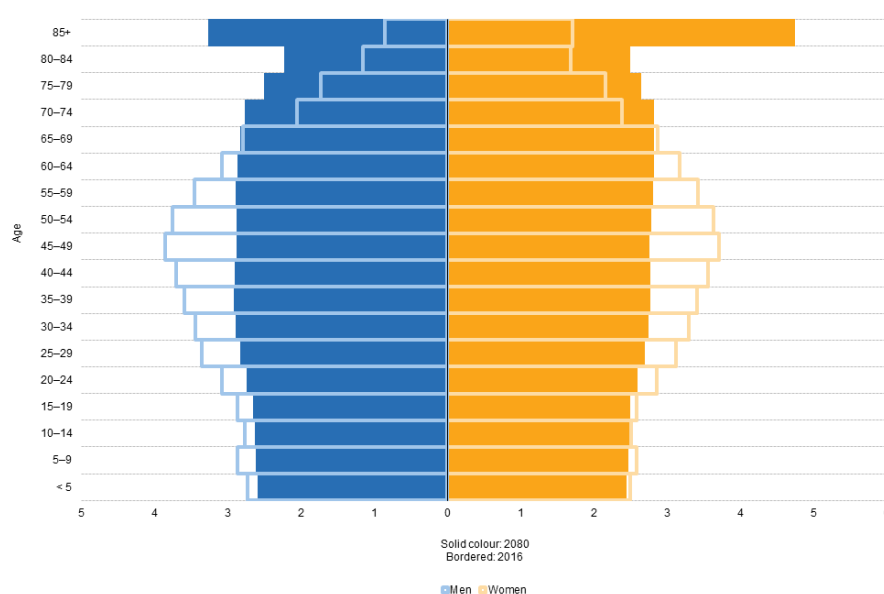
Note: 2016: estimate, provisional. 2080: projections (EUROPOP2015).
Source: Eurostat (online data codes: demo_pjangroup and proj_15npms)

Source: Eurostat, 2017, Archive: Structure and aging of the population

For this reason, the aim of the paper is to evaluate the impact of the aging of the Slovak population on public expenditures through expenditures on old-age pensions. We evaluated selected demographic characteristics as well as old-age pension expenditures in the time period 2011-2022. The ageing of the Slovak population was evaluated on the basis of the development of the number of people of post-reproductive age within Slovakia and in individual regions. We evaluated the impact on public finances through social insurance expenditures on old-age pensions as well as through the average monthly amount of old-age pensions. In addition, we also evaluated the ageing index and the economic dependency index of the elderly. These two indicators are the most commonly used in the assessment of population ageing. While the ageing index evaluates changes in the age structure of the population, especially in the age category of the pre-productive and productive population, the index of economic dependency of the elderly evaluates the burden on the productive component of the population.

$$\text{Ageing index (Sauvy index)} = \frac{\textit{number of people in post−productive age (65+ years)}}{\textit{number of people of pre−productive age (0−14 years)}} \; x \; 100 \tag{1}$$

$$\text{Index of economic dependency of the elderly} = \frac{\textit{number of people in post−productive age (65+ years)}}{\textit{number of people of productive age (15−64 years)}} \; x \; 100 \tag{2}$$

The data sources for the individual indicators were obtained from the Statistical Office of the Slovak Republic and from the INESS - Institute of Economic and Social Studies. Analysis and results were processed in MS Excel.

3 Results and Discussion

The total population of Slovakia has continuously increased every year until 2020. In 2021, compared to the previous year, there is a slight decrease in the population of Slovakia by 0.45%, which amounts to 25 069 inhabitants. A similar situation was repeated in 2022, when the decrease in population was only 0.10%, representing 5,920 inhabitants. Despite the fact that in two years there was a decrease in the population of Slovakia, the number of population of post-working age showed an annual increasing trend. Comparing 2011 and 2022, the increase in the post-productive age population was 40%, while the overall increase in the country's population was only 0.45%. In absolute terms, the total population in 2022 increased by 24,470 compared to 2011, and the population of post-productive age increased by 278,406 (Figure 2).

Figure 2 – Development of the number of total population and post-productive age population in Slovakia
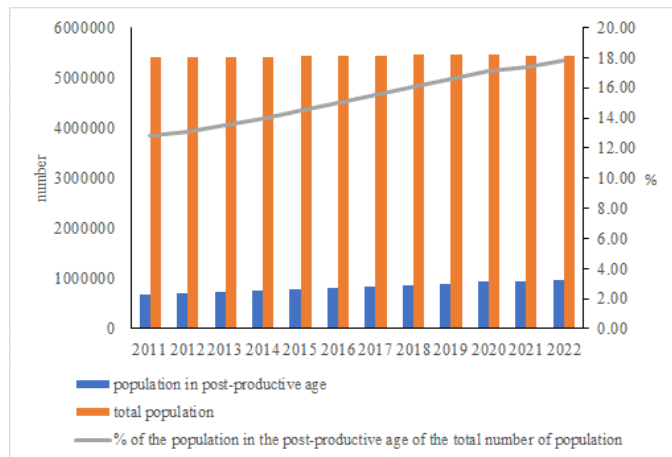
Source: Statistical Office of the Slovak Republic, own processing

The share of the population of post-productive age increased from 12.78% in 2011 to 17.8% in 2022 during the analysed time period. This significant nationwide increase in the population of post-productive age was also reflected in the individual regions. The most significant increase in the number of post-productive age population in 2022 compared to 2011 was recorded in the Bratislava region by 56.2%, Trnava region by 42.6% and Žilina region by 41.6% (Figure 3). This development is a consequence of the socio-economic development of the country and its regions. All three of the above-mentioned regions are among the economically developed regions due to the presence of major automotive firms (Volkswagen - Bratislava, Stellantis - Trnava, Kia - Žilina). It is these firms, together with subcontracting companies, that can attract inhabitants from other regions, who do not come back, but stay in the region afterwards. The Banská Bystrica region will have the lowest increase in the post-productive population in 2022 compared to 2011 (32% increase).

Figure 3– Development of the population in the post-productive age in the individual regions of Slovakia
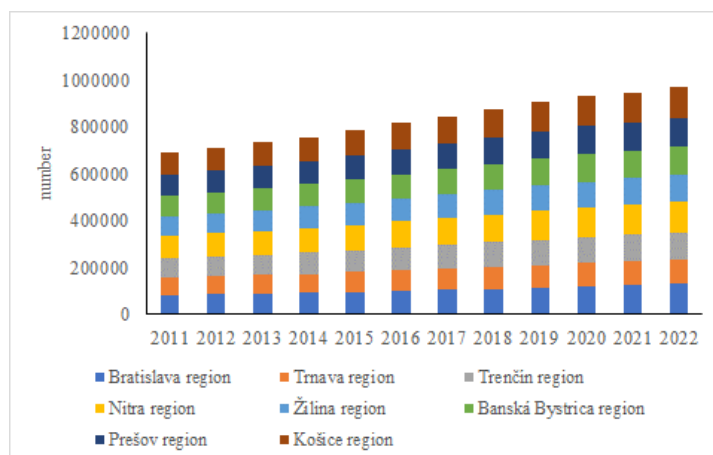
Source: Statistical Office of the Slovak Republic, own processing

The ageing of the Slovak population is confirmed by the ageing index. While in 2011 there were 82 people of post-reproductive age for every 100 people of pre-productive age and one could speak of a progressive age structure,

in 2018 there has already been a significant change. This year, there were already 101 seniors for every 100 people of pre-productive age, which placed Slovakia in a degressive age structure. And this situation continues to worsen. In 2022, there were already 110 people of post-reproductive age for every 100 people of pre-productive age. Similarly, the index of economic dependence of the elderly confirms this. While in 2011 there were almost 18 people of post-productive age for every 100 people of productive age, in 2022 there was 27 people (Table 1).

Table 1 – Development of selected indicators

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Aging Index	82.96	85.51	88.34	91.17	94.22	96.96	99.43	101.9	104.8	107.34	108.27	110.95
Index of Economic Dependence of the Elderly	17.8	18.35	19.03	19.74	20.57	21.55	22.54	23.52	24.54	25.47	26.13	27.02
Expenditure on old-age pensions per 1 inhabitant in €	747	779	845	885	936	996	1 042	1 096	1 172	*	1 109	1 246

Source: Statistical Office of the Slovak Republic, INESS, own processing

* unavailable data

Such a significant aging of the population has a particular impact on public finances. Expenditure on pension payments is rising and pressure on the provision of health and social services is increasing. Per capita expenditures on old-age pensions was increased by €499 in 2022 compared to 2011 (66.8% increase). This fact leads to adjustments in the retirement age and in the tax and levy burdens on workers. However, according to Thomay (2002) the usual consequence of increasing the contribution obligation is that people leave the informal economy, which reduces the number of contributors to the pension system, while the number of benefit recipients remains unchanged. The subsequent increase in levy rates to compensate for this change results in further leakage and a reduction in the size of the wage (i.e. levy) base. The growth of the informal economy thus has a negative impact on the financing of pensions and also has a negative impact on economic growth, since people in the informal economy are usually less productive. In fact, they spend considerable resources to hide their activities (which are economically unproductive resources) and have limited access to capital (technology, machinery), which has a negative impact on the productivity of their work. However, these legislative changes are not only the result of an ageing population, but also of the fact that many young people leave to study and work abroad and do not return, or return at retirement age. The consequence of this is that the retirement age is rising. A person becomes entitled to a pension at the earliest on reaching retirement age. At present, in Slovak conditions, the retirement age of the population born before 1967 is known. For women, the number of children they have brought up is still taken into account, although gradually this fact will no longer have an impact on the determination of the retirement age. In 2019, the government has guaranteed a pension cap at the age limit of 64 years. According to Danková et al.(2020) the introduction of the pension cap has raised questions about the impact of the policy on individuals and the transfer of the financial burden to future generations, i.e. a change in intergenerational redistribution. Current trends in intergenerational solidarity suggest that redistribution in many countries is taking place from younger to older generations. This trend is due to demographic developments (ageing of the population) and an increase in public transfers to older generations, particularly through pension systems. Šebo & Danková (2018) assume that the introduction of a retirement age cap will not only reduce future pensions, but also worsen the balance sheet of the social Insurance company, which may pass on an even greater financial burden to future generations. The introduction of a pension age cap will not only affect the amount of pensions from the first pillar, but also the amount of savings in the second or third pillar by reducing the number of years of service and years of savings. At present, the government has changed the retirement age guarantee through changes to the Slovak Constitution. Reaching the age of 64 years will no longer necessarily mean that you are entitled to a retirement pension. For younger generations, this means that they are likely to retire at an older age, but this does not have to be the rule. Currently, it is possible for residents to continue to receive a pension and work at the same time without restrictions after retirement age. Many pensioners take advantage of this situation, primarily for economic reasons.

Figure 4– Development of the number of old-age pensions in Slovakia
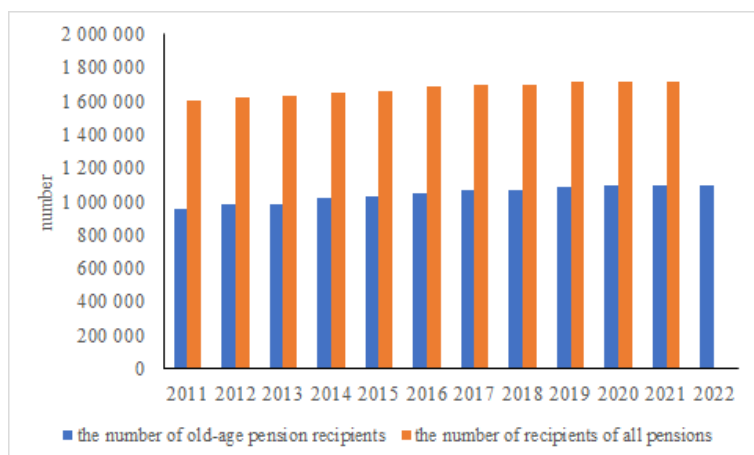
Source: Statistical Office of the Slovak Republic, INESS, own processing

Within the framework of pension insurance in Slovakia, there are 2 subsystems: old-age and disability insurance. Old-age pension is provided from old-age insurance. In addition, however, inhabitants can be recipients of other pensions than old-age pensions if they meet specific conditions - e.g. widow's and widower's pensions, or orphan's or invalidity pensions. The number of recipients of any pensions increased continuously every year. In comparison between 2011 and 2021, their number increased by 109,000 beneficiaries, which represents a 6.79% increase (Figure 4). Similarly, the number of old-age pension recipients increases every year. While in 2011 975,633 pensioners received old-age pensions, in 2022 there were already 1,100,000 of them, which represents an increase of 142,367 pensioners (14.87%).

Figure 5 – Development of expenditures on old – age pensions and average monthly amount of retirement pensions
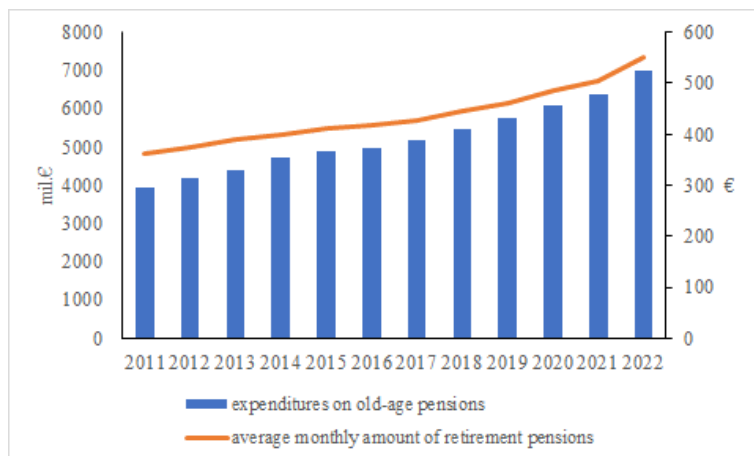
Source: Statistical Office of the Slovak Republic, INESS, own processing

The increase in the number of people of post - productive age has also led to an increase in total spending on old-age pensions, which almost doubled in 2022 compared to 2011. However, this increase in expenditures was not only due to the increase in the post-productive population, but also to legislative changes related to pension provision (e.g. indexation of pensions, payment of the 13th pension, etc.). These changes, as well as the introduction of the so-called minimum pension or the compensation for the increased cost of living of the elderly in the recent period, have also had an impact on the average monthly amount of old-age pensions. While in 2011 the average monthly pension was €362.08, in 2022 it will reach €549.60 (Figure 5). The Fiscal Responsibility Council predicts that the average monthly pension will reach €594.30 in 2023 and even €749.70 in 2026. The last increase in pensions based on the current economic situation will be implemented on the basis of the amendment of Act No. 461/2003 Coll. as of 1 July 2023 by 10.6%.

Figure 6 – Development of incomes and expenditures of the social insurance company
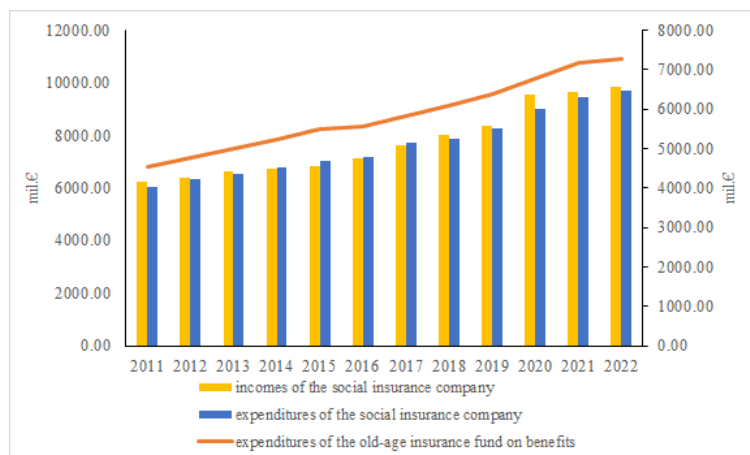
Source: Statistical Office of the Slovak Republic, INESS, own processing

The Social Insurance Company was established on 1 November 1994 by Act No. 274/1994 Coll. on the Social Insurance Company as a public institution. The basic source of the Social Insurance Company's incomes is the premiums for sickness insurance, old-age, invalidity, accident, guarantee, unemployment insurance and the Solidarity Reserve Fund paid by the insured, employers and the State. With the adoption of the Social Insurance Act No 461/2003 Coll. the National Council of the Slovak Republic made it possible to launch the long-awaited pension reform. This was the only way to start reforming the social security system, which, as of 1 January 2004, was transformed into social insurance in the true sense of the word, with the Social Insurance Institution as the implementing body. The remit of the Social Insurance Institution has been extended to include unemployment insurance and guarantee insurance, whose agenda has been taken over from the National Labour Office. Since 1 January 2005, the Social Insurance Institution has also added new responsibilities related to the implementation of old-age pension savings, i.e. the second pillar of the pension reform. In the context of old-age pension savings, the insurance company primarily collects contributions, forwards them to pension management companies and registers contracts on old-age pension savings. After the reform of the pension system, the resulting pension can be made up of a pension from the social insurance fund and from pension savings in Pillar II (supplementary pension insurance) as well as from pension savings in Pillar III (voluntary supplementary savings). At present, there is an obligation to contribute to the social insurance fund as well as to join Pillar II. Mandatory entry into Pillar II may apply not only to young people who are currently finishing their studies and will be employed for the first time after 1 May 2023, but also to persons under 40 years' old who were not previously obliged to pay pension contributions and who become obliged to do so after 1 May 2023 (and later) (e.g. self-employed persons, but also persons returning from abroad and starting their first job in Slovakia). Geffert (2020) notes, however, that the second pension pillar in the Slovak Republic is politically influenced; hence, locally, by a legislative regulation which stipulates that in 2019, savers in Pillar II were obliged to save only 4.75% of the total 18% contributions, while 13.25% was in favour of the Social Insurance Company. According to Melicherčík (2004) pension reform was necessary to reverse the unfavourable trend of the pay-as-you-go deficit. Changing the indexation of pensions and raising the retirement age reduces the deficit of the pay-as-you-go pillar. As regards the emergence of a two-pillar system, the positive effects on the deficit will only become apparent later (after 2040, according to the author). A two-pillar system is likely to provide higher pensions. However, with non-zero probability, these pensions may be lower than the projected pensions from a single-pillar system. Without additional resources, a second (savings) pillar cannot be introduced without depriving any generation. The incomes of the social insurance company have continuously increased every year compared to the years 2011 and 2022, increasing by 57%. The expenditures of the social insurance company also increased in a similar way, but compared to the incomes, they increased in 2022 compared to the year 2011 by up to 61%. With the exception of the time period 2014 - 2017, the social insurance company was able to cover its expenditures with its own income (Figure 6). Out of the total expenditures of the social insurance company, the expenditures of the old-age insurance fund accounted for an average of 76%. The highest share was made up of these expenditures in 2015 (78.06%). However, comparing the years 2011 and 2022, the share of old-age insurance fund expenditures in the total expenditures of the social insurance company slightly decreased by 0.72%.

4 Conclusion

The increase in the number of elderly people and the associated ageing of the population is closely linked to the increasing longevity of the population, but also to the low birth rate. In particular, low fertility is a consequence of socio-economic changes in society as well as changes in the lifestyles of young people (postponement of parenthood until later in life). Every European country is trying to find solutions to deal with this situation. In November 2021, the Government of the Slovak Republic approved the National Programme on Active Ageing for 2021-2030, which aims to support the building of a sustainable society through the promotion and valorisation of the potential of people of all ages, especially in the context of their ageing process. The strategy also addresses the issue of the sustainability of pension entitlements for future generations of older people in the context of the ageing index, or index of economic dependency of the elderly (Ministry of Labour, Social Affairs and Family of the Slovak Republic, 2023). In the future, it will also be necessary to analyse the impact of new legislation in the area of pension provision, because with the current rate of ageing of the Slovak population, the pressure on public finances, in particular on expenditure related to the payment of old-age pensions, will continuously increase. Although Slovakia has undergone a pension reform that has created the conditions for the so-called pension mix - a combination of compulsory and voluntary pension savings, the question remains how public finances, and in particular the social insurance company, will deal with the period when Husák's children will retire. This is a strong generation of children born in the 1970s, especially in the period 1972-1979. This generation has quite a long time to reach retirement age, but unless the conditions of the pension system are changed, this will place a huge financial burden on the public finances.

Acknowledgements

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The Magic Triangle of Public Finances in V4 and PIIGS

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Abstract: The issue of the sustainability of public finances has again become an important topic with regard to current developments. This is also why this study focuses on the mentioned problem, using the magic triangle of public finances. The aim of the study is to evaluate the development and differences in public finance of the Visegrad Group and PIIGS countries between 2006-2022. The goal is achieved based on literature research and using quantitative methods. Based on the results, there are noticeable differences between the countries of the Visegrad Group and the PIIGS countries. While the public finances of the PIIGS countries were in a worse situation during the financial crisis, better results for these countries can be observed in the post-COVID-19 period. However, over the entire observed period, the situation is better in the countries of the Visegrad Group regarding public revenues, while the opposite is true for public expenditures and debt.

1 Introduction

The issue of public finance sustainability is present in public discourse. This issue is burning when economic development is not good. However, it is time when public finance to fulfil its stabilization and redistribution functions.

Last time, the COVID-19 pandemic and the war in Eastern Europe negatively influenced economic development and public finance. The system of public finance is not prepared for this situation as usual. The financial crisis, called Great Recession, was the previous significant intervention in public finances and their sustainability.

This study focuses on the issue of public finances and their analysis in two selected groups in the European Union. These are the Visegrad Group and PIIGS countries (Portugal, Italy, Ireland, Greece, and Spain).

The motivation for the emergence of this study is the relevance and current importance of this issue.

The study is created as an extension of the study by Cíbik & Mikuš (2022), from which it is also methodologically based. Cíbik & Mikuš (2022) focused their research on aspects of public finances in 2015-2021 on the countries of the Visegrad Group. The reason for such a focused study was to compare the effects of the COVID-19 pandemic on public finances in countries with close backgrounds.

The author extends this study to a previous significant event that impacted the issue of public finances (the Great Recession). The beginning of time period thus begins in 2007 and ends in 2022, for which data is available. In addition to the countries of the Visegrad Group, which are used in Cíbik & Mikuš (2022), this study is also extended to the area of PIIGS countries, which were in a very problematic situation during the financial crisis with regard to the impact on public finances. The purpose is to compare these two areas in a given period and, in addition to analysis, to compare based on similarities or differences.

The aim of the study is to evaluate the development and differences in public finance of the Visegrad Group and PIIGS countries between 2006-2022.

This goal will be fulfilled using literature research to define theoretical starting points. The study also uses quantitative methods to calculate values for individual states for the given period. Based on this, the results will be analysed and compared. The results will then be synthesized in the conclusion.

The study consists of five parts. The Introduction is followed by a Literature Review, where both selected groups of states are briefly introduced, and the concept of the magic triangle of public finances is presented here. In part 3, the data for the subsequent calculations are determined. The Results section includes presenting the results achieved based on the calculations and their evaluation. The Conclusion summarizes the findings of this study.

2 Literature Review

In this study, two areas are analysed. In the alliance, the Visegrad Group represents four countries from Central Europe – the Czech Republic, Hungary, Poland, and Slovakia. These countries have long-term historical intersections, especially the post-war development of these countries was affected by participation in Eastern Bloc. These experiences formed the post-communist era with democracy. These states were building a transformed economy and trying to gain membership in new groupings, which is also the reason for the creation of the Visegrad Group. Today, these countries are often compared together (Grodzicki, 2020; Zdražil & Applová, 2016; Neszmelyi, Vinogradov & Nagy, 2022; Dziuba, Jablonská, Sulak & Lawinska, 2018; Lehoczki, 2022; Hinke, Rain & Hrabovska, 2021).

Similar to how previous states can be defined, PIIGS states can be defined based on certain similarities. The difference, however, is that these states are not joined in an alliance based on formalized elements. Originally, these were the PIGS countries - Portugal, Italy, Greece, and Spain - which had their long-term problems in terms of economic growth and public finances in previous decades. Due to further development, another I was added to the acronym to represent Ireland. Similarly, one can find many pieces of research that use this area (Li, Ranjbar & Chang, 2017; Duman, 2018; Alfonso & Almeida, 2016; Abad-Gonzalez & Gutierrez-Lopez, 2016; Cheng, Wu, Lee & Chang, 2014; Pamplona, Leite & da Silva Zonatto, 2018).

Considering the above, it is evident that the selected areas are relevant for research. Especially in the case of the PIIGS countries, the position of their public finances during the financial crisis and the need to use foreign loans played a role, which also had an impact on their political scene (Ferraz & Portugal Duarte, 2015).

Although there are various tools for measurement in the field of public finances (Pulay & Simon, 2020; Balakin & Onufriichuk, 2018; Doennebrink & Grevenbrock, 2022), this study will use the magic triangle of public finances, as already announced in the Introduction.

2.1 Magic Triangle of Public Finances

Cíbik & Mikuš (2022) created the magic triangle of public finances, which was established based on the magic quadrilateral. The magic quadrant is associated with Nicholas Kaldor or Lionel Stoléru (Savoiu, Gogu & Taicu, 2017). This quadrant has four indicators (or vertex in a quadrangle): economic growth, unemployment, price stability, and external balance.

This concept, which is focused on macroeconomic aggregates, has been adapted to the level of public finances. Specifically, public income, public expenditure, and public debt are used here. These three indicators represent the peaks of the magic triangle of public finances.

Figure 1 graphically shows this concept with individual indicators. Individual indicators are presented as year-on-year changes in absolute values. The advantage of such an arrangement is using only one parameter, and thus the impossibility of being influenced by another parameter. Thus, the result shows a percentage change compared to the previous year, but only within these three parameters and separately. Furthermore, it is possible to compare countries regardless of their differences, such as the size of the country, population, etc.

On the other hand, only a change in the situation is pointed out here, which can be observed in the deterioration or improvement of the situation compared to the previous year. It is impossible to monitor long-term changes here, especially if there will be improvements and deterioration. In the long-term development framework, it is possible to point to a trend and compare it within several countries, which is the purpose of this study.

The magic triangle of public finances is constructed according to Figure 1. Each of the axes has its starting position. This position is affected by the greatest growth or decline of an individual indicator so that the indicators cannot interfere with another axis (further in the study: the largest year-on-year change occurred in the public debt in Ireland in 2008 and amounted to almost 69%, the value was therefore set to 100).

Figure 1 – Magic Triangle of Public Finances
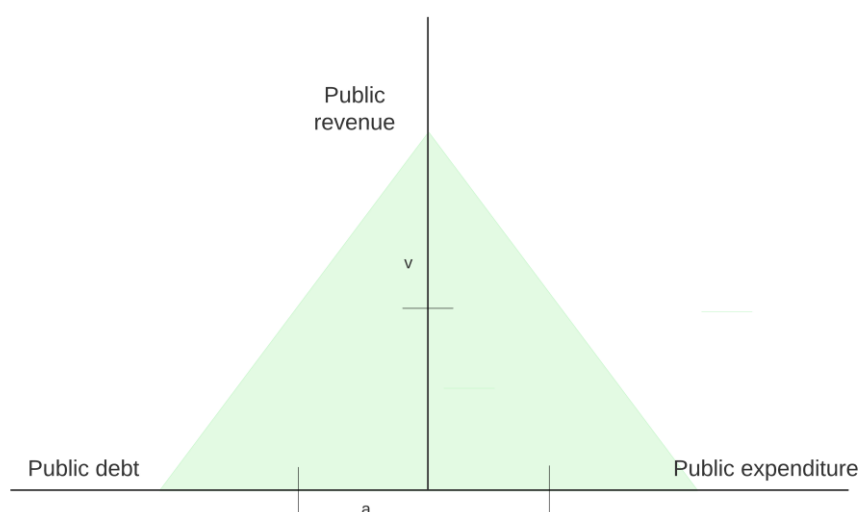
Source: own processing based on Cíbik & Mikuš (2022)

Another essential part is the area of the triangle, which indicates improvement (the area of the triangle increases) or deterioration (when the area decreases). Accordingly, the indicators also shift during the change.

The area is calculated as follows:

$$T = av / 2 \tag{1}$$

where T denotes the area, a represents the sum of public debt and public expenditure, then v denotes public revenue.

If public revenues increase year-on-year, then there is an increase that leads to an increase in area. That is, if the value were to rise by 10%, then there is a mark of 110. For the other two parameters, the value is subtracted from 100, i.e., with a year-on-year increase of 10% for public debt or public spending, the value will drop to 90. It leads to reduce the area with unchanged public revenues. Should there be a year-on-year decrease in public debt or spending, the area will increase, as this change is considered positive.

3 Data and Methods

The aim of the study is to evaluate the development and differences in public finance of the Visegrad Group and PIIGS countries between 2006-2022.

To fulfil this goal, the magic triangle of public finances described in the previous chapter is used. The triangle is created based on the data defined in Table 1. The data comes from the Eurostat database and uses millions of EUR values for 2006-2022. Thus, creating a time series of 16 data points is possible.

Table 1 – Data description

National accounts indicator (ESA 2010)	Source	Code	Unit of measure	Time
Total general government revenue	Eurostat	GOV_10A_MAIN_custom_6656757	Million euro	2006-2022
Total general government expenditure		GOV_10A_MAIN_custom_6656757		
Government consolidated gross debt		SDG_17_40_custom_6656764		

Source: own processing

Data are drawn both for the entire European Union (27 countries for the given period) and also for the countries of the Visegrad Group (Czech Republic CZ, Hungary HU, Poland PL, Slovakia SK) and PIIGS (Portugal PT, Italy IT, Ireland IE, Greece GR, Spain ES).

Based on the obtained data, it is possible to make an adjustment for year-on-year changes and to make an adjustment for the values of the triangle. Due to this, a graphical display is also possible. The obtained values are then used to analyse and compare within the given definitions.

4 Results

In this part, the results are first presented in terms of year-on-year changes, then the results are presented in the framework of the magic triangle of public finances.

The initial assessment can be carried out for year-on-year changes. Within public revenues, it is possible to define two periods of revenue decline in millions of euros. The first period refers to the Great Recession when some states had this decrease already in 2008 (IE and EC), but all states except Slovakia had this decrease in 2009. In the following years, the decrease in income was relatively isolated, except in Greece (2011-2014 and 2017) and the Czech Republic (2012-2014). Another significant decrease occurred in 2020 in all states caused by the COVID-19 pandemic.

In the case of public expenditure, it is possible to see slower growth between 2009 and 2017, when in some cases, there is also a decrease. This decrease was most pronounced in Ireland in 2011. However, there was an even higher increase the year before. Prolonged lower spending growth or decline is particularly noticeable in the PIIGS countries.

Table 2 – Average 2006-2022

Country	Public revenue	Public Expenditure	Public Debt
EU	3,0	3,3	4,5
CZ	5,4	5,6	8,2
HU	3,8	3,5	4,3
PL	5,4	5,5	5,8
SK	6,5	6,2	9,2
PT	2,8	2,2	5,1
IT	1,9	2,4	3,2
IE	3,4	3,5	10,8
GR	1,3	0,7	2,9
ES	2,1	3,2	8,8

Source: own calculation based on Eurostat (2023)

The last indicator is public debt. The highest value was in Ireland in 2008 (68.7%). In some countries, there was also a decrease in the value in millions of euros in the monitored period, either in several periods (CZ, PL, IE, GR) or only occasionally (HU, PT, ES).

Table 2 shows average year-on-year changes for all indicators. In the case of public revenues, the average growth in the countries of the Visegrad Group is higher, which is also above the average growth of the countries of the European Union. Conversely, the PIIGS countries achieve below-average values, except Ireland.

Average expenditure growth reaches lower values in the PIIGS countries, again below the average of the European Union countries except for Ireland. In contrast, the countries of the Visegrad Group achieve a higher increase in public spending. The best situation is in Hungary, which achieved a lower value of the average growth of public revenues.

Based on these two indicators, it is possible to make a difference, from which it is subsequently evident that the average growth of income than the expenditure is noticeable in Greece and Portugal (both 0.6 p.p.), Hungary (0.4) and Slovakia (0.3). The situation is slightly unfavourable for Poland and Ireland (-0.05 p.p.). The remaining states already have higher average expenditures than revenues. The European Union as a whole is in the same situation. The worst result is achieved by Spain (-1 p.p.), the situation is better in Italy (-0.5) and the Czech Republic (-0.2). In the countries of the European Union, the difference is -0.3 p.p.

Figure 2 and 3 – Correlation of Public Revenue (left) and Expenditure (right)

	CZ	HU	PL	SK	PT	IT	IE	GR	ES
CZ	1.00	0.78	0.80	0.62	0.76	0.68	0.49	0.82	0.55
HU	0.78	1.00	0.75	0.68	0.70	0.74	0.60	0.71	0.66
PL	0.80	0.75	1.00	0.47	0.60	0.52	0.43	0.54	0.56
SK	0.62	0.68	0.47	1.00	0.49	0.50	0.17	0.53	0.17
PT	0.76	0.70	0.60	0.49	1.00	0.80	0.76	0.82	0.80
IT	0.68	0.74	0.52	0.50	0.80	1.00	0.76	0.85	0.78
IE	0.49	0.60	0.43	0.17	0.76	0.76	1.00	0.60	0.88
GR	0.82	0.71	0.54	0.53	0.82	0.85	0.60	1.00	0.67
ES	0.55	0.66	0.56	0.17	0.80	0.78	0.88	0.67	1.00

	CZ	HU	PL	SK	PT	IT	IE	GR	ES
CZ	1.00	0.49	0.68	0.41	0.16	0.51	0.31	0.54	0.72
HU	0.49	1.00	0.62	-0.04	0.11	0.19	0.12	0.24	
PL	0.68	0.62	1.00	0.09	0.29	0.20	0.58	0.27	0.28
SK	0.41	-0.04	0.09	1.00	0.33	0.32	0.24	0.65	0.64
PT	0.16	0.11	0.29	0.33	1.00	0.45	0.59	0.28	0.31
IT	0.51	0.19	0.20	0.32	0.45	1.00	0.16	0.54	0.62
IE	0.31	0.12	0.58	0.24	0.59	0.16	1.00	0.23	0.32
GR	0.54	0.24	0.27	0.65	0.28	0.54	0.23	1.00	0.59
ES	0.72		0.28	0.64	0.31	0.62	0.32	0.59	1.00

Source: own calculation

The results of these year-on-year changes in indicators can be correlated, and their rate monitored. In the case of public revenues (Figure 2), it is possible to observe higher values among the countries of the Visegrad Group. Figure 3 again shows a higher rate among the Visegrad Group countries than PIIGS countries.

The correlation of the development of public debt (Figure 4) is again more noticeable among the Visegrad Group countries as a whole compared to the PIIGS countries. Similarly, higher values can be seen among PIIGS countries.

Figure 4 – Correlation of Public Debt

	CZ	HU	PL	SK	PT	IT	IE	GR	ES
CZ	1.00	0.48	0.62	0.65	0.33	0.53	0.24	0.10	0.35
HU	0.48	1.00	0.47	0.35	-0.16	0.37	0.08	-0.09	
PL	0.62	0.47	1.00	0.71	0.52	0.52	0.09	0.04	0.36
SK	0.65	0.35	0.71	1.00	0.74	0.76	0.57	0.14	0.75
PT	0.33	-0.16	0.52	0.74	1.00	0.56	0.64	0.41	0.72
IT	0.53	0.37	0.52	0.76	0.56	1.00	0.35	0.24	0.70
IE	0.24	0.08	0.09	0.57	0.64	0.35	1.00	0.57	0.56
GR	0.10	-0.09	0.04	0.14	0.41	0.24	0.57	1.00	0.12
ES	0.35		0.36	0.75	0.72	0.70	0.56	0.12	1.00

Source: own calculation

Based on the obtained data, it is subsequently possible to determine the values for the location of the triangles (see Appendix) and their area in the given time horizon. Figures 5, 6, and 7 show the size of the area. If there was no change in any of the parameters, the value is 10,000, so this is the limit where the situation neither worsens nor improves. There is a deterioration for values below 10,000; conversely, if the area grows above 10,000, the situation is better year-on-year than in the previous year. The first year is 2007, so this compares 2007 with 2006. The results for the European Union are added here for a single-value comparison across Figures 5, 6, and 7.

Figure 5 shows the situation in the Visegrad Group and the EU countries. As can be seen, 2009 meant a worsening situation for all countries. Poland had a different situation the year before, with a year-on-year improvement. In

the following years, there was an improvement, but in 2012 the situation was better only in Hungary. This interim period, when there was gradual harmonization except for the Czech Republic in 2016, was ended by a decline in the quality of public finances in 2020. The reason is a sudden shock within the context of the COVID-19 pandemic and the dampening of the economy. Subsequently, there was a leap in improvement, which can be linked to the revival of the economy (or its relaxation). However, the situation could look more optimistic in the Czech Republic, where the position improvement is the slowest. In the case of Poland, the decline in 2022 is probably also influenced by the greater improvement in 2021. As stated above, evaluating this development in the long term is impossible, but it is necessary to look at year-on-year changes, which is why this analysis is limited.

Figure 5 – Development of area in Visegrad Group countries and EU
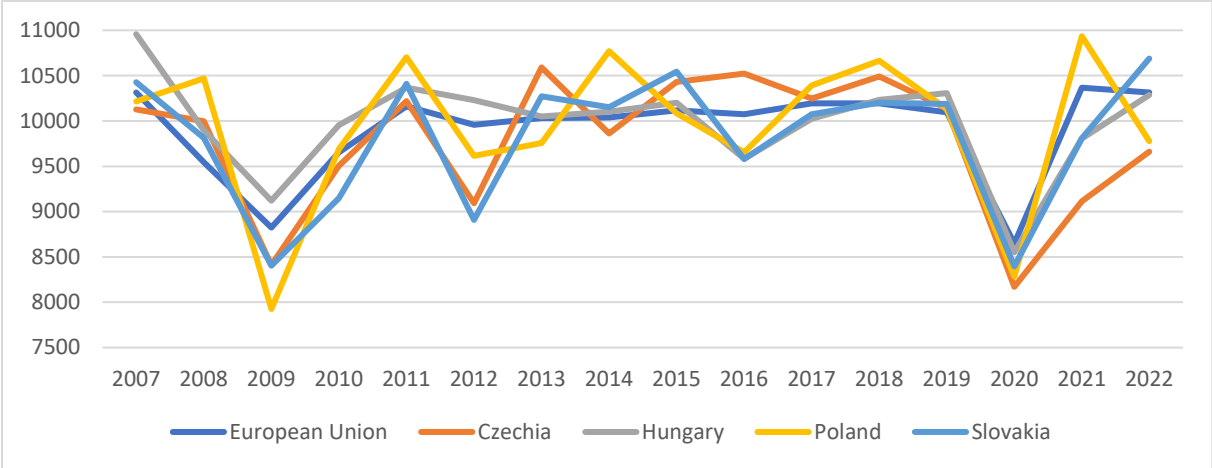
Source: own processing based on Eurostat (2023)

Figure 6 then shows the situation in the PIIGS countries. At first glance, it can be seen here that Ireland is more pronounced about higher falls and growth than other countries, at least in the first half of the observed period. In the beginning, there is also a more significant difference for Italy. However, the movement of the monitored states is similar. After the initial fall, which was here in 2008, the situation worsened the following year. In other periods, states have values of around 10,000, i.e., there is no change in an area, even though parameters s may change. So there is an equalization. This situation is evident in all countries. Only Ireland is in the upper part, so public finances are improving. However, the decline occurred in 2020 for the same reasons as for the countries of the Visegrad Group. In the case of the PIIGS countries, however, all countries will improve in 2021, when they are above the 10,000 level, and similarly in 2022. The highest rate of improvement is then again in Ireland. Greece can observe an improvement in 2022 compared to 2021, but the other situations are the same. Ireland is indeed a country that is different from the other countries of the original PIGS group. Ireland is indeed a country that is not quite in line with the other countries of the original PIGS group.

Figure 6 – Development of area in PIIGS countries and EU
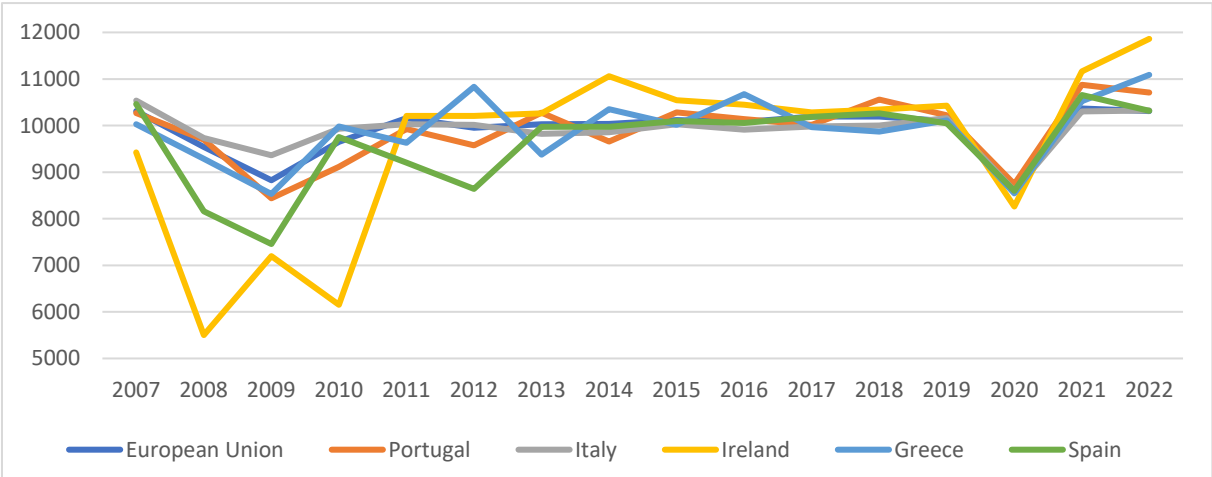
Source: own processing based on Eurostat (2023)

Figure 7 shows the same trend at the beginning and end of the monitored period. In between, a certain transformation is taking place, which is particularly noticeable in the Visegrad Group, which is more mobile.

The beginning of the period is marked by a decline, which is influenced by the financial crisis, which had a higher impact on the PIIGS countries. However, both groups are below the values of the European Union. In the subsequent period, there was an improvement in value until 2011, when the improvement of the Visegrad Group was better than the European Union. However, a minor public finance crisis in the Visegrad Group countries follows. The period 2013-2015 is similar, with a slight improvement. The Visegrad Group is the best, followed by the PIIGS and the European Union. The reason is probably the less serious situation in the European Union, so there may not be such an improvement afterward.

Figure 7 – Development of area in Visegrad Group, PIIGS, and EU
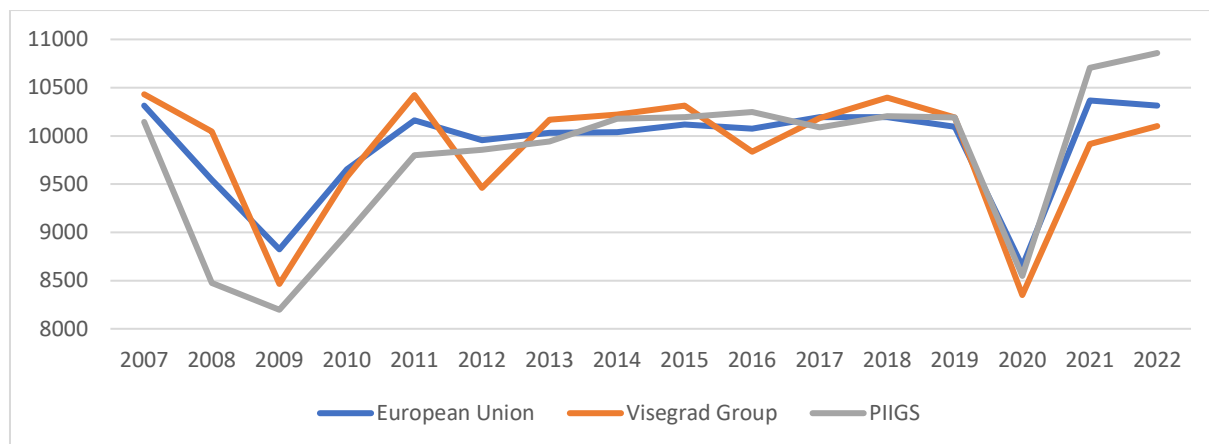
Source: own processing based on Eurostat (2023)

2016 is again affected by the deterioration of public finances in the Visegrad Group, followed by an improvement.

2020 affected all groupings, with the PIIGS situation copying the European Union regarding values between 2018-2020. As of 2020, the situation of the Visegrad Group is worse than that of the PIIGS countries, which, on the other hand, did not experience such a decline, and the subsequent improvement is in a better position than that of the European Union, and especially compared to the Visegrad Group.

4 Conclusion

With every negative economic development, public finances are burdened by a debate about their sustainability. Public finances are supposed to fulfil a stabilizing function and a redistributive function. On the other hand, there is the view of sustainability, which is, of course, also related to the ability of governments to ensure positive development in economically favourable periods and thereby create space for economically unfavourable periods.

Since the beginning of the 21st century, there has been a two-fold significant impact on public finances as part of economic development. The first milestone was the financial crisis (Great Recession) at the end of the first decade. The second milestone was the COVID-19 pandemic.

The study uses the time 2006-2022 in the territory of the Visegrad Group and PIIGS countries. Both areas are often explored together. While the Visegrád Group is directly an alliance (a formalized organization) whose members have historical ties, particularly evident in the last century, especially in the Czech Republic and Slovakia. The PIGS countries have historical ties, but also within economic development and public finances. The original unofficial territory of the PIGS was enriched with Ireland and is now referred to as the PIIGS.

The magic triangle of public finances was used for processing. This tool uses three indicators: public revenue, public expenditure, and debt. The tool compares year-on-year changes, and based on the results, a triangle is created whose area indicates the overall improvement or deterioration of the situation in public finances.

The tool uses year-on-year changes in absolute values, which means that other parameters that could distort the development of public finances (typically the share of public debt in a gross domestic product) are not used here. On the other hand, long-term year-on-year changes can be used to indicate a trend, but they cannot be completely

compared. The reason is other circumstances, such as inflation, which differs in different years, so it would be necessary to clean these data by this factor.

The development of the indicators shows that the basic development was similar in all countries (decline in the quality of public finances in the context of the Great Recession and the COVID-19 pandemic). However, there are differences between the countries of the Visegrad Group and the PIIGS countries (see Figures 2, 3, and 5). While the PIIGS countries were problematic in the first period, in the second half, the situation worsened in the countries of the Visegrad Group (see Figure 7).

This imbalance leads to whether the countries of southern Europe have learned from this situation, and the results point to the fact that they have, in contrast to the countries of the Visegrad Group, which did not experience these fiscal problems and are therefore gaining experience with fiscal imbalances today.

More minor differences can be seen within the internal ties between states in Poland from other countries, where the deviations are more extensive, but the primary trend is maintained. In the Czech Republic, there were deviations in the trend in 2015 and 2017, and most recently in 2021 and 2022, a worse recovery from the COVID-19 situation.

There is a difference Among the PIIGS countries, especially for Ireland, due to logical differences and fewer ties to these countries. However, in principle, the PIIGS countries have a greater uniformity of development.

The limitations of the research are already mentioned matters such as limitations on year-on-year comparisons and approximations to parameters such as the inflation rate. Further research can be devoted to the comparison and usefulness of comparing the magic triangle of public finances with other tools for measuring the sustainability or stability of public finances. Furthermore, it is possible to focus on the differences in the development of public finances between the countries of the Visegrad Group and the PIIGS countries with regard to the reason for their differences during both crisis situations.

Acknowledgements

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Appendix: Magic Triangle of Public Finances in countries Visgrad Group, PIIGS and EU
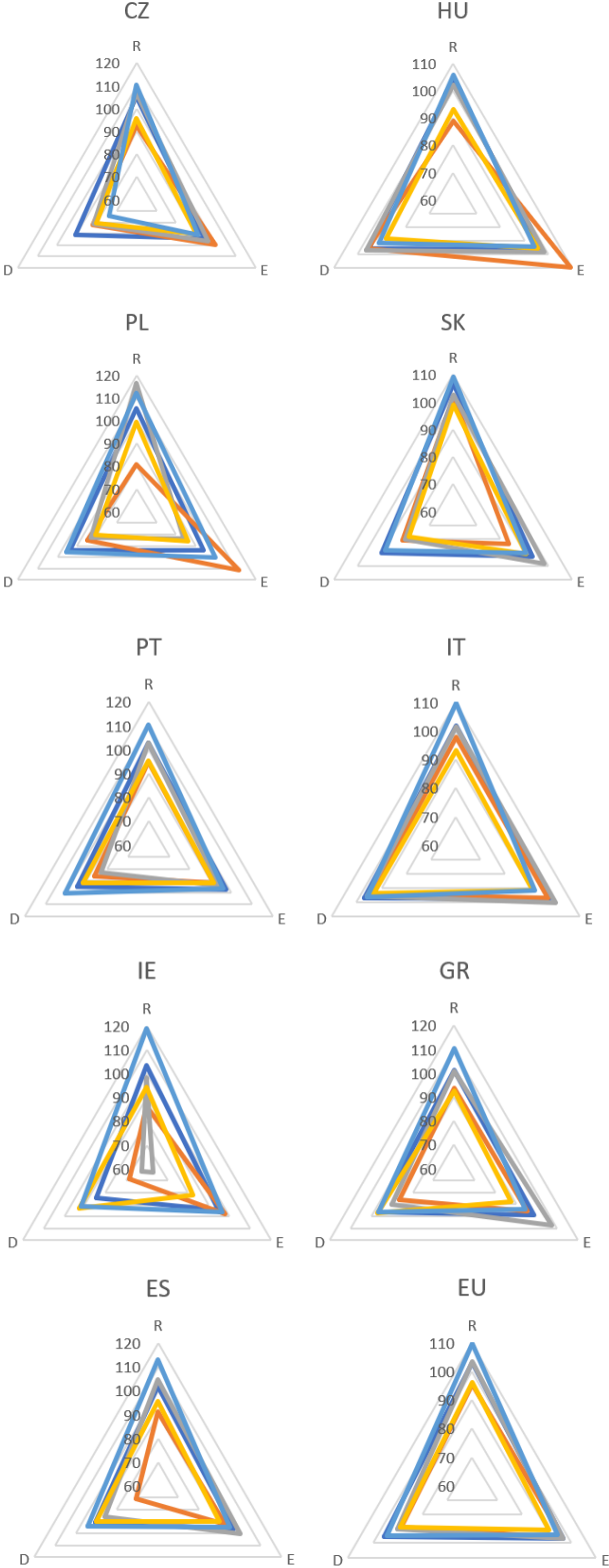
Suggestions for Changes to the Calculation of the Municipal Revenue from Shared Taxes

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Abstract: The current public finance situation in the Czech Republic raised discussions about the poor correlation between the current system of local finance distribution of resources and between the economic potential and needs of different size categories of municipalities. The paper aims to assess the possible impact on municipal shared revenues by adding to the tax-sharing formula the criterion of population ageing, namely, the number of people over 65 years of age. The shared-tax revenues of selected municipalities were recalculated according to the new proposed model, and the impacts on municipal revenues were evaluated. Based on the calculation, the proposed model has not delivered any major negative or positive changes. We recommend reducing the number of municipalities in the Czech Republic first and then designing a new model for their financing.

1 Introduction

Based on the theories of fiscal federalism (Oates, 2011; King, 2016; Weingast, 2014), some level of fiscal and political autonomy of subnational governments is desirable for more efficient delivery of public services. The idea of local autonomy highlights municipalities' possibilities in deciding on the provision of local public services according to their own preferences. In order to do so, they need a certain degree of protection from interference from higher political levels, sufficient resources to fulfil their tasks and the means to decide on the things that have to be done (self-government). The problem arises in determining a decision on the optimal size of local government that ensures efficient service provision without threatening democracy (Oates, 2011). Gendzwill and Swianiewitz (2016) state that in smaller municipalities, decisions are taken closer to the needs of the citizens, which increases accountability, and provides local governments with effective ways of political participation or democratic decision-making.

In European countries, local governments have a rather fragmented size structure. Typical countries with very small municipalities (fewer than 5000 inhabitants) are Iceland, Austria, Switzerland, Hungary, Cyprus, Slovakia, France and the Czech Republic. On the other hand, in many European countries since the second half of the twentieth century, there has been an effort to consolidate the number of local governments generally forced by the national government country (in particular Nordic countries and the United Kingdom) (Fox & Gurley, 2006). Arguments supporting territorial merging emphasise that small municipalities have problems providing high-quality public services and competent administrative support. Financial resources and staff constraints were frequent stumbling blocks in transforming municipalities into independent administrative units. Oliveira and Martinez-Vazquez (2003), Lander (2017), and Gendzwill et al. (2020) insist that too small municipalities cannot fully benefit from a regime of fiscal autonomy because their tax bases are not sufficiently large; they lack technical and administrative capacity because they are unable to retain qualified staff with the necessary expertise; they cannot benefit from economies of scale and provide public services effectively. These facts make small municipalities much more vulnerable, and any crisis or significant loss of revenues can endanger them, lead to problems with their financial situation, and endanger the quality of service provision. There exist several country studies supporting the argument that service provision due to economies of scale is more efficient in larger This work aims to validate the theory of ...municipalities (Boyne, 1995 in England; Allers and Geertsema, 2016 in the Netherlands; Blessed and Baskaran, 2016 in Germany; Afonso and Venâncio, 2019 in Portugal).

1.1 Financing of Municipalities - Situation in the Czech Republic

Since the establishment of the independent Czech Republic, the structure and competencies of public administration have been the subject of many changes. The Czech system is fragmented, with the average municipality size being the lowest among OECD countries in terms of population and area and almost 90% of municipalities having fewer than 2 000 inhabitants (OECD, 2021; Fumis & Kokko, 2022). This fragmentation results in what the OECD describes as 'below average public spending efficiency in the Czech Republic' (Urban & Maisonneuve, 2021). As the Monitoring Committee of the application of the European Charter of Local Self-Government in the Czech Republic states, the high number and varying capacity of municipalities complicate the financial dimension of local government in the Czech Republic (Furdui & Kokko, 2022).

Czech regions and municipalities rely heavily on shared taxes and revenue from the central government through grants and transfers. Taxes are determined centrally, and the Ministry of Finance regularly provides projections of expected tax revenues, making budgeting at the local level easier. However, this also reduces decentralisation's efficiency and accountability benefits (Dougherty et al., 2019). From a practical point of view, it cannot be easy to achieve a meaningful level of self-financing and corresponding accountability in the Czech case. Due to their small size, most Czech municipalities are not optimal taxing units.

Tax revenues play a significant (in the case of municipalities, a key) role in financing subnational government in the Czech Republic. Most come from shared taxes, defined by Act No. 243/2000 Coll., on Budgetary Allocation of Taxes). Revenue from shared taxes represents 60% of municipal revenues. Tax revenue directly levied at the local level (as opposed to shared taxes) represents only 1% of total tax revenue in the Czech Republic. Property tax is the only tax that belongs directly to municipalities. Municipalities raise only 8.3% of their tax revenue (Provazníková, 2015). The financial resources from shared taxes can be disposed of as municipalities choose, giving them a degree of financial autonomy. This allows them to allocate those resources to the tasks that have been prioritised. While municipalities have some financial autonomy regarding shared taxes, the high ratio of conditional (earmarked) to unconditional (general) grants indicates limited autonomy, which is constrained by the dominance of earmarked transfers.

Total tax revenue is shared among different levels of government (state, regions, municipalities, and the state fund for traffic infrastructure) according to coefficients stipulated by Act No. 243/2000 Coll., on Budgetary Allocation of Taxes. To municipalities is distributed 25.84% of shared taxes, to regions 9.78% and the state 64.38%. Shared taxes represent Value Added Tax - VAT, Personal Income Tax - PIT (Tax on Interest and Dividends, Tax on Unincorporated Individuals, and Tax on Wages and Salaries – additionally, 1.5% is redistributed according to the location of employees in proportion to all employees in the CR), Corporate Income Tax – CIT (without the income tax paid by municipalities or regions itself).

The tax-sharing formula for municipalities is quite complex. The formula takes into account population size (78%, following a formula), the population size (10%), the number of children in nursery schools and primary schools (9%), and the size of the cadastral area (3%). Over the past years, the tax-sharing system was changed: at the beginning, in favour of larger municipalities by introducing a cap on the cadastral area component, the weight of the component on the number of children in kindergartens and primary schools and the coefficients for calculating the population size. Later, the weights of the indicators were changed (Provazníková, 2015).

Despite significant progress in the effort to equalise the financing conditions for sub-national governments, there are still arguments for changes to the Budgetary Allocation Taxes. Among the most frequent are demands for adjusting the criteria for redistributing tax revenues to regions and municipalities or for greater financial independence of local governments. Sub-national governments feel strongly dependent on income from the central level; their financial resources are still insufficient for the necessary investment in infrastructure and local development, leaving them largely dependent on subsidies from national or EU programs. Another problem is the fact that the system of redistribution of shared taxes among municipalities does not correspond to the demographic structure of the population and its predicted development, i.e. the ageing of the population and the increasing share of the seniors in the total population, which increases the demands on the budgets of these municipalities.

The main argument of the municipalities themselves and unions of municipalities (e. g. Svaz měst a obcí, Sdružení místních samospráv) for the revision of the current situation is that in connection with the expected ageing of the population, the current criteria will insufficiently reflect the needs of the municipalities in the future. These arguments of Sdružení místních samospráv (2022) and some political representatives (Polčák, 2019) follow the example of Slovakia, which includes a population age criterion in shared taxes redistributing formula. The paper aims to assess the possible impact on municipal shared revenues by changing the tax-sharing formula of the

criterion of population ageing, namely the number of people over 65 years of age. The paper provides evidence that introducing this criterion is negligible for municipal shared revenues and does not eliminate the problems with related services financing. The paper corresponds with opinions that primarily the size of municipalities in the Czech Republic limitate quality and efficient service delivery, especially in small municipalities.

2 Material and Methods

As a result of the demographic development of the population, in which there is a decline in the birth rate on the one hand and an increase in life expectancy on the other, the age structure is changing, and the proportion of older people is increasing. While in 2001, seniors made up less than 14% of the population of the Czech Republic, twenty years later, it is already more than 20% (Table 1), and this number is expected to grow in the future. According to the Strategy for Preparing for an Ageing Society 2019-2025 prepared by the Ministry of Labour and Social Affairs (2019), seniors will make up one-third of the Czech population by 2050. Therefore, municipalities are calling for a change in the redistribution mechanism of shared taxes by introducing a criterion considering the number of seniors in the municipality.

Table 1 – Number of people over 65 in the Czech Republic 2001-2021

Year	Total population of the CR	Persons aged 65 and over		Year	Total population of the CR	Persons aged 65 and over	
		Absolutely	In %			Absolutely	In %
2000	10 266 546	1 423 003	13,9	2011	10 505 445	1 701 436	16,2
2001	10 206 436	1 414 557	13.9	2012	10 516 125	1 767 618	16.8
2002	10 203 269	1 417 962	13.9	2013	10 512 419	1 825 544	17.4
2003	10 211 455	1 423 192	13.9	2014	10 538 275	1 880 406	17.8
2004	10 220 577	1 434 630	14.0	2015	10 553 843	1 932 412	18.3
2005	10 251 079	1 456 391	14.2	2016	10 578 820	1 988 922	18.8
2006	10 287 189	1 482 437	14.4	2017	10 610 055	2 040 183	19.2
2007	10 381 130	1 512 834	14.6	2018	10 649 800	2 086 617	19.6
2008	10 467 542	1 556 152	14.9	2019	10 693 939	2 131 630	19.9
2009	10 506 813	1 598 883	15.2	2020	10 701 777	2 158 322	20.2
2010	10 532 770	1 635 826	15.5	2021	10 516 707	2 169 109	20.6

Source: Czech Statistical Office. 2022b

In order to test the effects of population ageing on municipalities' revenues, it was first necessary to change the tax-sharing formula and set new weights for new criteria. Based on the development of mathematical formulas, the tax-sharing revenues for municipalities were then recalculated according to the new proposed model, and the impacts of the new model on municipal revenues were evaluated.

Due to the very high number of municipalities in the Czech Republic (6.254), eight size categories of municipalities were created to simplify the new model testing. In order to compare the impacts of the tested model on the smallest municipalities, more categories were created for municipalities under 1.000 inhabitants than are commonly used, e.g., by the Czech Statistical Office. Municipalities under 1.000 inhabitants were divided into five size categories, as these municipalities represent 76% of all municipalities in the country. In each size category, two representative municipalities were selected based on data on the demographic structure of the population in the municipalities from the Czech Statistical Office (2022a, 2002c) and data on the amount of their tax revenues from the Financial Administration Office (2023) (see Table 2).

Table 2 – Municipalities selected to test the impact of the proposed tax-sharing system

Size category (number of inhabitants)	Municipality/region
1-49	Vysoká Lhota/Vysočina, Čilá/Středočeský
50-99	Holotín/Pardubický, Rybníček/ Vysočina
100-299	Braníškov/Jihomoravský, Radkova Lhota/Olomoucký
300-499	Popovičky/Středočeský, Doksany/Ústecký
500-999	Okrouhlo/Středočeský, Němčice/Pardubický
1 000-4 999	Nová Ves/Středočeský, Valdice/Královehradecký
5 000-29 999	Jesenice/Středočeský, Mariánské Lázně/Karlovarský
30 000-99 999	Česká Lípa/Liberecký, Přerov/Olomoucký

Source: own processing

The key to selection was similarity in terms of population and tax revenue. Conversely, for population structure, the effort was always to select two municipalities with a more significant difference in the proportion of persons over 65 years of age in the municipality's total population. This difference is most noticeable in the smaller municipalities, where it is even a few tens of per cent. On the other hand, in the largest category of municipalities, it is only 6% due to very similar population structures. Detailed data on selected municipalities are in Annex 1 presented.

2.1 Model and Data

The current mechanism of redistribution of shared tax revenues to the municipalities is based on four criteria:

1. cadastral area of the municipality with a weight of 3%,
2. the population size with a weight of 10 %,
3. the number of children in nursery schools and primary schools with weight 9 %,
4. recalculated population with a weight of 78% multiplied by the percentage by which municipalities participate in gross national tax revenues.

The proportion of individual municipalities on shared taxes is calculated in two steps: the shares of the four largest cities in the Czech Republic - the capital city of Prague. Plzeň. Ostrava and Brno (according to the coefficients set in Table 3) are calculated separately.

Table 3 – Coefficients of the four largest cities in the Czech Republic

City	Coefficient
Capital city Prague	4.0641
Plzeň	2.2961
Ostrava	2.2961
Brno	2.2961
Other municipalities	1.0000

Source: Annex No. 3 to Act No. 243/2000 Coll., as amended by Act No. 483/2001 Coll.

The recalculated population of each municipality is derived from the four size categories and the coefficients of gradual conversion between these categories according to Table 4.

Table 4 – Recalculation coefficients by size category of municipalities

Size category of the municipality (number of inhabitants)	Coefficients of gradual conversion	Multiplication of subsequent transitions
0-50	1.0000	1.0000 x number of inhabitants in the municipality
51-2000	1.0700	50 + 1.0700 x number of inhabitants exceeding 50
2001-30000	1.1523	2136.5 + 1.1523 x number of inhabitants exceeding 2000
30 001 and more	1.3663	34400.9 +1.3663 x number of inhabitants exceeding 30000

Source: Annex No. 2 to Act No. 243/2000 Coll., as amended by Act No. 483/2001 Coll.

The new model introduces a fifth criterion, "number of persons aged 65 and over," with a weighting of 4% (TR_5). The criterion's weight is calculated as the arithmetic mean of the shares of municipal social spending for the years 2017-2021. The weight of the new criterion is introduced at the expense of the criterion recalculated population (TR_4), which weight was reduced to 74% (see formula 5). The other criteria and their weights remain unchanged. The calculation of individual municipality participation in the shared taxes is based on the formula (1).

$$TR_T = TR_1 + TR_2 + TR_3 + TR_4 + TR_5 \tag{1}$$

TR_T = proportion of municipality on shared taxes in total

$$TR_1 = \frac{\text{size of cadastral area of municipality}}{\text{cadastral area of all municipalities}} * 3 \tag{2}$$

$$TR_2 = \frac{\text{number of inhabitants of municipality}}{\text{number of inhabitants of all municipalities}} * 10 \tag{3}$$

$$TR_3 = \frac{\text{the number of children in nursery schools and primary schools}}{\text{the number of children in nursery schools and primary schools in all municipalities}} * 9 \tag{4}$$

$$TR_4 \frac{\text{multiplication of the coefficient of subsequent transitions of the municipality}}{\text{multiplication of the coefficient of subsequent transition of other municipalities}} * TP * 74 \tag{5}$$

TP = the total percentage by which the municipalities, apart from the capital city of Prague. Plzeň. Ostrava and Brno participate in the share of the gross national revenue from shared taxes according to Decree No. 249/2022 Coll.

$$TR_5 = \frac{\text{number of persons aged 65 and over in the municipality}}{\text{number of persons aged 65 and over in all municipalities}} * 4 \qquad (6)$$

Data from the tax revenue forecast 2023 prepared by the Ministry of Finance of the Czech Republic (2022) were used as input data. Based on this forecast, all shared taxes should increase year-on-year, mainly due to the high inflation rate (15.1% in 2022) and the rising price level and wage increases, which positively impact nominal tax collections.

3 Results and Discussion

The results of applying the suggested model on the proportion of selected municipalities in shared taxes are shown in Tables 5, 6 and Annex 2. Using the data from Annex 1, the calculation of tax revenues (TR_1 up to TR_5) based on formulas (2) up to (6) where applied (see Annex 2). Table 5 exhibits the original and new recalculation coefficients for expressing proportion (in percentage) by municipalities in shared-tax revenue. When comparing the resulting values with the current situation (based on Decree No.49/2022 Coll.), the new coefficients decrease only for the municipalities of Holotín. Popovičky. Němčice. Nová Ves and Jesenice (in Table 5 highlighted in bold). Within the size categories, it represents the municipalities with a lower share of seniors in the municipality's total population. The other municipalities have increased their ratios.

Table 5 – Municipal tax sharing percentages – original and new model coefficients

Municipality	Original model		New model		Difference
	25.84%	1.5%	25.84%	1.5%	
Vysoká Lhota	0.000149	0.000110	0.000165	0.000110	0.000016
Čilá	0.000183	0.000110	0.000192	0.000110	0.000009
Holotín	0.000431	0.000422	0.000424	0.000422	**-0.000007**
Rybníček	0.000515	0.000202	0.000544	0.000202	0.000029
Braníškov	0.001331	0.000550	0.001334	0.000550	0.000003
Radkova Lhota	0.001241	0.003245	0.001382	0.003245	0.000141
Popovičky	0.002668	0.002218	0.002625	0.002218	**-0.000043**
Doksany	0.002767	0.001907	0.002807	0.001907	0.000040
Okrouhlo	0.004774	0.001705	0.004821	0.001705	0.000047
Němčice	0.004710	0.000917	0.004593	0.000917	**-0.000117**
Nová Ves	0.008708	0.001852	0.008478	0.001852	**-0.000230**
Valdice	0.008889	0.018974	0.009020	0.018974	0.000131
Jesenice	0.069408	0.065483	0.068283	0.065483	**-0.001125**
Mariánské Lázně	0.087779	0.118555	0.089988	0.118555	0.002209
Česká Lípa	0.269553	0.393685	0.270182	0.393685	0.000629
Přerov	0.298704	0.442852	0.303930	0.442852	0.005226

Source: Annex to the Decree No. 249/2022 Coll.; own calculations

The total amount of shared-tax revenues (TR_T) copied the change in coefficients. The decrease in the total amount of shared taxes occurred only in municipalities with a lower coefficient, in the relative amount of 1.6-2.5% of the tax revenues of these municipalities. The other municipalities exhibited an increase (see Table 6) which is expected to average 4%, and up to 4.5% for municipalities with older populations. The detailed distribution between particular tax revenues in the original and new model for 2023 is shown in Annex 2.

Introducing a new criterion in calculating the tax-share formula of selected municipalities caused an increase in the recalculation coefficients, especially for municipalities with a larger number of persons aged 65 and over. Municipalities with a small proportion of seniors have seen a decrease in the coefficient. This fact mirrored the different distribution of tax revenues. Municipalities with a lower coefficient experienced a decline in revenues ranging from 1.5-2.6%, and these were always municipalities with younger populations. A deeper examination of the higher-income municipalities shows that the increase in revenues is slightly higher in the "older" municipalities (up to 4.5%). In comparison, the "younger" municipalities recorded an increase in tax revenues of "only" 4%. Therefore, the proposed model has not delivered any major negative or positive changes. There has been only

a small transfer of funds between municipalities, which will not be significantly affected. Therefore, it is only a partial and insignificant parameter in municipal budgets today.

Table 6 – Total municipal revenue from shared taxes in 2023 – original and new model (in CZK)

Municipality	2023 (original model)	2023 (new model)	Difference
Vysoká Lhota	424 340.30	469 554.10	45 213.80
Čilá	520 419.62	545 852.38	25 432.76
Holotín	1 230 556.05	1 210 775.02	**-19 781.04**
Rybníček	1 461 354.90	1 543 304.91	81 950.01
Braníškov	3 777 656.85	3 786 134.44	8 477.59
Radkova Lhota	3 603 855.84	4 002 302.44	398 446.60
Popovičky	7 605 674.72	7 484 162.64	**-121 512.08**
Doksany	7 876 142.42	7 989 176.92	113 034.50
Okrouhlo	13 541 612.50	13 674 428.03	132 815.53
Němčice	13 337 211.86	13 006 585.96	**-330 625.90**
Nová Ves	24 662 947.54	24 012 999.19	**-649 948.35**
Valdice	25 686 033.99	26 056 221.97	370 187.97
Jesenice	198 094 089.50	194 914 994.30	**-3 179 095.20**
Mariánské Lázně	251 593 799.01	257 836 129.05	6 242 330.04
Česká Lípa	773 482 995.31	775 260 462.76	1 777 467.45
Přerov	857 328 820.09	872 096 776.99	14 767 956.90

Source: Annex to the Decree No. 249/2022 Coll.; own calculations

4 Conclusion

Today, municipalities are entitled to 25.84% of the shared taxes allocated based on four criteria. In the context of the expected demographic development and higher demands on municipal budgets, a fifth criterion has been proposed to consider the number of inhabitants over 65 age living in the municipality. Given the significant fragmentation of municipal self-government in the Czech Republic, eight size categories were created. Within them, the two municipalities were similar in population and tax revenue and different in terms of the proportion of people over 65 in the total population. Based on the calculation, it can be concluded that the proposed model has not delivered any major negative or positive changes. There has been only a small transfer of funds between municipalities, which will not be significantly affected. Therefore, it is only a partial and insignificant parameter in municipal budgets.

Moreover, the proposed change does not address the problem of small municipalities whose revenues are limited and cannot create funds for larger capital projects. As a result of the amendment's implementation, the amount of funds these municipalities will continue to hold inefficiently in their bank accounts will increase. This is related to the already mentioned high number of very small municipalities and the resulting economic dependence of these units on the state. The fragmentation of municipalities results in considerable transaction costs, increasing inefficiency, and questions about the non-efficient utilisation of available public finance. There were also criticisms of the reluctance of many municipalities to use possibilities on the revenue side of their budgets - e.g., in setting local fees, setting prices for services provided (rent. water. sewerage. heat. public transport), setting property tax coefficients, etc. This was perceived as a failure to use their fiscal autonomy (Urban & Maisonneuve, 2021).

The current public finance situation in the Czech Republic raised discussions about the poor correlation between the current system of local finance distribution of resources and between the economic potential and needs of different categories of municipalities. Despite clear asymmetries between the size, income and capabilities of municipalities, there is no equalisation mechanism in the Czech Republic. The current tax-sharing system does not correct the inequalities. Therefore, some form of equalisation system should be considered (Furdui & Kokko, 2022).

The fragmentation of municipalities, where more than three-quarters of municipalities do not even reach 1.000 inhabitants, points to the need to reduce the number of municipalities in the Czech Republic. The authors are aware that due to several historical and social factors, the amalgamation of municipalities is considered almost politically impossible. In many countries, inter-municipal cooperation is seen as a first transitional step towards amalgamation reform or an alternative option that local government may choose and benefit from economies of scale in some service delivery. The best-known example of such an option is France. The recommendation for the Czech

Republic could be a reform of the tax-sharing system combined with economic incentives to promote inter-municipal cooperation. The preferential funding from corporate tax to a cooperation union of municipalities in required population size, number of municipalities, and budget volume could be transferred. Initially, it could be an additional source of revenue for cooperative municipalities with a decreasing amount of funding for distribution to non-cooperating municipalities. The present study has only examined the impact of the new tax-sharing formula on local government revenues. Future research should consider the potential dimensions of inter-municipal cooperation.

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Annex 1 – Data for calculation of new model – selected municipalities

Size category	Municipality/region	Cadastral area in ha (on 1. 1. 2022)	Number of inhabitants (on 1. 1. 2022)	Number of inhabitants with 65 age and over (on 1. 1. 2022)	Number of children and pupils (on 30. 9. 2021)
1-49	Vysoká Lhota (Vysočina)	160.0	16	11	0
	Čilá (Středočeský)	191.4	20	8	0
50-99	Holotín (Pardubický)	277.4	59	5	0
	Rybníček (Vysočina)	361.5	68	26	0
100-299	Braníškov (Jihomoravský)	366.5	210	35	0
	Radkova Lhota (Olomoucký)	209.8	205	109	0
300-499	Popovičky (Středočeský)	519.9	433	45	0
	Doksany (Ústecký)	312.2	436	91	23
500-999	Okrouhlo (Středočeský)	832.3	746	144	27
	Němčice (Pardubický)	254.9	778	60	24
1 000-4 999	Nová Ves (Středočeský)	195.2	1 417	101	75
	Valdice (Královehradecký)	91.9	1 357	287	155
5 000-29 999	Jesenice (Středočeský)	1 754.2	9 777	1 027	1 397
	Mariánské Lázně (Karlovarský)	5 179.0	12 237	3 252	1 685
30 000-99 999	Česká Lípa (Liberecký)	6 609.6	36 740	6 730	5 280
	Přerov (Olomoucký)	5 845.0	41 404	10 138	4 794

Source: Czech Statistical Office (2022a, 2022c); Annex to the Decree No. 249/2022 Coll.

Annex 2 – Municipal revenue from shared taxes in 2023 original and new model – in detail (in CZK)

Municipality	Original model				New model			
	PIT (1.5%)	PIT (25.84%)	CIT (25.84%)	VAT (25.84%)	PIT (1.5%)	PIT (25.84%)	CIT (25.85%)	VAT (25.84%)
Vysoká Lhota	3 286.8	97 678.6	95 561.0	227 814.0	3 286.8	108 167.5	105 822.6	252 277.2
Čilá	3 286.8	119 967.6	117 366.8	279 798.4	3 286.8	125 867.7	123 139.0	293 558.9
Holotín	12 609.4	282 546.7	276 421.3	658 978.7	12 609.4	277 957.8	271 931.9	648 276.0
Rybníček	6 035.8	337 613.8	330 294.6	787 410.7	6 035.8	356 625.1	348 893.7	831 750.3
Braníškov	16 434.0	872 551.4	853 635.3	2 035 036.2	16 434.0	874 518.1	855 559.3	2 039 623.0
Radkova Lhota	96 960.6	813 551.0	795 913.9	1 897 430.4	96 960.6	905 985.0	886 344.0	2 113 012.8
Popovičky	66 273.8	1 749 036.2	1 711 118.6	4 079 246.1	66 273.8	1 720 847.1	1 683 540.6	4 013 501.1
Doksany	56 981.2	1 813 936.7	1 774 612.1	4 230 612.4	56 981.2	1 840 159.2	1 800 266.1	4 291 770.5
Okrouhlo	50 945.4	3 129 647.3	3 061 799.2	7 299 220.7	50 945.4	3 160 458.6	3 091 942.6	7 371 081.4
Němčice	27 400.0	3 087 691.4	3 020 752.8	7 201 367.7	27 400.0	3 010 990.8	2 945 715.0	7 022 480.2
Nová Ves	55 337.8	5 708 623.4	5 584 865.4	13 314 121.0	55 337.8	5 557 844.5	5 437 355.1	12 962 461.8
Valdice	566 943.1	5 827 280.0	5 700 949.5	13 590 861.4	566 943.1	5 913 158.4	5 784 966.2	13 791 154.3
Jesenice	1 956 632.0	45 501 164.0	44 514 737.5	106 121 555.9	1 956 632.0	44 763 658.1	43 793 220.1	104 401 484.0
Mariánské Lázně	3 542 423.4	57 544 471.5	56 296 956.3	134 209 947.8	3 542 423.4	58 992 605.3	57 713 695.8	137 587 404.6
Česká Lípa	11 763 307.8	176 708 380.3	172 877 493.1	412 133 814.1	11 763 307.8	177 120 728.1	173 280 901.5	413 095 525.4
Přerov	13 232 417.8	195 818 633.2	191 573 452.0	456 704 317.2		231 321 123.0	226 306 278.0	539 506 143.0

Source: Ministry of Finance of the Czech Republic (2022); own calculations

Mental Health of Children and Adolescents in the Czech Republic: Focused on the Regions of the Czech Republic

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Abstract: Population health is a priority for society at national, international and global levels as a whole. Mental health is one of the fundamental dimensions of health, that has come to the forefront of public policy concerns due to many societal changes. This contribution responds to a pivotal issue in society, specifically the mental health of children and adolescents. It focuses on monitoring the development of the prevalence of mental illness in patients (25-) and assessing regional differences for the period 2010-2021. The research showed that the highest number of patients treated for psychiatric illnesses was in the Olomouc Region and in the Capital City of Prague, while the lowest number was in the Zlín Region. As a rule, mental illnesses afflict more women than men, on average by more than 9 % in the observed period. In terms of the analysed mental illnesses (dg. F1, F3, F4, F90-98), the largest increase in the number of treated patients (25-) occurred in diagnoses F3 - Affective disorders and in dg. F4 - Neurotic, stress and somatoform disorders. Considering the age structure of the patients, it was found that mental health disorders were mainly experienced by patients over 18 years of age.

Keywords: Age, children and adolescent, gender, mental health, region

JEL Classification: C02, H10, C12

1 Introduction

Mental health is primarily a medical issue, however, it should not be overlooked that mental health is not only reflected on the individual or his/her family, but also on the economy and society as a whole (OECD, 2023; Barták and Dlouhý, 2012). This is undoubtedly implicit in the European Commission's (2023) definition of mental health, according to which mental health means *"having the capacity to self-actualise, to relate to others, to participate in public life and to be productive at work"*, and the World Health Organization (2022), which defines mental health as *"a state of mental well-being that enables people to cope with the stresses of life, realize their abilities, learn well and work well, and contribute to their community"*.

Mental health develops throughout the lifespan, but exactly half of all mental illnesses that emerge in adulthood have their actual onset before the age of 14 and nearly three-quarters before the age of 24. Mental health promotion and the prevention of mental illness are thus crucial during childhood and adolescence because they help to prevent and mitigate not only the personal, but also the economic and social impact of mental disorders. In this context, child and adolescent mental health is seen as a major global public health challenge (Comprehensive Mental Health Action Plan 2013-2030; MacLachlan, McMellon and Inchley, 2022).

Psychiatric care in the Czech Republic currently represents a significant part of the health care system, also due to the fact that, the number of psychiatric patients, including children and adolescents, has been increasing in recent years (Health 2030). This has also resulted in an increasing economic burden on the country in the form of rising costs for the treatment of mental illness, which are estimated to reach up to 4 % of GDP (State of Health in the EU: more protection and prevention for longer and healthier lives, 2018). The aim of this research responds to the above.

The aim of the article (research) is to detect regional differences in the prevalence of patients (25-) in the field of psychiatry in the Czech Republic for the period 2010-2021. The subject of the research were mainly the following selected diagnoses - Mental and behavioural disorders caused using psychoactive substances (F1), Affective disorders (F3), Neurotic, stress and somatoform disorders (F4) and Disorders of mental development, behaviour and emotions with onset in childhood and adolescence (F90-F98).

To achieve the research objective, the following research questions were set:

RQ1: Did child and adolescent mental health deteriorate in all counties during the observed period, particularly during the Covid-19 pandemic?

RQ2: Were more women than men experiencing mental health disorders during the observed period?

The mental health of children and adolescents has been the subject of articles by many authors. Cosma, Költö, Badura, Winkler, and Kalman (2021) researched time trends in mental well-being (psychological and somatic problems, life satisfaction) among Czech adolescents between 2002 and 2018, including the influence of selected factors (gender, age, and socioeconomic status) on their mental well-being. Hierarchical regression models were used in the research, which revealed the fact that somatic difficulties increased only until 2010, while life satisfaction decreased until 2014. Furthermore, the results showed that girls, older adolescents and adolescents coming from low-income families faced worse mental well-being. In the case of mental distress, gender cap increased over time, whereas age and socioeconomic differences were relatively stable.

The mental health of Czech children and adolescents was also the subject of a study by Bínová and Havelka (2021), but during the Covid-19 pandemic. More specifically, their study dealt with the impact of the Covid-19 pandemic on the provision of paedopsychiatric care in paedopsychiatric outpatient and inpatient facilities over two periods – from March 2020 to September 2020 (first wave of the lockdown) and from October 2020 to April 2021 (second wave of the lockdown). According to the study's conclusion, social isolation was behind the increase in mental morbidity among children and adolescents, causing a significant increase in the need for acute outpatient and inpatient paedopsychiatric care.

Wiens et al. (2020) evaluated mental health trends, namely Canadian youth (12-24 years) for the period 2011-2018. Specifically, the prevalence of poor/fair perceived mental health, diagnosis of mood and anxiety disorders, suicidality, and perceived stress and sleep problems, substance use, and mental health consultations were examined. The results of the meta-analysis noted an increase in the prevalence of diagnosed mood and anxiety disorders and mental health consultations over time, but mostly among young women, who also suffered from suicidal behaviour more than before. In contrast, there was a decrease in the prevalence of binge drinking, most markedly among young men.

Temporal trends of adolescent mental well-being (aged 11, 13 and 15) between 2010 and 2018 were also researched by Bersia et al. (2022), but in Italy. Their aim was to evaluate potential explanatory factors (schoolwork pressure, social support, socioeconomic status, geographical location and immigration origin). Based on multivariable logistic regression models performed on life satisfaction, psychological and somatic health problems, it was found that, while life satisfaction was stable over the time, the number of psychosomatic health problems increased in each of the three age groups, but especially in 15-year-old girls. The authors concluded that poor social support or pressure exerted at school played a significant role in the decline in mental well-being.

Lempinen, Luntamo and Sourander (2019) dealt with changes in mental health service use by 8-year-old children in Finland over 24 years (1989 to 2013), together with associated factors. The results of the study showed that the use of mental health services increased steadily during the observed period. Mental health problems as well as some family factors were associated with their use, but according to the authors, the increase in service use was not explained by them. The authors added to the study's conclusion by suggesting that the increase may be due to better public awareness of mental health issues or a reduction in stigma.

The identification and treatment of child and adolescent mental health problems was investigated by Zwaanswijk, van Dijk and Verheij (2011) in Dutch general practice between 2004 and 2008. Based on an analysis of time trends in the prevalence of registered mental health problems, it was found, as in the aforementioned studies, that the percentage of children and adolescents diagnosed with mental health problems increased over a five-year period. However, the authors supplemented their study with an analysis of prescriptions for psychotropic medication, which showed that the percentage of children who were prescribed psychoanalgesics increased, while the percentage of prescriptions for antidepressants decreased for both children and adolescents. Analysis of referrals to primary and secondary mental health care showed that the percentage of children referred to primary and secondary mental health care increased over the years studied, but no significant increase was found for adolescents.

Pitchforth et al. (2019) examined the existence of temporal trends in child and adolescent (4-24 years) mental health in national health surveys from England, Scotland and Wales between 1995 and 2014. However, the authors used regression models to examine temporal trends in seven variables (general health, long-term health condition,

long-term mental health condition, Warwick-Edinburgh Mental Wellbeing Score, above-threshold Strengths and Difficulties Questionnaire Total score, SDQ Emotion score, General Health Questionnaire score). Results showed that all participants aged 4 to 24 years had increased long-term mental illness, both in England and in Scotland and Wales.

2 Material and Methods

The research methodology aims to answer two research questions (RQ1-RQ2) and includes a description of the analysis, variables and chosen methods.

2.1 Model and Data

The data used for the purposes of this research are based primarily on the National Portal of Psychiatric Care (administered by the Institute of Health Information and Statistics of the Czech Republic), which comprehensively maps mental health care in the Czech Republic, not excluding psychiatric care for children and adolescents. The register of psychiatric care for children and adolescents registers anonymised data about patients up to the age of 25, due to the fact, that mental health develops significantly after the age of 18, as the boundary of adulthood. The datasets obtained from the registry were used to analyse the prevalence of patients treated (25-) for psychiatric illness in each region between 2010 and 2021.

Another data source is the Czech Statistical Office, from whose Public Database, which is a comprehensive information system, data were extracted regarding the number, gender and age structure of the population of the individual regions of the Czech Republic during the years. The data were used to analyse the evolution of the demographic structure of the population and to recalculate the number of treated patients per inhabitant, which enabled inter-country comparison with respect to population size and better identification of similarities.

Considering the availability of data, the research was conducted over a 12-year period, from 2010 to 2021.

To detect regional differences in the prevalence of psychiatric patients (25-) in the Czech Republic, was chosen selected measures of time series dynamics, because they are suitable indicators to characterize the basic features of their behaviour. The first indicator chosen was the average absolute growth rate, which was used to express the average absolute annual change in the number of patients during the monitoring period. The average relative increment, as the next indicator, was chosen to express the average annual relative change in the number of patients during the monitoring period. The average growth rate was chosen as the last indicator to express the average rate of change in the number of patients during the period.

2.2 Development of the demographic structure of the population in the regions of the Czech Republic (2010-2021)

In the Czech Republic, a double census of population, houses and flats was carried out between 2010 and 2021. This resulted in new population figures, which were reflected in a decrease in the total population. As a result, between 2010 and 2011 there was a relative decrease in the population of 0.2 %, however, from the beginning of 2011 until the end of 2020 the population of the Czech Republic grew every year, the only exception being 2013, when there was an absolute decrease of 3.7 thousand inhabitants, a relative decrease of 0.04 %. However, between 2020 and 2021, there was again a decrease in population due to new population figures, but this time it was almost 2 %.

During the period 2010 to 2021, the largest number of permanent residents was registered in the Central Bohemian Region and the Capital City of Prague, with an average of approximately 1.3 million inhabitants in each of these regions. More than 1 million inhabitants were also registered in the Moravian-Silesian and South Moravian Regions, where the number of inhabitants was around 1.2 million. On the other hand, the Karlovy Vary Region had the lowest number of inhabitants, i.e. less than 300 thousand on average. In the Karlovy Vary, Ústí nad Labem, Olomouc, Zlín and Moravian-Silesian Regions, the population decreased every year. On the other hand, in the Central Bohemian, South Moravian, Pardubice, Plzeň and South Bohemian Regions, the population grew mainly over the time, with the exception of 2021.

Considering the basic age structure consisting of three main categories (0 to 14 years, 15 to 64 years, 65 years and over), it can be noted that between 2010 and 2020, the share of people aged 0 to 14 years and 65 years and over predominantly increased every year in all regions. The productive age category of persons aged 15 to 64 years declined annually in all regions, except Prague and the Central Bohemian Region.

The child population represented on average 15.4 % of the total population of the Czech Republic. On average, the highest annual growth of this age category was registered in the Central Bohemian Region and in Prague, where it was less than 2.5 % between 2010 and 2020. In contrast, the lowest average annual growth of this category was registered in the Ústí nad Labem Region, where it was relatively almost zero. On average, the productive part of the population accounted for 66.3 % of the total population of the Czech Republic. For the productive part of the population, the highest average annual decrease was registered in the Karlovy Vary Region, where it amounted to 1.8 %, while the average annual decrease was almost zero in the Central Bohemian Region. The senior part of the population represented on average 18.3 % of the population of the Czech Republic. The average relative year-on-year increase exceeded 2 % in all regions, with the highest increase averaging almost 3.5 % in the Liberec Region.

2.3 Development of the number of treated patients (25-) for psychiatric diseases F00-F99, X60-X84, Z55-Z65 in the regions of the Czech Republic (2010-2021) – gender, age

Table 1 shows that between 2010 and 2021, on average, the highest number of patients (-25) treated for psychiatric diseases was registered in the Olomouc Region and in the Capital City of Prague, both with around 450 patients per 100,000 inhabitants. On average, more than 400 patients were also treated in the Ústí nad Labem and Plzeň Regions. In contrast, the lowest average number of patients treated, i.e. less than 300, was registered only in the Zlín Region.

It can also be observed that the last year monitored (i.e. 2021) differs significantly from the other years in relation to the number of patients treated. In this year, the highest number of treated patients was registered in the South Bohemian Region, where the value of treated patients reached 660 persons per 100,000 inhabitants, thus doubling compared to 2020. More than 100 fewer patients were registered in the Pardubice Region, where the value exceeded 550 people, representing a 67 % increase compared to 2020. More than 500 patients were also registered in the Olomouc Region (13% year-on-year increase), in the Capital City of Prague (23% year-on-year increase) and, most recently, in the South Moravian Region (30% year-on-year increase). On the other hand, the lowest number of treated patients in 2021 was registered in the Zlín Region, where the value was 343 persons per 100,000 inhabitants, which represented an almost 11% year-on-year increase compared to 2020. The threshold of 380 treated patients was also not exceeded in the Liberec Region (17% year-on-year increase) and the Hradec Králové Region (13% year-on-year increase), as well as in the Vysočina Region (20% year-on-year increase).

The highest average increase in the number of patients treated during the years was more than 7 % in the South Bohemian Region. An average increase of more than 6.5 % was also registered in the Pardubice Region. On the other hand, the lowest average increase, which was below 1 %, was in the Capital City of Prague, in the Ústí nad Labem and Liberec Regions.

Table 1 – Development of the number of treated patients (25-) for psychiatric diseases F00-F99, X60-X84, Z55-Z65 in the regions of the Czech Republic per 100,000 inhabitants (2010-2021)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Capital City of Prague	492.12	488.71	471.58	462.10	441.30	406.65	400.08	402.39	415.87	432.29	428.70	525.18
Central Bohemian Region	346.01	349.78	343.72	358.15	362.76	348.75	348.32	359.94	370.46	391.72	373.53	434.20
South Bohemian Region	305.06	297.53	302.33	307.02	306.64	298.92	298.45	308.83	312.84	328.54	328.69	660.09
Plzeň Region	394.04	394.40	392.12	381.93	385.72	383.90	379.65	392.59	406.28	424.32	415.14	487.01
Karlovy Vary Region	317.60	300.80	290.26	301.33	292.78	307.87	316.16	330.62	335.27	372.45	355.56	431.83
Ústí nad Labem Region	390.17	418.18	418.82	441.85	453.45	431.03	440.72	451.07	465.52	442.52	377.56	418.14
Liberec Region	344.04	343.28	327.18	317.69	342.51	358.19	327.37	307.98	317.70	315.16	320.43	373.34
Hradec Králové Region	272.42	285.35	296.59	305.41	307.03	315.63	322.04	352.00	345.02	357.40	331.22	374.48
Pardubice Region	272.46	284.16	290.47	296.83	290.83	297.73	298.52	320.16	327.47	349.04	330.37	552.64
Vysočina Region	305.36	310.37	314.29	326.72	304.90	311.87	314.42	324.77	320.22	336.69	314.40	377.38
South Moravian Region	361.31	352.64	347.09	349.66	351.25	364.02	364.49	376.63	388.78	394.61	391.21	508.84
Olomouc Region	398.34	409.49	441.81	429.74	454.64	452.85	454.20	446.19	466.68	476.48	467.42	530.23
Zlín Region	246.59	260.86	282.17	280.26	282.85	272.22	288.62	305.81	304.19	315.77	309.27	343.10
Moravian-Silesian Region	323.20	325.57	318.58	317.50	318.93	315.09	309.38	318.94	336.61	361.98	361.05	413.92
Czech Republic	354.77	358.30	357.80	360.54	361.42	355.96	355.66	365.15	375.16	388.68	375.28	450.74

Source: Own elaboration according to the National Portal of Psychiatric Care (2010-2021)

Table 2 shows that in eight of the fourteen regions, on average, more women than men were affected by mental disorders during the years, by more than 9 %. This was the case in Prague, Central Bohemian, South Bohemian,

Plzeň, Karlovy Vary, Hradec Králové, Pardubice and, most recently, Olomouc Regions. However, the opposite was true in Ústí nad Labem, Liberec, South Moravian, Zlín and Moravian-Silesian Regions, where on average more men than women suffered from mental illness, by almost 8 %. In Vysočina Region, the average number of women and men treated was almost identical during the years under review, so the relative difference between them was almost zero. On the other hand, the largest difference between the number of treated women and men per 100,000 inhabitants was registered in Prague, where on average almost 25 % more women than men were struggling with mental disorders.

Table 2 – Development of the number of treated patients (25-) by gender for psychiatric diseases F00-F99, X60-X84, Z55-Z65 in regions of the Czech Republic per 100,000 inhabitants (2010-2021)

Region		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Capital City of Prague	M	444.26	441.09	427.13	426.30	403.01	370.48	371.59	365.09	368.17	370.86	355.30	414.87
	F	537.52	533.62	513.58	495.85	477.32	440.70	426.92	437.64	461.15	490.87	498.94	630.29
Central Bohemian Region	M	328.99	332.40	327.69	345.81	348.23	334.10	331.56	332.66	341.36	363.50	331.72	366.23
	F	362.60	366.74	359.35	370.19	376.92	363.03	364.67	386.54	398.88	419.33	414.45	500.58
South Bohemian Region	M	304.92	286.41	281.39	285.36	278.79	279.51	276.03	289.20	285.61	307.29	309.32	328.54
	F	305.20	308.32	322.66	328.06	333.69	317.79	320.26	327.96	339.41	349.32	347.62	424.19
Plzeň Region	M	386.73	385.11	373.97	371.69	378.84	385.17	366.19	364.20	378.85	384.71	379.04	410.72
	F	401.19	403.51	409.88	391.95	392.46	382.67	392.87	420.47	433.29	463.43	450.86	561.86
Karlovy Vary Region	M	343.65	306.20	309.12	306.58	306.67	314.73	323.56	333.73	300.37	344.66	336.43	399.83
	F	292.48	295.57	271.93	296.22	279.24	301.17	308.95	327.60	369.32	399.58	374.23	463.03
Ústí nad Labem Region	M	437.72	466.28	459.67	483.23	503.12	484.40	498.30	502.24	509.92	481.29	371.60	396.12
	F	343.86	371.29	378.93	401.35	404.72	378.57	384.07	400.72	421.81	404.27	383.43	439.65
Liberec Region	M	383.78	349.81	328.31	324.20	359.95	378.90	338.10	317.77	322.22	327.27	323.41	368.97
	F	305.90	337.00	326.09	311.44	325.72	338.22	317.01	298.51	313.33	303.41	317.53	377.60
Hradec Králové Region	M	273.21	291.62	303.76	311.46	310.19	319.88	320.89	351.09	333.52	348.41	316.04	346.43
	F	271.66	279.30	289.66	299.56	303.98	311.53	323.15	352.89	356.19	366.14	345.99	401.80
Pardubice Region	M	280.61	280.13	296.89	309.40	302.11	313.93	301.01	309.89	305.57	320.91	303.75	537.85
	F	264.53	288.09	284.21	284.57	279.82	281.89	296.08	330.21	348.99	376.75	356.67	567.21
Vysočina Region	M	311.67	311.88	315.12	335.09	309.64	315.85	314.89	318.37	326.68	334.87	314.12	354.98
	F	299.15	308.88	313.47	318.48	300.23	307.95	313.96	331.08	313.85	338.49	314.68	399.58
South Moravian Region	M	372.13	358.16	356.94	360.75	367.96	383.84	384.98	387.23	399.85	401.69	396.58	491.70
	F	350.99	347.36	337.64	339.02	335.24	345.00	344.82	366.43	378.13	387.79	386.03	525.43
Olomouc Region	M	398.83	393.77	440.57	418.67	442.31	459.37	463.21	459.73	472.74	472.30	454.66	499.51
	F	397.88	424.50	442.99	440.34	466.42	446.61	445.58	433.23	460.88	480.48	479.67	559.81
Zlín Region	M	247.19	274.75	285.13	285.23	281.92	295.93	309.42	319.29	305.13	317.93	302.56	313.34
	F	246.01	247.57	279.34	275.51	283.74	249.49	268.67	292.87	303.29	313.69	315.72	371.89
Moravian-Silesian Region	M	350.37	346.32	330.09	336.59	334.65	334.14	323.58	324.85	337.34	361.91	354.42	383.42
	F	297.17	305.69	307.56	299.19	303.84	296.79	295.75	313.27	335.91	362.06	367.43	443.38
Czech Republic	M	358.09	356.67	355.63	361.17	362.01	361.43	359.25	361.59	365.46	375.36	353.23	406.15
	F	351.58	359.88	359.89	359.93	360.85	350.68	352.20	368.60	384.56	401.61	396.72	494.06

Source: Own elaboration according to the National Portal of Psychiatric Care (2010-2021)

It is quite clear from the appendix that mental health disorders were mainly experienced by people over 18 years of age in all regions. On average, more than 50 patients per 1,000 inhabitants aged 22 to 25 were treated in the Capital City of Prague. The threshold of 40 patients in this age category was also exceeded in the Olomouc, Plzeň and Central Bohemian Regions. On average, fewer than 30 patients were registered only in Vysočina Region.

Between the ages of 18 and 21, the highest average number of patients treated, i.e. more than 46 per 1,000 inhabitants, was again registered in the Capital city of Prague. More than 40 patients were also treated in the Plzeň Region. By contrast, the lowest average number of patients was registered in Vysočina and Zlín Regions, both with around 27 people.

In the age group of 16-17 years, the highest number of patients treated was registered in Prague, i.e. around 20 persons per 1,000 inhabitants. In the Ústí nad Labem and Olomouc Regions, the number of treated patients averaged around 16 persons. On the other hand, the lowest number of patients treated was in the South Bohemian Region, i.e. around 7 on average. In the Ústí nad Labem and Olomouc Regions, the highest number of patients treated was in the age group of 11 to 15 years, with more than 9 patients per 1,000 inhabitants, and in the age group of 7 to 10 years, with about 5 patients each.

2.3 Selected mental illnesses

From the point of view of the aim of the research, the subject of the research was treated patients according to selected psychiatric diagnoses, which according to the International Classification of Diseases are diagnoses F1, F3, F4 and F90-F98. These diagnoses were chosen based on the highest number of treated patients.

Diagnosis F1 - Mental and behavioural disorders caused by the use of psychoactive substances - covers a wide range of mental illnesses, but their common feature is the use of psychoactive substances (e.g. alcohol, tobacco, sedatives or cocaine), whether prescribed by a doctor or not.

An F3 diagnosis is defined as an affective disorder or mood disorder that tends towards depression or euphoria with or without anxiety. Such a change in mood goes hand in hand with a change in overall activity. Most of these disorders tend to return and recur.

The neurotic, stress and somatoform disorders, labelled F4, are a group of disorders in which anxiety is largely triggered by specific situations that are not normally dangerous but are nevertheless avoided by the patient. If the patient finds himself in these situations anyway, he suffers from fear in them.

Diagnoses F90-F98 indicate behavioural and emotional disorders with a normal onset in childhood, usually during the first five years of life. They are characterised by a lack of persistence in the activity performed and a tendency not to complete it. Such a patient usually has problems with discipline and is undisciplined and impulsive.

3 Results and Discussion

Based on Table 3, the prevalence of treated patients diagnosed with F1 decreased on average in absolute and relative terms between 2010 and 2021 in all regions. In absolute terms, the highest decrease was registered in the Plzeň Region, where the average annual decrease in treated patients was 2 persons per 100,000 inhabitants, i.e. more than 5 %. The 4% average relative decrease was also registered in the Central Bohemian Region, the Capital City of Prague, the Karlovy Vary Region and the Moravian-Silesian Region. By contrast, the lowest average relative decline of less than 0.5 % was registered in the Hradec Králové Region. The national average annual rate of decline was more than 3 %.

Table 3 - Development of the prevalence of treated patients (25-) in individual regions per 100,000 inhabitants within the diagnosis F1 – Mental and behavioural disorders caused by the use of psychoactive substances

Region	$\bar{\Delta}$	$\bar{k}$	$\bar{\delta}$	$\bar{\delta}$ (%)
Capital City of Prague	-1.612	0.954	-0.046	-4.623
Central Bohemian Region	-1.661	0.952	-0.048	-4.752
South Bohemian Region	-0.178	0.995	-0.005	-0.550
Plzeň Region	-2.072	0.946	-0.054	-5.359
Karlovy Vary Region	-1.458	0.959	-0.041	-4.051
Ústí nad Labem Region	-1.258	0.969	-0.031	-3.055
Liberec Region	-0.750	0.978	-0.022	-2.173
Hradec Králové Region	-0.096	0.997	-0.003	-0.338
Pardubice Region	-0.730	0.965	-0.035	-3.468
Vysočina Region	-0.703	0.970	-0.030	-2.973
South Moravian Region	-0.310	0.990	-0.010	-1.038
Olomouc Region	-1.057	0.965	-0.035	-3.466
Zlín Region	-0.275	0.989	-0.011	-1.094
Moravian-Silesian Region	-1.454	0.958	-0.042	-4.231

Region				
Czech Republic	-1.032	0.969	-0.031	-3.138

According to Table 4, the absolute and relative prevalence of treated patients with diagnosis F3 increased in all regions between 2010 and 2021. The Plzeň Region achieved the highest average absolute year-on-year growth, with just under 3 patients per 100,000 inhabitants, with an average year-on-year growth rate of 6.5 %. The Karlovy Vary Region also achieved an average annual growth rate of more than 6 %. The Ústí nad Labem Region and Moravian-Silesian Region also exceeded the 5% annual growth rate. Less than 1% average annual relative growth was registered in only one region, namely the Olomouc Region. The national average annual growth rate was less than 3.5 %.

Table 4 - Development of the prevalence of treated patients (25-) in individual regions per 100,000 inhabitants within the diagnosis F3 – Affective disorders (mood disorders)

Region	$\bar{\Delta}$	$\bar{k}$	$\bar{\delta}$	$\bar{\delta}$ (%)
Capital City of Prague	0.821	1.014	0.014	1.380
Central Bohemian Region	1.241	1.034	0.034	3.409
South Bohemian Region	1.020	1.034	0.034	3.400
Plzeň Region	2.888	1.065	0.065	6.470
Karlovy Vary Region	1.898	1.063	0.063	6.301
Ústí nad Labem Region	1.744	1.057	0.057	5.652
Liberec Region	1.175	1.046	0.046	4.589
Hradec Králové Region	0.705	1.032	0.032	3.224
Pardubice Region	1.268	1.045	0.045	4.523
Vysočina Region	1.142	1.033	0.033	3.257
South Moravian Region	0.874	1.027	0.027	2.727
Olomouc Region	0.179	1.006	0.006	0.595
Zlín Region	0.538	1.028	0.028	2.808
Moravian-Silesian Region	1.664	1.052	0.052	5.164
Czech Republic	1.222	1.035	0.035	3.498

Considering the data presented in Table 5, it can be concluded that the prevalence of treated patients with F4 diagnosis has been increasing on average in relative and absolute terms over the years under study in the individual regions. From the absolute point of view, the highest annual increase was registered in the Central Bohemian and Karlovy Vary Regions, where it was around 7.5 patients per 100,000 inhabitants. The average relative annual growth rate was more than 5 % in the Karlovy Vary Region. In the Central Bohemian, Pardubice, Zlín and Vysočina Regions, the average annual growth rate was more than 4 %. On the other hand, the lowest relative growth was registered in Prague, where the prevalence of treated patients grew by 2.3 % on average. The South Bohemian, Liberec, South Moravian and Olomouc Regions were also below the 3% threshold. In the Czech Republic as a whole, the prevalence of patients grew on average by more than 3 % year on year.

Table 5 – Development of the prevalence of treated patients (25-) in individual regions per 100,000 population within the diagnosis F4 – Neurotic, stress and somatoform disorders

Region	$\bar{\Delta}$	$\bar{k}$	$\bar{\delta}$	$\bar{\delta}$ (%)
Capital City of Prague	5.038	1.023	0.023	2.254
Central Bohemian Region	7.569	1.047	0.047	4.663
South Bohemian Region	3.500	1.026	0.026	2.560
Plzeň Region	6.001	1.033	0.033	3.293
Karlovy Vary Region	7.444	1.054	0.054	5.355
Ústí nad Labem Region	4.686	1.035	0.035	3.547
Liberec Region	2.989	1.023	0.023	2.322
Hradec Králové Region	4.979	1.035	0.035	3.546
Pardubice Region	5.520	1.042	0.042	4.227
Vysočina Region	5.411	1.044	0.044	4.405
South Moravian Region	3.969	1.026	0.026	2.602
Olomouc Region	4.093	1.024	0.024	2.351
Zlín Region	5.528	1.046	0.046	4.640
Moravian-Silesian Region	4.425	1.032	0.032	3.216

Region				
Czech Republic	5.224	1.034	0.034	3.358

Source: Own calculation

Table 6 shows that during the 12 years the prevalence of treated patients with F90-F98 diagnosis in a total of nine regions increased on average year on year, namely Prague, Central Bohemian, Plzeň, Hradec Králové, Pardubice, South Moravian, Olomouc, Zlín and also Moravian-Silesian Regions. On average, the highest, or 7%, year-on-year increase was registered in the Zlín Region. In the remaining five regions there was an average year-on-year decline, with an average relative decline of almost 10 % in the Liberec Region. Half the average relative decline was registered in the Ústí nad Labem Region. The national average annual growth rate of the prevalence of treated patients was less than 0.5 %.

Table 6 – Development of the prevalence of treated patients (25-) in each region per 100,000 population within the diagnosis F90-F98 – Disorders of psychological development and disorders of behaviour and emotions with onset usually in childhood and adolescence

Region	$\bar{\Delta}$	$\bar{k}$	$\bar{\delta}$	$\bar{\delta}$ (%)
Capital City of Prague	0.424	1.016	0.016	1.561
Central Bohemian Region	0.458	1.022	0.022	2.227
South Bohemian Region	-0.809	0.953	-0.047	-4.705
Plzeň Region	0.467	1.016	0.016	1.628
Karlovy Vary Region	-0.773	0.973	-0.027	-2.690
Ústí nad Labem Region	-2.704	0.944	-0.056	-5.552
Liberec Region	-2.826	0.903	-0.097	-9.750
Hradec Králové Region	0.721	1.057	0.057	5.731
Pardubice Region	0.414	1.027	0.027	2.703
Vysočina Region	-0.134	0.996	-0.004	-0.421
South Moravian Region	1.001	1.021	0.021	2.093
Olomouc Region	2.586	1.055	0.055	5.473
Zlín Region	0.995	1.071	0.071	7.134
Moravian-Silesian Region	0.314	1.011	0.011	1.142
Czech Republic	0.137	1.005	0.005	0.457

Source: Own calculation

4 Conclusion

Monitoring the mental health of children and adolescents is essential for planning public policies and services for population health. Thus, this research allowed to detect regional differences in child and adolescent (25-) mental health in the Czech Republic for the period 2010-2021 and provided answers to two research questions.

RQ1: Did child and adolescent mental health deteriorate in all regions during the time period studied, particularly during the Covid-19 pandemic?

RQ2: Were more females than males experiencing mental health disorders during the study years?

The number of treated child and adolescent patients increased in all regions of the Czech Republic between 2010 and 2021. On average, the Olomouc Region and the Capital City of Prague had the highest number of patients with mental disorders, while the Zlín Region had the lowest number. The most significant year was 2021, when the highest year-on-year increases in the number of treated patients were registered in all regions, with the number of treated patients in the South Bohemian Region even doubling compared to 2020. The Covid-19 pandemic has started to have an impact on the mental health of children and adolescents.

In more than half of the regions, more women than men experienced mental health disorders, with the largest gender gap in the Capital City of Prague, where a quarter more women than men experienced mental health disorders. On the other hand, almost no gender difference was registered in Vysočina Region. In this context, although not unequivocally, it can be stated that more women than men struggled with mental health disorders.

With regard to the age of the child and adolescent patients, it was found that it was mainly persons over 18 years of age who struggled with mental health disorders. On average, most patients aged 16 to 25 were treated in the Capital City of Prague. On average, most patients aged 7 to 15 were treated in the Ústí nad Labem and Olomouc Regions.

The most frequently diagnosed mental disorders in children and adolescents were neurotic, stress and somatoform disorders. The highest absolute average year-on-year increase in the number of patients with this diagnosis was registered in the Central Bohemian and Karlovy Vary Regions, while the lowest was registered in the Liberec Region.

However, the research did not fully identify the reasons behind the regional disparities. However, the impact of the increasing number of child and adolescent mental health patients in terms of socio-economic losses is clear and represents a public policy issue. This must be solved, particularly in the current economic climate, through effective and efficient public policies, and by pursuing the objectives of the ongoing mental health care reform.

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Appendix

Development of the number of treated patients (25-) by age for psychiatric diseases F00-F99, X60-X84, Z55-Z65 in regions of the Czech Republic per 1,000 inhabitants (2010-2021)

	Age	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Capital City of Prague	0 to 3	0.32	0.16	0.36	0.46	0.23	0.10	0.20	0.27	0.26	0.20	0.17	0.14
	4 to 6	0.99	0.47	0.86	1.58	1.25	0.56	0.56	0.66	0.82	1.02	1.03	0.53
	7 to 10	2´.29	1.67	2.02	2.22	2.76	1.76	1.38	1.71	1.39	1.76	1.39	1.39
	11 to 15	5.93	5.84	5.02	6.19	5.70	5.38	5.28	4.49	5.71	5.36	4.93	7.35
	16 to 17	17.61	18.95	18.78	19.70	21.18	21.37	18.35	18.96	18.97	22.90	19.41	23.96
	18 to 21	39.19	41.27	41.74	44.08	41.02	39.98	43.54	47.97	51.36	52.63	51.58	61.16
	22 to 25	46.70	51.36	51.45	50.78	51.08	49.50	50.15	50.79	52.20	54.55	56.74	64.37
Central Bohemian Region	0 to 3	0.13	0.14	0.11	0.16	0.13	0.13	0.16	0.08	0.06	0.06	0.10	0.11
	4 to 6	0.86	0.29	0.52	0.83	0.54	0.57	0.58	0.51	0.43	0.36	0.50	0.59
	7 to 10	1.62	1.21	1.44	2.35	2.20	1.48	1.29	1.01	0.85	1.24	1.09	1.22
	11 to 15	3.59	3.08	3.28	3.84	4.91	4.28	3.90	3.73	3.64	4.46	3.50	4.07
	16 to 17	12.13	11.91	12.81	12.94	15.26	14.88	14.05	12.99	15.20	16.43	13.46	15.32
	18 to 21	25.28	27.67	27.77	29.42	31.74	33.34	36.49	39.75	41.75	44.90	43.34	50.35
	22 to 25	33.81	36.47	36.38	38.23	38.23	37.54	38.42	42.29	44.76	47.57	47.72	53.71
South Bohemian Region	0 to 3	0.14	0.11	0.07	0.11	0.08	0.00	0.00	0.00	0.00	0.07	0.07	0.08
	4 to 6	1.44	0.30	0.24	0.18	0.23	0.19	0.15	0.10	0.30	0.20	0.15	0.39
	7 to 10	2.81	0.64	0.58	0.81	0.65	0.55	0.35	0.38	0.46	0.58	0.67	0.84
	11 to 15	3.89	1.98	1.48	1.12	1.81	1.33	1.41	1.63	1.19	1.52	1.52	2.40
	16 to 17	7.97	6.67	6.06	6.66	6.84	5.81	6.11	5.94	7.79	9.31	7.90	10.00
	18 to 21	20.67	23.59	25.21	25.62	26.68	28.51	30.93	33.02	34.17	37.03	38.45	45.09
	22 to 25	28.21	29.74	31.29	33.51	34.28	34.19	34.93	38.06	40.00	43.03	44.20	47.29
Plzeň Region	0 to 3	0.47	0.20	0.04	0.17	0.09	0.13	0.04	0.08	0.00	0.00	0.08	0.00
	4 to 6	1.52	1.24	0.74	0.51	0.46	0.48	0.33	0.12	0.17	0.29	0.28	0.61
	7 to 10	3.99	3.19	2.95	3.33	2.27	2.09	1.60	1.57	1.37	1.52	1.41	1.30
	11 to 15	6.63	7.12	6.61	5.59	6.21	4.95	4.75	4.96	5.47	4.69	3.99	6.36
	16 to 17	12.48	13.32	12.38	13.88	15.19	15.75	11.80	14.11	17.14	17.69	14.58	17.78
	18 to 21	29.64	29.82	32.89	32.82	34.51	36.06	40.65	46.16	47.20	51.64	52.02	58.76
	22 to 25	33.10	35.71	35.88	36.54	38.76	41.20	41.77	42.09	44.41	47.59	49.42	55.44
Karlovy Vary Region	0 to 3	0.00	0.08	0.00	0.00	0.09	0.00	0.00	0.09	0.00	0.18	0.00	0.38
	4 to 6	1.22	0.11	0.30	0.29	0.00	0.52	0.11	0.24	0.12	0.00	0.36	0.62
	7 to 10	3.66	0.82	0.72	0.35	0.50	1.09	0.45	0.66	0.31	0.48	0.00	1.19
	11 to 15	6.21	2.67	2.96	3.24	2.74	3.32	3.14	2.61	2.03	1.79	2.01	3.08
	16 to 17	10.28	9.93	10.54	9.35	8.11	8.55	8.21	7.87	9.99	9.45	6.30	7.34
	18 to 21	21.12	23.36	24.23	25.51	28.51	29.15	31.66	38.14	38.95	46.72	44.08	50.66
	22 to 25	24.79	27.52	26.17	29.58	28.74	32.30	35.74	36.91	39.20	43.92	45.57	53.32
Ústí nad Labem Region	0 to 3	0.42	0.50	0.50	0.47	0.51	0.36	0.18	0.21	0.21	0.03	0.03	0.06
	4 to 6	2.86	1.98	2.49	2.80	3.29	2.68	2.22	2.57	2.13	1.52	0.28	0.28
	7 to 10	5.61	5.76	6.53	6.46	7.33	6.56	6.97	6.84	6.43	4.32	0.87	0.67
	11 to 15	8.91	9.33	9.66	10.15	10.77	10.97	10.94	10.73	11.27	8.19	3.95	3.32
	16 to 17	14.44	16.51	17.01	16.59	18.79	17.18	17.11	17.16	17.52	16.41	11.48	13.49
	18 to 21	23.13	26.41	26.15	31.19	33.69	31.36	32.56	37.18	40.02	41.31	39.98	44.89
	22 to 25	30.03	33.75	34.36	35.67	35.75	36.65	39.92	40.82	43.34	46.40	45.85	49.50
Liberec Region	0 to 3	0.10	0.24	0.20	0.05	0.05	0.11	0.16	0.05	0.05	0.00	0.16	0.39
	4 to 6	1.67	0.64	1.06	0.76	0.88	1.26	0.56	0.51	0.29	0.65	0.28	0.63
	7 to 10	5.24	3.02	2.20	1.80	3.43	3.60	1.61	1.33	1.07	1.06	0.68	1.04
	11 to 15	8.23	5.97	4.38	4.24	5.71	8.51	4.56	3.58	2.94	2.39	1.49	2.35
	16 to 17	13.50	12.57	11.07	12.09	12.70	16.44	10.18	12.17	10.20	9.59	7.23	7.45
	18 to 21	20.78	23.27	25.94	27.05	28.21	29.07	31.99	32.31	35.54	36.46	38.46	42.66
	22 to 25	26.47	30.49	28.83	28.35	31.40	31.17	33.31	31.68	34.85	36.61	40.06	46.91
Hradec Králové Region	0 to 3	0.04	0.12	0.04	0.09	0.00	0.00	0.00	0.09	0.13	0.00	0.00	0.00
	4 to 6	0.50	0.12	0.27	0.16	0.21	0.45	0.30	0.24	0.12	0.18	0.18	0.24
	7 to 10	0.65	0.60	0.83	0.70	0.27	0.63	0.28	0.44	0.50	0.39	0.27	0.69
	11 to 15	1.90	2.04	1.89	2.47	1.98	1.80	1.80	2.28	2.32	2.14	1.46	1.59
	16 to 17	7.63	8.33	7.72	9.05	8.49	9.43	10.94	12.23	9.55	12.40	9.71	9.88
	18 to 21	20.67	22.64	24.40	24.94	28.87	30.41	31.57	35.68	37.61	40.74	39.61	43.06
	22 to 25	26.27	28.35	30.39	32.39	32.37	34.15	36.81	41.58	42.21	44.29	42.29	48.94
Pardubice Region	0 to 3	0.17	0.09	0.09	0.19	0.09	0.05	0.14	0.00	0.14	0.09	0.05	0.18
	4 to 6	0.92	0.49	0.76	0.75	0.69	0.24	0.42	0.38	0.19	0.25	0.55	0.86
	7 to 10	1.28	0.79	0.98	1.00	0.66	0.63	0.52	0.85	0.83	1.11	1.05	0.84
	11 to 15	3.00	2.63	2.61	2.11	2.84	2.28	1.83	2.65	2.34	3.08	2.09	2.63
	16 to 17	7.23	8.78	10.69	9.42	7.85	8.21	8.74	10.95	10.21	11.07	9.12	14.12
	18 to 21	18.15	20.51	22.37	23.80	24.52	26.90	28.98	32.24	36.11	39.29	36.35	65.12
	22 to 25	25.62	27.52	27.36	29.58	30.12	31.97	32.58	34.98	36.45	39.67	41.54	67.10
Vysočina	0 to 3	1.24	1.29	1.57	1.17	2.02	1.31	0.68	1.04	0.66	0.51	0.19	0.60
	4 to 6	2.40	1.78	1.78	1.63	0.97	1.13	1.61	1.13	0.85	1.05	0.96	1.01
	7 to 10	3.75	3.44	4.01	4.28	3.45	2.80	2.48	2.68	2.64	2.75	2.34	2.21

Region	Age												
	11 to 15	5.83	5.93	5.75	6.10	5.66	5.39	5.43	5.62	4.38	5.36	3.92	5.00
	16 to 17	11.28	10.29	9.21	10.87	11.46	12.25	10.72	13.49	14.70	15.59	13.22	14.60
	18 to 21	18.55	19.89	20.81	21.42	21.74	24.01	26.06	27.33	30.79	32.94	32.14	40.65
	22 to 25	22.82	24.56	25.65	27.93	25.84	27.72	29.77	31.62	31.30	34.21	34.90	40.44
South Moravian Region	0 to 3	0.39	0.13	0.17	0.14	0.24	0.24	0.33	0.42	0.56	0.39	0.47	0.38
	4 to 6	2.65	1.43	1.53	1.39	1.45	2.37	3.15	2.93	3.02	3.05	3.12	4.70
	7 to 10	4.67	3.95	3.73	3.26	3.72	4.27	4.33	4.75	4.88	5.13	5.01	7.61
	11 to 15	6.54	6.75	6.02	6.56	6.53	7.07	7.40	7.83	8.84	8.58	7.62	10.73
	16 to 17	11.61	11.80	12.19	12.25	11.54	13.11	13.54	15.45	15.61	18.28	16.19	21.00
	18 to 21	23.83	25.16	26.20	27.46	28.81	29.54	30.92	34.70	37.03	39.51	39.95	49.10
	22 to 25	30.88	31.25	31.43	32.66	33.96	36.14	36.58	37.79	39.76	40.94	43.19	53.74
Olomouc Region	0 to 3	0.18	0.32	0.41	0.16	0.32	0.39	0.35	0.42	0.15	0.08	0.11	0.12
	4 to 6	1.52	1.22	2.45	1.39	1.68	2.16	2.06	2.45	1.64	2.20	1.85	1,63
	7 to 10	3.69	4.33	5.19	4.93	5.83	6.50	5.77	5.03	4.64	4.55	5.60	5.96
	11 to 15	6.12	6.57	7.77	8.02	8.71	9.03	9.13	9.76	10.55	9.73	9.26	10.03
	16 to 17	11.33	12.69	12.16	14.18	14.93	14.73	15.76	16.69	18.22	18.88	20.21	25.93
	18 to 21	26.39	30.12	31.99	32.40	35.57	36.63	37.90	40.44	45.02	46.91	45.54	51.45
	22 to 25	35.29	34.53	38.21	37.99	41.23	41.67	44.49	43.64	47.45	51.46	51.39	57.59
Zlín Region	0 to 3	0.08	0.04	0.09	0.00	0.00	0.09	0.04	0.09	0.04	0.13	0.04	0.00
	4 to 6	0.30	0.28	0.16	0.16	0.16	0.22	0.12	0.06	0.36	0.41	0.58	0.68
	7 to 10	0.72	0.48	0.65	0.86	0.52	0.41	0.49	0.64	0.65	0.34	0.52	0.81
	11 to 15	1.35	1.88	1.61	1.68	2.37	1.90	1.91	2.02	2.40	2.00	1.74	2.45
	16 to 17	4.85	7.53	8.75	7.84	10.33	8.89	7.74	9.27	9.09	11.07	12.23	12.02
	18 to 21	17.89	19.24	21.76	23.18	24.12	25.57	28.48	31.60	30.30	35.93	35.82	39.35
	22 to 25	24.44	25.87	28.60	28.73	29.32	28.84	32.84	36.05	39.00	39.57	39.09	43.23
Moravian-Silesian Region	0 to 3	0.47	0.15	0.12	0.19	0.19	0.00	0.00	0.02	0.08	0.10	0.06	0,06
	4 to 6	0.73	0.42	0.33	0.42	0.28	0.13	0.14	0.14	0.14	0.17	0.28	0,40
	7 to 10	2.20	1.19	1.08	1.41	0.77	0.74	0.55	0.51	0.49	0.59	0.48	0,63
	11 to 15	4.51	3.01	3.00	3.01	2.21	2.05	1.92	1.79	2.03	2.21	2.34	2.45
	16 to 17	8.28	8.90	8.07	8.97	8.85	8.81	8.97	10.11	10.66	12.63	12.13	14.29
	18 to 21	20.69	22.37	23.71	24.67	27.40	28.81	30.69	33.33	38.00	41.88	42.02	46.76
	22 to 25	28.59	31.02	30.33	30.35	32.02	32.85	33.45	36.16	38.48	42.91	44.28	51.94
Czech Republik	0 to 3	0.30	0.23	0.26	0.25	0.27	0.19	0.17	0.20	0.19	0.14	0.14	0.16
	4 to 6	1.41	0.78	0.97	1.02	0.95	0.97	0.98	0.97	0.90	0.94	0.88	1.10
	7 to 10	2.97	2.29	2.43	2.57	2.61	2.43	2.15	2.16	2.04	2.02	1.67	2.10
	11 to 15	5.19	4.73	4.55	4.81	5.05	4.99	4.76	4.77	5.00	4.77	3.89	4.96
	16 to 17	11.05	11.64	11.63	12.11	12.80	13.00	12.24	13.20	13.85	15.34	13.24	15.94
	18 to 21	24.20	26.25	27.47	28.90	30.43	31.37	33.74	37.13	39.81	42.82	42.22	49.96
	22 to 25	31.59	33.75	34.27	35.14	35.99	36.63	38.18	40.04	42.19	45.09	46.14	53.84

Source: Own calculation according to the Czech Statistical Office and the National Portal of Psychiatric Care (2010-2021)

Czech public policy of keeping municipal utility prices: Methodological option and related aspects of efficiency

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Abstract: The social and economic shocks of 2020-2022 have a significant impact on the cost of living for ordinary people. The urban population has fewer opportunities to reduce their costs (e.g. by growing their own food or using alternative energy equipment in their yards). The government is trying to subsidise part of the costs of utilities and to put pressure on natural monopolies (where possible) to reduce the prices of municipal utilities to end users. We evaluate this policy in the cities of the Czech Republic in terms of how efficient it is compared to the world's and Europe's largest urban areas in terms of how much the end consumer overpays the utilities, ceteris paribus. Scientifically, this research contributes to the discussion on how to estimate the counterfactual effects of public policy implementation in urban areas in times of social and economic shocks (such as pandemics and conflicts) based on consumer expenditures. We find that the Czech public policy of maintaining municipal utility prices has been similarly efficient to the matched (in terms of cost of living) municipalities of the world, but Czech residents still have to pay more for utilities than in many not perfectly matched cities of the EU and the world.

Keywords: Urban policy, counterfactual evaluation, Czech Republic, municipal utilities

JEL Classification: C90, E01, E60

1 Background of the Problem

Shocks are part and parcel of economic phenomena. There have been a particularly large number of shocks between 2020 and 2022. These include the coronavirus pandemic, conflicts and many other disasters that humanity has not faced in a long time.

The state is always trying to help the economy and its citizens. The state cannot intervene directly in key economic processes in a market economy. However, it can help people meet important costs.

This article looks at one such component, the cost of utilities. In villages, people are able to grow their own food and install their own wells, pumps to bring water from the ground into the house, solar panels and wind generators, which can significantly reduce household utility costs (Lenhart et al., 2020; Mitchell & Chesnutt, 2013; Saarloos & Quinn, 2022).

In urban areas, however, these options are limited. Utilities are often provided by natural monopolies or oligopolies. The state tries to intervene in such systems to minimise the cost of utilities to the population, which may be the most efficient strategy (Homsy, 2018) [although some researchers provide evidence that remunicipalisation may be the most efficient way (Richter, 2013; Wagner et al., 2021; Wagner & Berlo, 2017)]. Utilities are also at the heart of urbanisation, as no modern city can exist without a well-developed utility management system (Peiser, 1983).

The purpose of this paper is to assess whether the Czech policy of regulating utility prices in its major cities has worked effectively during the 2020-2022 shocks, by looking at costs as elements of household consumption expenditure.

2 Research Questions

RQI: Is the public policy of keeping municipal utility prices low in the Czech Republic effective and efficient in large cities during 2020-2022 shocks?

RQII: How to implement a methodology to measure the efficiency of utility management policy based on consumer expenditures?

3 Data and Methodology

The data

The main data sources are those collected by the company Numbeo (NUMBEO, 2022). The authors carried out additional research to estimate the accuracy of these prices in certain urban areas by verifying prices online and surveying the local population. The latter part was particularly useful for estimating prices for 2022 in the full dataset.

The graph below shows the output of the first step of the analysis: the estimation of missing data. Consumer expenditure is not just on utilities, but the money saved on utilities can cover other costs (such as food, clothing, housing or beverages). It is important to estimate the cost of utilities for the final consumer in the context of other expenditures.

Figure 1 - Data availability by category
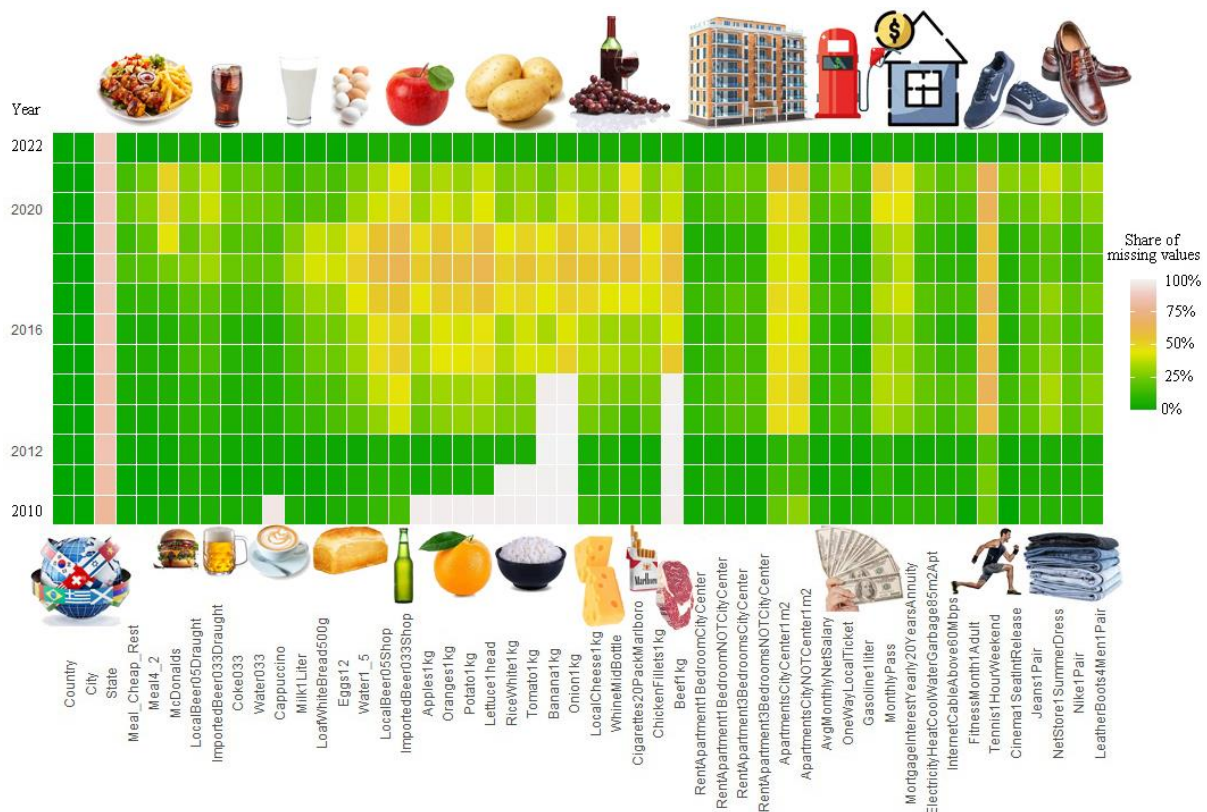
Notes: Own analysis in R

The proportion of missing values determines the colour: solid green (no missing values), light green (about 25% of missing values), yellow (about 40% of missing values), yellow-magenta (about 50% of missing values), solid magenta (about 70% of missing values), grey-magenta (about 85% of missing values), light-grey (all values missing) for each category (consumer goods).

The year indicates the year in which the data are available or missing.

All images are representative of the price columns. They are for illustrative purposes only.

The variables

Country represents the country.

City shows the level of large cities within countries.

State shows the state (for countries with federal divisions (like USA)).

Meal_Cheap_Rest - the average price of a meal in a cheap restaurant.

Meal4_2 - the average price of a meal for two in a café. McDonalds - is the price of a standard combo in McDonalds (or equivalents where McDonalds is not available).

LocalBeer05Draught - the average price of a 0.5 litre pint of local beer in a bar.

ImportedBeer0.33Shop - the average price of imported beer in a bar.

Coke0.33 - is the average price of coke in a local bar.

Water0.33 - the average price of water in a local café.

Cappuccino - is the average price of a cappuccino in a local café.

Milk1Litre - is the average price of a litre of milk in a local grocery store.

LoafWhiteBread500g - is the average price of a loaf of white bread, estimated at 0.5 kilograms in weight.

Eggs12 - is the average price of a dozen (12) eggs in a local grocery store.

Water1_5 - is the price of a bottle of water (1.5 litres) in a local supermarket.

LocalBeer05Shop - is the price of a bottle of local beer (0.5 litre equivalent) in a local supermarket.

ImportedBeer03Shop - is the price of a bottle of imported beer (0.3 litre equivalent) in a supermarket.

Apples1kg - is the average price of 1kg of apples in a local grocery store.

Oranges1kg - is the average price for 1 kg of oranges in a local grocery store.

Potato1kg - is the average price for 1 kg of potatoes in a local grocery store.

Lettuce1head - is the average price for 1 head of lettuce in a local grocery store.

RiceWhite1kg - is the average price for 1 kg of standard white rice (dry) in a local grocery store.

Banana1kg - is the average price for 1 kg of bananas in a local grocery store.

Onion1kg - is the average price for 1 kg of onion in a local grocery store.

LocalCheese1kg - is the average price for 1 kg of local cheese in a local grocery store.

WhineMidBottle - is the average price for 1 bottle of cheap wine in a local grocery store.

Cigarettes20PackMarlboro - is the average price for 1 pack ("stange") of 20 cigarettes (Marlboro or similar).

ChickenFillets1kg - is the average price for 1 kg of chicken fillets in a local grocery store.

Beef1kg - is the average price for 1 kg of beef (red meat, leg) in a local grocery store.

RentApartment1BedroomCityCenter - is the average price for renting a one-bedroom apartment in the city centre.

RentApartment1BedroomNOTCityCenter - is the average price of a one-room apartment outside the city centre.

RentApartment3BedroomCityCenter - is the average price of an apartment (with three rooms) in the city centre.

RentApartment3BedroomNOTCityCenter - is the average price of an apartment (with three rooms) outside the city centre.

ApartmentsCityCenter1m2 - is the average price per square metre for buying a standard apartment (about 85 m2) in the city centre.

ApartmentsNOTCityCenter1m2 - is the average price of one square metre for buying standard apartments (about 85 m2) outside the city centre.

AvgMonthlyNetSalary - is the average monthly net salary.

OneWayLocalTicket - is the average price of a one-way ticket on a local public transport system.

MonthlyPass - is the average price of a monthly pass for local public transport.

MortgageInterestYearly20YearsAnnuity - is the average interest rate for mortgages with a 20-year repayment period (annuity payments).

ElectricityHeatCoolWaterGarbage85m2Apt - is the average monthly price of public utilities (water, sewerage, electricity, heating, cooling, garbage and other related services) for a standard apartment (85 square metres).

InternetCableAbove60Mbps - the monthly price of an Internet cable with a speed above 60 Mbps.

FitnessMonthly1Adult - the price of a monthly fitness pass.

Tennis1HourWeekend - the price of one hour of tennis during the weekend.

Cinema1SeatIntRelease - the cost of one seat in a cinema for an international release.

Jeans1Pair - the price of one pair of jeans.

NetStore1SummerDress - the average price of a summer dress in a local net store.

Nike1Pair - the average price of a pair of Nike trainers (or equivalent) in a local net store.

LeatherBoots4Men1Pair - is the average price of a pair of business class leather boots in a local net store.

The descriptive statistics

The table below contains the descriptive statistics of the data.

Table 1 – The descriptive statistics of the data

VARIABLE	NOBS	MEAN	STD.DEV	MIN.	25 %	MEDIAN	75 %	MAX.
YEAR	5233	2017,14	3,35	2010	2015	2017	2020	2022
MEAL_CHEAP_REST	4773	10,20	5,77	0,71	5,31	10,00	14,67	46,64
MEAL4_2	4607	45,74	23,92	2,96	26,67	44,22	60,64	195,90
MCDONALDS	4162	6,89	2,52	0,67	5,14	6,75	8,10	42,96
LOCALBEER05DRAUGHT	4348	3,65	2,15	0,47	1,83	3,34	5,00	13,20
IMPORTEDBEER033DRAUGHT	4144	4,24	1,98	0,50	2,60	4,00	5,50	13,99
COKE033	4590	1,54	0,88	0,17	0,80	1,49	2,03	7,28
WATER033	4601	1,18	1,53	0,12	0,51	1,11	1,57	64,83
CAPPUCCINO	4508	2,89	1,74	0,37	1,83	2,81	3,72	64,83
MILK1LITRE	4390	1,21	0,50	0,30	0,86	1,09	1,43	6,81
LOAFWHITEBREAD500G	4129	1,58	0,94	0,13	0,80	1,42	2,20	6,86
EGGS12	4150	2,37	1,01	0,66	1,67	2,20	2,94	9,56
WATER1_5	3720	1,01	0,63	0,18	0,52	0,78	1,40	4,20
LOCALBEER05SHOP	3252	1,77	1,08	0,30	1,01	1,49	2,15	15,00
IMPORTEDBEER033SHOP	2995	2,45	1,16	0,61	1,62	2,21	2,93	11,45
APPLES1KG	3548	2,51	1,30	0,47	1,56	2,29	3,11	13,67
ORANGES1KG	3248	2,17	1,22	0,29	1,30	1,82	2,76	13,21
POTATO1KG	3320	1,36	0,90	0,18	0,65	1,15	1,84	8,46
LETTUCE1HEAD	3121	1,23	0,63	0,12	0,77	1,11	1,60	5,97
RICEWHITE1KG	3403	1,97	1,12	0,45	1,15	1,71	2,41	11,87
TOMATO1KG	3221	2,29	1,40	0,25	1,25	1,96	3,12	11,20
BANANA1KG	2654	1,58	0,61	0,39	1,19	1,48	1,86	6,79
ONION1KG	2343	1,29	0,83	0,20	0,64	1,09	1,72	6,46
LOCALCHEESE1KG	3557	9,60	4,32	0,97	6,52	8,79	11,69	39,84
WHINEMIDBOTTLE	3637	9,69	4,39	0,71	6,21	9,00	12,00	46,92
CIGARETTES20PACKMARLBORO	3463	6,15	4,38	0,65	2,91	5,00	7,84	30,98
CHICKENFILLETS1KG	3765	7,49	3,98	1,69	4,54	6,87	9,52	36,47
BEEF1KG	2319	11,82	6,72	2,48	7,87	10,55	13,99	68,01
RENTAPARTMENT1BEDROOMCITYCENTER	4757	813,17	548,23	50,67	400,00	708,29	1067,5	7418,62
RENTAPARTMENT1BEDROOMNOTCITYCENTER	4676	604,45	426,27	40,01	268,12	530,12	819,53	5287,65
RENTAPARTMENT3BEDROOMSCITYCENTER	4498	1508,81	1001,29	85,78	742,04	1304,48	1967,1	7823,41
RENTAPARTMENT3BEDROOMSNOTCITYCENTER	4539	1069,25	719,31	1,13	507,99	935,76	1409,2	6240,00
APARTMENTSCITYCENTER1M2	3169	4016,76	3785,98	2,95	1613,6	2687,93	5078,7	41433,2
APARTMENTSCITYNOTCENTER1M2	3134	2523,85	2426,64	1,54	1001,3	1646,44	3243,3	38733,1
AVGMONTHLYNETSALARY	4636	1864,04	1397,69	19,57	605,67	1593,79	2837,8	9139,96

VARIABLE	NOBS	MEAN	STD.DEV	MIN.	25 %	MEDIAN	75 %	MAX.
ONEWAYLOCALTICKET	4586	1,65	1,20	0,00	0,57	1,48	2,50	8,34
GASOLINE1LITER	4847	1,25	0,48	0,00	0,89	1,23	1,60	2,77
MONTHLYPASS	3633	53,07	33,17	0,00	25,52	50,00	75,00	237,00
MORTGAGEINTERESTYEARLY20YEARSANNUITY	3631	6,58	5,26	1,00	3,48	4,65	9,05	129,07
ELECTRICITYHEATCOOLWATERGARBAGE85M2APT	4384	136,97	70,70	6,28	79,93	133,48	181,99	503,65
INTERNETCABLEABOVE60MBPS	4628	38,30	22,76	2,99	22,35	35,24	51,43	377,91
FITNESSMONTH1ADULT	4586	44,50	21,00	5,23	30,61	39,88	52,91	205,22
TENNIS1HOURWEEKEND	2543	17,04	9,56	0,00	10,40	14,81	21,60	94,94
CINEMA1SEATINTRELEASE	4658	9,08	4,38	1,07	5,59	9,26	12,00	121,60
JEANS1PAIR	4345	66,23	26,97	8,00	44,44	62,39	84,85	233,33
NETSTORE1SUMMERDRESS	3970	41,65	14,77	7,53	32,96	38,75	46,67	250,00
NIKE1PAIR	4382	86,48	24,78	17,50	72,37	83,01	97,13	451,05
LEATHERBOOTS4MEN1PAIR	4174	95,33	34,63	18,00	73,55	92,78	113,60	454,63

Notes: Own analysis in R

Variable - name of the variable (the subchapter 'Variables' contains the detailed description of each variable name). NOBS - number of observations. MEAN - mean values. STD.DEV - standard deviation. MIN. - Minimum value. MEDIAN - Median value. MAX. - Maximum value. 25% - the first quartile. 75% - the third quartile.

Methodology

The core methodology is the difference in differences approach (Card & Krueger, 1994; Pelucha et al., 2023; Shemetev & Pelucha, 2022) so that (1):

$$Utilities_{it}^{USD} = \beta_0 + \beta_1 IfAfterTreatment_t * IfTreated_i + \beta_2 IfAfterTreatment_t + \beta_3 IfTreated_i + u_i + v_{it}$$

Notes: We estimate this model for three comparisons of prices after treatment of Czech cities with: properly matched cities (method: propensity score matching), major cities of the world, and major cities of the European Union.

Utilities - cost of utilities in current USD for Czech and other urban areas (cities). t - time; i - local territorial unit (city); $\beta 0$ - intercept; β - specific estimates of parameters; IfAfterTreatment - dummy variable that equals one if the period is within or after the treatment [implementation of utilities price-control public policy to counter the shocks in 2020-2022] (zero otherwise); IfTreated - dummy variable that equals one if specific city received the treatment [implementation of Czech utilities price-control public policy to counter the shocks in 2020-2022] (zero otherwise); If treated - dummy variable that is one if a specific region received the treatment (the Czech city), zero otherwise; u - unit-specific random error; v - idiosyncratic random error [the model uses clustered and bootstrapped random errors]. The null hypothesis: the treatment effect is insignificant relative to the price of utilities ($\beta_1 = 0$); the alternative hypothesis: the treatment effect is significant ($\beta_1 \neq 0$). The common method of Jan Zouhar and Mark Gardener for writing equations and specifying models (Gardener, 2017; Zouhar, 2022; Zouhar & Sklenicka, 2017) *is the basis for writing equations in this study.*

The PSM [paired balanced propensity score matching (PSM) estimation for the pre-treatment covariates (Holland, 1986; Quandt, 1972; Roy, 1951; Rubin, 1974)] method provided the additional dataset. The pre-treatment covariates (X) are those variables included in Table 1 and Figure 1 (except for the Y-variable, and Tennis1HourWeekend [few data]) so that:

$$\begin{cases} Y_{CZ} = \mu_{CZ}(X) + U_{CZ} \\ Y_{Not\_CZ} = \mu_{Not\_CZ}(X) + U_{Not\_CZ} \end{cases} \tag{2}$$

Notes: Y_{CZ} denotes the potential outcome of being a CZ-compliant city in terms of consumer prices of basic goods (within the mentioned pre-treatment covariates); Y_{Not_CZ} – is a potential outcome of not being a CZ-compliant city. μ represents the general non-linear mechanism for generating data based on the pre-treatment covariates (X). U represents random errors for the two different types of cities. The result of this function is then balanced by picking up the cities similar to those in CZ that have the higher propensity to be estimated as equivalent to Czech (CZ) cities based on the statistical distance estimated by the GLM function in R based on the X covariates [matchit function from the MatchIt package, which includes the recent proposals to improve the robustness of the method (Ho et al., 2007)]. This creates a dataset with an equal number of cities in the Czech Republic and the municipalities closest to them in terms of the cost of living of their inhabitants.

Equation (2) creates the data set for further estimation by equation 1.

4 Results

Table 2 shows the main results of this research.

Table 2 - The results of the DiD regressions

```
===============================================================================
                                               Dependent variable:
                          -----------------------------------------------------
                                    ElectricityHeatCoolWaterGarbage85m2Apt
                             (1)                  (2)                  (3)
-------------------------------------------------------------------------------
IfCZTreated                -18.83              28.39***             -11.40**
                          (24.28)               (5.32)               (5.52)

IfAfterTreatment           -3.94               10.39***             18.32***
                          (29.46)               (2.26)               (3.52)

IfCZTreated:IfAfterTreatment 50.62             38.70***             30.78***
                          (31.19)               (8.56)               (8.98)

Constant                  184.14***            134.51***            174.29***
                          (23.01)               (1.17)               (1.85)


-------------------------------------------------------------------------------
Object      Perfectly matched (PSM) cities (EU)  World Cities  Cities of EU (2022 members)
Observations                58                   5,128                1,411
R2                          0.07                 0.01                 0.03
Adjusted R2                 0.02                 0.01                 0.02
Residual Std. Error    60.95 (df = 54)      71.18 (df = 5124)     57.72 (df = 1407)
F Statistic         1.46 (df = 3; 54) 14.22*** (df = 3; 5124) 12.33*** (df = 3; 1407)
===============================================================================
Note:                                        *p<0.1; **p<0.05; ***p<0.01
```

Notes: Own elaboration in R

The dependent variable (Y) is the price of utilities (common price for water, electricity, cooling, garbage collection and related costs for a standard 85 m2 dwelling) expressed in current USD.

Equation (1) uses the perfectly matched cities in a balanced dataset (the imbalance ratio is 1.03% [0.00% would mean a perfectly balanced dataset] in favour of the control group, due to the unavailability of some data on prices in Plzen (CZ) for several observations). These cities are Prague (CZ), Brno (CZ), Olomouc (CZ), Ostrava (CZ), Plzen (CZ) vs. Bratislava (SK), Braga (PT), Cluj-Napoca (RO), Dresden (DE), Poznan (PO).

Equation (2) compares the Czech cities (Prague, Brno, Olomouc, Ostrava and Plzen (5 Czech Cities)) vs. 520 of the world's largest cities in 129 countries.

Equation (3) compares the Czech cities (Prague, Brno, Olomouc, Ostrava and Plzen) vs. 149 largest cities of the European Union in 25 countries other than the Czech Republic. These countries are: "Austria", "Belgium", "Bulgaria", "Croatia", "Cyprus", "Denmark", "Estonia", "Finland", "France", "Germany", "Greece", "Hungary", "Ireland", "Italy", "Latvia", "Lithuania", "Luxembourg", "Malta", "Netherlands", "Poland", "Portugal", "Slovakia", "Slovenia", "Spain", "Sweden" (+1 "Czech Republic" is in a different (treated) category).

Annex I shows the table of core price parameters for world cities by categories compared to the Czech Republic on an analogue of Table 1 (data cut: 2022 [Table 2 has after treatment period between 2020-2022 as the policy changes were sudden since the first wave of pandemics (spring-summer 2020) until the very 2022]).

Annex II shows the DiD analysis of the policy in the form of a graph in USD and percentage (5 largest cities in the Czech Republic vs. 149 EU cities).

Utilities are USD 38.7 more expensive in Czech cities than in global cities (for a standard 85 square metre apartment). This may be the result of third factors such as: cheaper labour (e.g. Cairo), cheap resources for utilities (e.g. Lagos), and other factors not directly related to regional or municipal policies.

In addition, Czech cities offer USD 30.78 more expensive utilities than major EU cities. It may also be the result of third factors such as: cheaper labour (as in Sofia), having a port (as in Lisbon), having cheap water or thermal energy (as in Reykjavik (non-EU) or Budapest (Todorović, 2021)), transaction costs for spending in non-euro currencies, and other factors not directly influenced by municipal and regional policies.

Therefore, the results of the first equation (1) provide a clear perspective on whether the Czech policy of subsidising utility costs and influencing local natural monopolies is efficient. It represents cities perfectly matched to those in the Czech Republic (selected by the PSM method from among 520 largest cities in the world in terms of similarity of consumer prices for common goods). It shows that the extra costs of Czech cities compared to similar cities are statistically insignificant, which means that Czech policy is quite effective. Of course, it could be even more efficient if prices were significantly lower, but keeping the price level at the same level as the matched cities is an effect (no additional negative effect of the policy for consumers in terms of prices).

4 Discussion

The core method of estimating the efficiency of any business is to compare its inputs with its outputs (Isard, 1962). This method is widely used in finance (Brealey et al., 2020). Several researchers have attempted to apply this approach to the efficiency of utilities and public policies (Richter, 2013; Wagner et al., 2021). It is sensible, if somewhat narrow, as the mass of the population is more interested in lower prices for them than in the highest corporate profits. They tend to judge the efficiency of public policy by how much money is left in their pockets (for their families) after all utility bills are paid (Doepke & Zilibotti, 2019).

Another approach is to look at how people use municipal utilities. For example, a statistically well-justified study on this issue (Mitchell & Chesnutt, 2013) estimates efficiency by how much water, energy and other materials households can save from their consumption. This approach is extremely important and correct in all respects, but the economic incentives other than the money saved from reduced resource consumption are beyond the scope of these studies.

The third approach derives from Peiser's (1983) seminal research comparing income (Y) with municipal utility prices. At the same time, this approach doesn't go deeper to see the efficiency of public policy by looking at the price of utilities, since public authorities can support lower prices for utilities, but cannot directly influence the incomes of the general population (except for those they directly employ).

In addition, the research follows the recommendation for the Czech Republic (Stastna, 2009) to study public spending on infrastructure (and utilities) separately for each municipality (in our case urban area).

The limitation of this research is the omission of the discussion of contracting principles to reduce the costs for the population (while possibly increasing the costs for local authorities) (Soukopová et al., 2017).

As shown in Annex II, the utility prices in the Czech Republic (in terms of what many final consumers pay out of their own pockets) become about +20% [+USD 31-32] above the EU prices [149 cities] by 2022 (although they were lower than the EU in the pre-treatment period (2010-2019)). However, if we look at this situation differently, we can select a perfect EU pair [5 cities] (in terms of the total price vector) for each large Czech city [5 largest Czech cities], and, in this case, the difference is not statistically significant ($p>0.1$ [Table 2, Equation 1]). This means that some other factors (such as geographical location or infrastructure) could increase the prices of utilities in the Czech Republic. In this sense, the Czech policy was efficient (as it did not lead to additional price increases compared to the cities most similar to the largest Czech cities).

5 Conclusion

We thus offer a new methodology for estimating efficiency based on expenditure that people pay out of their pockets (in our case for utilities). Although the DiD and PSM statistical identification strategies are not a new approach, - their implementation in the new domain (estimating public policy on utility prices in cities) is a novelty of this research.

Another novelty of this research is the approach to estimating the efficiency of public policy in keeping the prices of utilities in cities lower by comparing the costs of these utilities with the costs in similar cities (found by PSM on the basis of non-utility prices).

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Table 3. The data cut of the final state of affairs for the main prices in different cities of the Czech Republic vs. other cities **in 2022**, current USD

VARIABLE	5 CZ CITIES		MATCHED 5 EU		149 EU CITIES		520 WORLD CIT.	
	MEAN	STD.DEV.	MEAN	STD.DEV.	MEAN	STD.DEV.	MEAN	STD.DEV.
YEAR	2022	0	2022	0	2022	0	2022	0
MEAL_CHEAP_REST	7,9	0,9	8,1	0,8	13,4	3,8	11,7	6,6
MEAL4_2	37,8	3,6	40,9	7,2	59,1	18,0	53,6	25,6
MCDONALDS	7,0	0,2	7,0	1,2	8,7	1,7	7,7	2,6
LOCALBEER05DRAUGHT	2,0	0,2	2,5	1,0	4,3	1,7	4,0	2,3
IMPORTEDBEER033DRAUGHT	2,1	0,2	3,1	0,5	4,2	1,5	4,6	2,1
COKE033	1,5	0,2	1,9	0,7	2,3	0,8	1,7	0,9
WATER033	1,2	0,1	1,5	0,5	1,7	0,7	1,3	0,8
CAPPUCCINO	2,5	0,3	2,4	0,9	2,8	1,0	3,1	1,2
MILK1LITRE	1,0	0,1	1,0	0,2	1,2	0,3	1,3	0,6
LOAFWHITEBREAD500G	1,3	0,1	1,1	0,1	1,7	0,6	1,7	1,1
EGGS12	2,2	0,1	2,6	0,2	3,0	0,6	2,7	1,0
WATER1_5	0,6	0,1	0,7	0,1	0,8	0,3	1,0	0,6
LOCALBEER05SHOP	0,8	0,1	1,0	0,1	1,5	0,8	1,9	1,1
IMPORTEDBEER033SHOP	1,5	0,3	1,4	0,1	2,0	0,7	2,6	1,2
APPLES1KG	1,6	0,1	1,5	0,5	2,1	0,6	2,7	1,4
ORANGES1KG	1,9	0,2	1,8	0,5	2,0	0,6	2,4	1,3
POTATO1KG	0,8	0,1	1,1	0,4	1,4	0,5	1,6	1,0
LETTUCE1HEAD	1,2	0,2	1,1	0,3	1,3	0,4	1,3	0,7
RICEWHITE1KG	2,0	0,1	1,5	0,3	2,0	0,5	2,2	1,3
TOMATO1KG	2,8	0,3	2,5	0,7	2,6	0,8	2,6	1,5
BANANA1KG	1,5	0,0	1,5	0,2	1,8	0,4	1,6	0,6
ONION1KG	0,8	0,1	0,9	0,2	1,2	0,4	1,5	0,9
LOCALCHEESE1KG	10,5	0,9	9,5	1,8	11,7	3,2	10,5	4,5
WHINEMIDBOTTLE	6,0	1,0	5,5	0,8	6,8	2,1	9,7	4,3
CIGARETTES20PACKMARLBORO	5,9	0,2	5,6	1,6	6,8	2,5	7,1	4,9
CHICKENFILLETS1KG	7,6	0,5	6,4	1,4	8,7	2,2	8,1	4,0
BEEF1KG	11,1	1,0	11,7	1,4	15,0	4,7	13,4	7,5
RENTAPARTMENT1BEDROOMCITYCENTER	646,8	171,1	595,1	90,9	827,9	330,8	900,0	658,8
RENTAPARTMENT1BEDROOMNOTCITYCENTER	503,3	119,1	466,4	84,7	645,5	269,7	685,5	521,6
RENTAPARTMENT3BEDROOMSCITYCENTER	1041,6	375,4	1039,8	209,8	1469,2	610,8	1625,2	1071,6
RENTAPARTMENT3BEDROOMSNOTCITYCENTER	845,1	216,9	755,0	142,3	1090,8	450,3	1175,7	810,7
APARTMENTSCITYCENTER1M2	4563,4	2036,2	3542,5	1237,4	4596,2	2419,3	4251,0	3719,3
APARTMENTSCITYNOTCENTER1M2	3504,6	1246,3	2496,1	1066,5	3147,3	1681,5	3003,3	3101,9
AVGMONTHLYNETSALARY	1457,6	126,5	1374,8	702,8	2028,3	960,1	2041,2	1579,6
ONEWAYLOCALTICKET	1,0	0,2	1,4	0,9	2,1	0,9	1,6	1,1
GASOLINE1LITRE	1,8	0,0	1,8	0,2	1,9	0,2	1,5	0,5
MONTHLYPASS	21,6	3,3	35,8	20,0	52,6	25,7	49,1	31,4
MORTGAGEINTERESTYEARLY20YEARSANNUITY	5,1	0,5	3,5	2,2	2,9	1,5	6,6	7,2
ELECTRICITYHEATCOOLWATERGARBAGE85M2APT	231,9	24,3	183,8	78,3	202,0	63,9	157,0	81,0
INTERNETCABLEABOVE60MBPS	21,3	3,3	23,6	12,3	32,8	11,2	39,0	24,0
FITNESSMONTH1ADULT	44,8	3,4	36,4	3,1	40,4	10,6	42,0	18,2
TENNIS1HOURWEEKEND	13,2	1,5	16,7	6,4	19,8	7,9	18,7	10,0
CINEMA1SEATINTRELEASE	8,6	0,4	8,0	2,0	10,5	3,1	9,5	4,2
JEANS1PAIR	83,7	6,6	79,2	8,5	84,2	14,4	64,5	23,5
NETSTORE1SUMMERDRESS	37,6	3,2	36,6	4,9	36,3	6,6	39,2	12,2
NIKE1PAIR	85,5	4,9	78,6	10,5	85,7	12,6	86,1	22,5
LEATHERBOOTS4MEN1PAIR	100,2	11,0	93,2	27,2	109,4	25,2	98,3	34,4
N CITIES (2022)	5		5		149		517	

Notes: Own work in R using the alexandershemetev package (Shemetev, 2020). All abbreviations correspond to Table 1 and notes under Figure 1.

CZ - five largest Czech cities;
Matched - five world cities with maximum propensity score matching (before treatment) with the five largest Czech cities.
EU - largest cities in the European Union (excluding the Czech Republic, which is in the first row).
World - largest cities in the world (excluding the Czech Republic - it is in the first row).

Figure 2. DiD results of the 5 Czech cities vs. 149 EU cities (prices of utilities for 85m^2 app.)

Current USD   **Percentage**
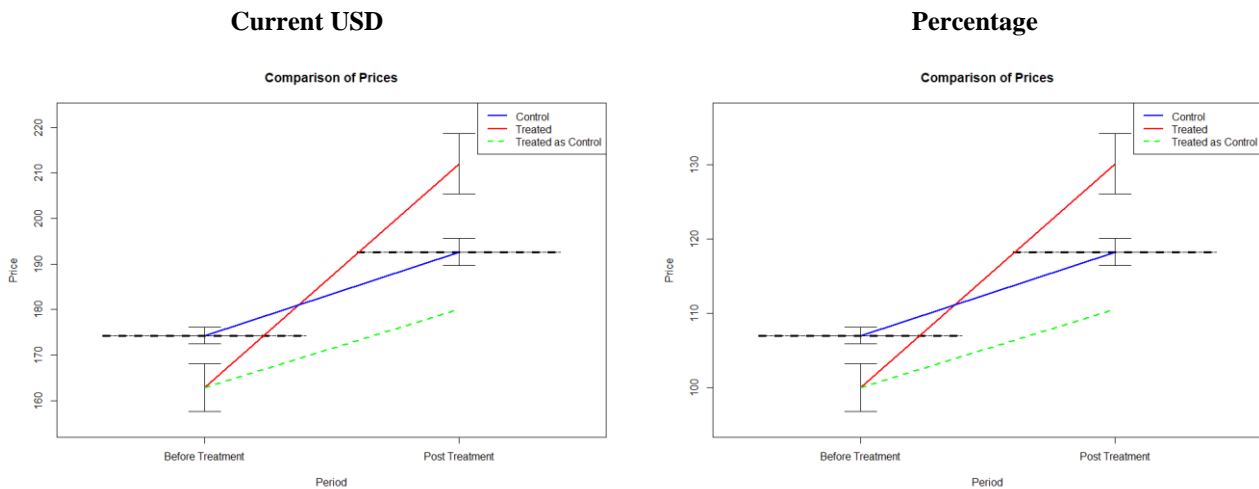
Notes: Own work in R (the R base plotting). The pre-treatment period is 2010-2019; the post-treatment period is 2020 [rapid policy impact during the first two waves of the pandemic] - 2022.

The red line ("**Treated**") represents the actual increase in the price of utilities in the Czech Republic that citizens will have to pay out of their own pockets (5 largest Czech cities).

The blue line ("**Control**") is the actual increase in the price of utilities that EU citizens (excluding the Czech Republic) will have to pay out of their own pockets (149 EU cities).

The black 'I' shapes represent the confidence intervals for the treated and control groups at each period, estimated graphically for better representation by the SEM method (CFA Institute, 2022, pp. 384–386) [Standard Error of the Mean (SEM) = standard deviation divided by the square root of the sample size].

The green dotted line ("**Treated as Control**") represents the potential trend in the Czech Republic if the dynamics were similar to those in the EU. The difference between the "**Treated**" line and the "**Control**" line in the post-treatment period represents an effect of about USD 31-32 (20% above the EU in the Czech Republic's base prices in the pre-treatment period). Equation (3) in Table 2 shows the significance and more precise magnitude of this effect.

This plot looks like the Czech Republic has become more expensive. But it is not the fault of politics, we suggest. The reason may be the internal disadvantages of the Czech Republic in the face of the energy crisis (such as geographical location, disruption of supply chains, etc.).

The propensity score matching method (table 2, eq. 1) shows that Czech policy has the same efficiency as the perfectly matched cities from abroad. In this sense, Czech policy is efficient.

Annex III. Global list of 525 research cities

This research applies to the next cities: Aachen, Aalborg, Aberdeen, Abidjan, Abu Dhabi, Accra, Ad Dammam, Adana, Addis Ababa, Adelaide, Agadir, Ahmedabad, Al Khobar, Albuquerque, Alexandria, Algiers, Alicante, Almaty, Amman, Amsterdam, Anchorage, Ankara, Antalya, Antwerp, Arhus, Astana (Nur-Sultan), Asuncion, Athens, Atlanta, Auckland, Austin, Aveiro, Baghdad, Baku, Baltimore, Bandung, Bangalore, Bangkok, Banja Luka, Barcelona, Bari, Barranquilla, Basel, Batumi, Beijing, Beirut, Belfast, Belgrade, Belo Horizonte, Bergamo, Bergen, Berlin, Bern, Bhopal, Bhubaneswar, Bialystok, Bilbao, Birmingham, Bishkek, Bogota, Boise, Bologna, Bonn, Boston, Bournemouth, Braga, Brampton, Brasilia, Brasov, Bratislava, Breda, Bremen, Brescia, Brighton, Brisbane, Bristol, Brno, Brussels, Bucaramanga, Budapest, Budva, Buenos Aires, Buffalo, Bucharest, Burgas, Bursa, Cagliari, Cairo, Calgary, Cali, Cambridge, Campinas, Canberra, Cancun, Cape Town, Caracas, Cardiff, Casablanca, Cascais, Catania, Cebu, Cincinnati, Cleveland, Cluj-Napoca, Coimbatore, Coimbra, Cologne, Colorado Springs, Columbus, Constanta, Copenhagen, Cork, Coventry, Craiova, Cuenca, Dakar, Dallas, Damascus, Dar es Salaam, Debrecen, Delhi, Denver, Derby, Detroit, Dhaka, Dnipro, Doha, Dortmund, Dresden, Dubai, Dublin, Dubrovnik, Dundee, Durban, Edinburgh, Edmonton, Eindhoven, Enschede, Erbil (Irbil), Eskisehir, Espoo, Essen, Exeter, Faisalabad, Florence, Florianopolis, Fort Lauderdale, Fort Worth, Frankfurt, Fredericton, Freiburg im Breisgau, Fresno, Funchal, Gaborone, Galway, Gdansk, Gdynia, Geneva, Genoa, Gent, George Town, Georgetown, Giza, Glasgow, Gold Coast, Gothenburg, Granada, Graz, Grenoble, Groningen, Guadalajara, Guangzhou, Guatemala City, Guayaquil, Guildford, Gurgaon, Guwahati, Haarlem, Haifa, Halifax, Hamburg, Hamilton, Hangzhou, Hanoi, Hanover, Harare, Havana, Heidelberg, Helsinki, Heraklion, Ho Chi Minh City, Hobart, Hong Kong, Honolulu, Houston, Hyderabad, Chandigarh, Charlotte, Chattanooga, Chengdu, Chennai, Chiang Mai, Chicago, Chisinau, Chittagong, Christchurch, Iasi, Indianapolis, Indore, Innsbruck, Irvine, Isfahan (Esfahan, Islamabad, Istanbul, Izmir, Jacksonville, Jakarta, Jeddah (Jiddah), Jerusalem, Johannesburg, Kaliningrad, Kamloops, Kampala, Kansas City, Kaohsiung, Karachi, Karlsruhe, Kathmandu, Kaunas, Kazan, Kelowna, Kharkiv, Khartoum, Kiev (Kyiv), Kigali, Kingston, Kitchener, Klaipeda, Knoxville, Kocaeli, Kochi, Kolkata, Konya, Kosice, Krakow (Cracow), Krasnodar, Kuala Lumpur, Kuching, Kuwait City, La Paz, Lagos, Lahore, Larissa, Larnaca, Las Palmas de Gran Canaria, Las Vegas, Lausanne, Leeds, Leicester, Leipzig, Leiria, Leuven, Lima, Limassol, Limerick, Linz, Lisbon, Liverpool, Ljubljana, Lodz, London, Los Angeles, Louisville, Louisville", Lublin, Lucknow (Lakhnau), Lund, Luxembourg, Lviv, Lyon, Maastricht, Macao, Madison, Madrid, Makati, Malaga, Male, Malmo, Manama, Manchester, Manila, Mannheim, Maribor, Marrakech, Marseille, Mashhad, Melbourne, Memphis, Merida, Mersin, Mexico City, Miami, Milan, Milwaukee, Minneapolis, Minsk, Mississauga, Monterrey, Montevideo, Montreal, Moscow, Multan, Mumbai, Munich, Muscat, Nagoya, Nairobi, Nanaimo, Nanjing, Nantes, Naples, Nashville, Nassau, Navi Mumbai, Netanya, New Orleans, New Taipei City, New York, Newcastle upon Tyne, Nice, Nicosia, Nijmegen, Nis, Nizhny Novgorod, Noida, Norwich, Nottingham, Novi Sad, Novosibirsk, Nuremberg, Oakland, Odense, Odessa (Odesa), Oklahoma City, Olomouc, Omaha, Oradea, Orlando, Osaka, Osijek, Oslo, Ostrava, Ottawa, Oviedo, Oxford, Padova, Palermo, Palma de Mallorca, Pamplona, Panama City, Paphos, Paris, Parma, Patna, Pattaya, Penang, Perm, Perth, Peshawar, Petah Tikva, Petaling Jaya, Philadelphia, Phnom Penh, Phoenix, Phuket, Pittsburgh, Plovdiv, Plymouth, Plzen, Podgorica, Port of Spain, Portland, Porto, Porto Alegre, Portsmouth, Poznan, Prague, Pretoria, Pristina, Puebla, Puerto Vallarta, Pune, Qingdao, Quebec City, Queretaro (Santiago de Querétaro), Quezon City, Quito, Rabat, Raleigh, Ramallah, Ramat Gan, Rawalpindi, Reading, Recife, Red Deer, Regina, Reno, Reykjavik, Riga, Richmond, Rijeka, Rio de Janeiro, Riyadh, Rome, Rostov-na-donu, Rostov-on-Don, Rotterdam, Sacramento, Saint Helier, Saint Louis, Saint Petersburg, Salt Lake City, Salzburg, Samara, San Antonio, San Diego, San Francisco, San Jose, San Juan, San Salvador, Santa Barbara, Santa Cruz, Santa Cruz de Tenerife, Santiago, Santo Domingo, Sao Jose dos Campos, Sao Paulo, Sarajevo, Saskatoon, Seatlle, Seoul, Seville (Sevilla), Shanghai, Sharjah, Sheffield, Shenzhen, Shiraz, Sibiu, Singapore, Skopje, Sliema, Sofia, Southampton, Split, Spokane, Stavanger, Stockholm, Stuttgart, Surabaya, Surrey, Suva, Suzhou, Sydney, Szczecin, Szeged, Taipei, Tallinn, Tampa, Tampere, Tangier, Tartu, Tashkent, Tbilisi, Tehran, Tel Aviv-Yafo, The Hague (Den Haag), Thessaloniki, Thiruvananthapuram, Tijuana, Timisoara, Tirana, Tokyo, Toronto, Toulouse, Trento, Treviso, Trieste, Tripoli, Tromso, Trondheim, Tunisia, Turin, Turku, Tuzla, Ufa, Ulaanbaatar, Uppsala, Utrecht, Vadodara, Valencia, Valletta, Vancouver, Varna, Verona, Victoria, Vienna, Vigo, Vilnius, Vladivostok, Voronezh, Warsaw, Washington, Wellington, Windhoek, Windsor, Winnipeg, Wroclaw, Yangon, Yekaterinburg, Yerevan, Zadar, Zagreb, Zaragoza (Saragossa), Zug, Zurich

The Comparison of Housing Affordability

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Abstract: The paper is focused to the comparison of housing affordability in Czech Republic, Slovakia, Austria, Germany and Poland. There are in the paper searched data from real estate market. The three partial house affordability indicators were included into the summarize method. There was created HEX index, which describe the housing affordability in selected countries. The aim of the paper is to find out what is the level of housing affordability in comparison to other countries involved into the research. There were set two hypothesis. The results of the research is that Czech Republic is still the country with the worst housing affordability in comparison to other comparative countries. Using of HEX indicator there was find out, the housing affordability is stil decreasing in the three comparative countries, while in other two countries (Czech Republic and Austria) is increasing.

Keywords: Housing Affordability, Real Estate Market, House Prices

JEL Classification: R30, P50

1 Introduction

The affordability of housing is an important topic of the present time (Baker, Mason and Bentley, 2015; Wetzstein, 2017; Ryšavý, 2021; Kašík and Slavata, 2018). Housing affordability broadly refers to the housing costs, both for renters and owner occupiers, relative to a given individual's or household's disposable income, mainly in the percentage (Bieri, 2014, CECODHAS, 2012). The most common notion of affordable housing implies that households that spend more than 30% of their gross income to obtain adequate and appropriate housing have an affordability problem, see Paris (2007). According to definition of Eurostat (Eurostat, 2021), a household is considered "overburdened" when the total housing costs represent more than 40 % of disposable income, where housing costs include mortgage or housing loans interest payments for owners and rent payments for tenants. For example, in 2020, 7.8 % of the EU population spent 40 % or more of their household disposable income on housing (Eurostat, 2020). Over the past couple of decades, housing affordability has become one of the most pressing challenges, especially in cities, where house prices have often outpaced national averages (OECD, 2021). Despite constant efforts from the governments to meet the increasing need for housing, many low- and middle-income households are getting priced out of cities (Czischke and van Bortel, 2018).

The paper is focused on the evaluation of housing affordability in the Czech Republic, Slovakia, Germany, Poland and Austria. The aim is the comparison of the situation in the five countries according to the selected housing indicators and calculated housing affordability index HEX (Housing efficiency index). The affordability of housing in the Czech Republic has long been one of the worst in comparison with European countries. This follows from the scientific study "Property Index - Overview of European Residential Markets", see Deloitte (2021). Property index analyses factors shaping the residential real estate markets in Europe and compares residential property prices across selected European countries and cities. This index has been monitored annually for the last ten years. The analysis in the presented paper will be made with regard to national differences. The Czech Republic was evaluated as the worst among European countries. The paper is focusing the issue at the national level and is comparing the housing affordability in total of the five countries.

1.1 Real Estate Markets of Selected Countries

The real estate market of selected countries due to the housing affordability can be characterized by the data as flat price, year rent, personal year income and housing supply. The table 1 presents the basic indicators of the five selected countries. As it is seen from Eurostat, the highest year annual personal income was indicated in Austria (48 317,- EUR). The lowest annual income in 2021 was reached in Poland (14 431 EUR). The annual income of 2021 is the latest number, which is available in Eurostat statistics. The population is presented in third column. Germany is the country with the highest population.

Table 1 – Basic indicators

Country	Annual Income 21	Population 23
Slovakia	16 162	5 434 000
Poland*	14 431	37 940 000
Austria	48 317	8 857 000
Germany	44 404	84 270 625
Czechia**	18 189	10 533 000

Source: Eurostat 2023, *Exchange rate 4,4661 PLN/EUR, ** Exchange rate 23,605CZK/EUR

The flat prices are in the table 2 shown. There is the price per m^2 presented. The table 2 presents the average prices of the three years. There is seen trend in last three years. The four countries Slovakia, Poland, Austria and Czechia had indicated price increase between 2022 and 2021. In Germany the prices had dropped in the same period. The year 2023 indicates drop of prices in three countries (Slovakia, Poland and Czechia) in comparison to 2022. In Germany and Austria there was the price increase indicated.

Table 2 – Flat prices per m^2 in EUR

Country	Flat price 21 / m^2	Flat price 22 / m^2	Flat price 23 / m^2
Slovakia	2 874	3 354	3 251
Poland*	2 025	2 383	2 238
Austria	7 410	7 313	8 346
Germany	6 069	6 815	6 851
Czechia**	3 083	3 091	2 818

Source: www.trzniceny.cz, www.otodom.pl, www.nehnutelnosti.sk, www.immobilienscout24.at, www.immobilienscout24.de, 2023, *Exchange rate 4,4661 PLN/EUR, ** Exchange rate 23,605CZK/EUR

The table 3 presents year rent per m^2 in last three years. In comparison to table 2 where the prices of flats dropped in some countries, the rents has consistently increased since 2021 or in case of Austria, stayed on the same level.

Table 3 – Rents per m^2 in EUR

Country	Rent year 21 / m2	Rent year 22 / m2	Rent year 23 / m2
Slovakia	109	139	144
Poland*	109	147	164
Austria	191	166	191
Germany	111	125	161
Czechia**	132	138	143

Source: www.trzniceny.cz, www.otodom.pl, www.nehnutelnosti.sk, www.immobilienscout24.at, www.immobilienscout24.de, 2023, *Exchange rate 4,4661 PLN/EUR, ** Exchange rate 23,605CZK/EUR

The total flats supply is in table 4 presented. Number of apartments was recorded from real estate servers shown down the table. In the table there are presented the flats for sale and flats for rent together.

Table 4 – Flats supply

Country	Flats supply 21	Flats supply 22	Flats supply 23
Slovakia	20 848	14 409	25 859
Poland	160 742	151 946	161 910
Austria	42 142	40 061	48 568
Germany	124 888	110 585	146 864
Czechia	17 878	19 206	24 876

Source: www.trzniceny.cz, www.otodom.pl, www.nehnutelnosti.sk, www.immobilienscout24.at, www.immobilienscout24.de, 2023.

There is seen in the table 4 the increase of supply between 2021 and 2022, which could indicate the increase of physical affordability of flats.

2 Material and Methods

The aim of this paper is to find out the level of housing affordability of Czech Republic in comparison of Slovakia, Germany, Poland and Austria according to the selected housing indicators. There will be evaluate the level of housing affordability by using of calculated housing affordability index HEX. The comparison is made at the national level of the selected countries.

Two hypotheses are established as part of the presented research.

Hypothesis H1 is as follows: Housing affordability in Czech Republic is on average lower than in other compared countries.

Hypothesis H2 is as follows: Housing affordability is decreasing in all of searched countries.

H1 is based on the claim that the affordability of housing in the Czech Republic is one of the worst in European countries (Deloitte, 2021). H2 is based on the claim that the affordability of housing in European countries has been decreasing in recent years (OECD, 2021). On the basis of these two presented hypotheses, it will be verified whether similar tendencies are clear at the state level.

2.1 Model and Data

There are several approaches how to measure the housing affordability (Anacker, 2019 or Czischke and van Bortel, 2018). The main stream compares financial housing affordability. It simply compares ratios of financial index numbers. The most used indicator is income to price ratio or income to rent ratio (Bieri, 2014). The second stream of measuring housing affordability compares physical affordability. Generally, it answers the question how many flats are built or how many flats there are in the economy (URI, 2022). To use separate indicators of housing affordability it may not provide the objective view for the problem. We will try to develop new methodology in the field of housing affordability.

The new evaluation methodology which is presented in this paper valuates the housing affordability more complexly. It includes three basic indicators financial and physical. The indicators are IR (income to rent), IP (income to price), FS (flats for sale and rent per 1 inhabitant). Individual indicators are compared with each other when they are plotted on the axes, where the contents of the cube defines the level of housing affordability. Mutual interaction between indicators is clearly shown on the next Figure 1.

Figure 1 - The methodology of linking housing affordability indicators
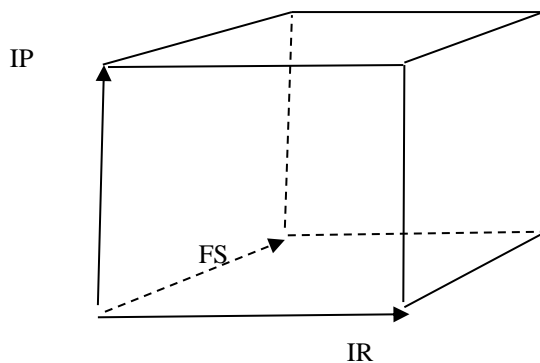
Source: Own methodology

The indicators are set logical. The higher the value of the indicator, the better the affordability of the housing. The contents of the cube (HEX) express complex level of housing affordability in the selected state. The higher the contents of the cube done by the partial indicators, better the level of housing affordability. The calculation of HEX is made according to the formula (1):

$$HEX = FS \times IR \times IP \tag{1}$$

where

FS…………   Flats for sale and for rent per 1000 inhabitants
IP…………..   Income to price ratio
IR…………..   Income to rent ratio

The calculation of FS, IP and IR ratio is summarised in following formulas (2), (3) and (4):

$$FS = (Fr + Fs) / Inh. \tag{2}$$

where

Fr………….. Flats for rent in the housing market
Fs………….. Flats for sale in the housing market
Inh. ………… Population of state

$$IP = I / P \tag{3}$$

where

P……………… Average flat price per m2
I……………… Average year personal income

$$IR = I / R \tag{4}$$

where

R…………… Average year rent per m2
I…………… Average year personal income

The above indicators will be compared in the presented research together with the values of Czech Republic, Poland, Slovakia, Austria and Germany. The data has been collected from real estate portals continuously since the year 2021.

As the main source of data describing Czech real estate market was used the internet analytical portal www.trzniceny.cz (Trzniceny, 2021, 2022, 2023). The data describing Polish real estate market were obtained from portal www.otodom.pl (Otodom, 2021, 2022, 2023). The data describing Slovak real estate market were obtained from portal www.nehnutelnosti.sk (Nehnutelnosti 2021, 2022, 2023). The data describing Austrian real estate market were obtained from portal www.immobilienscout24.at (Immobilienscout24 2021, 2022, 2023). The data describing German real estate market were obtained from portal www.immobilienscout24.de (Immobilienscout24 2021, 2022, 2023). The data included the information about flat prices, rent prices and sum of flats for sale and for rent. The other needed data were obtained from official pages of Eurostat (Eurostat 2023). Especially the information describing the level of salaries in the five countries. The analysis corresponds to the situation on real estate market as of June 2021, June 2022, June 2023.

3 Results and Discussion

In the next tables there are the results of research presented. The tables 5, 6, 7 present partial results, while the table 8 provides the complex results in each country. The I/P ratio is the most general indicator which shows the level of housing affordability. In general the indicator level of I/P ratio is between 4,97 to 6,48 in the shown countries. Only in the Czech Republic the level of housing affordability has increased since 2021 (5,90 – 6,45). In other countries the housing affordability has decreased since 2021.

Table 5 – Development of I/P ratio within 2021 and 2023

Country	I/P 21	I/P 22	I/P 23
Slovakia	5,62	4,82	4,97
Poland	7,13	6,06	6,45
Austria	6,52	6,61	5,79
Germany	7,32	6,52	6,48
Czechia	5,90	5,88	6,45

Source: own calculations

IR ratio is in the table 6 shown. The IR ratio is presents rental affordability. It is clear from the table 6 the rental affordability has dropped since 2021 in all the countries except of Austria, where the affordability has frozen. The drop of the indicator caused the increase of rental demand during the Ukrainian crisis and the increase of mortgage interest in European countries.

Table 6 – Development of I/R ratio within 2021 and 2023

Country	I/R 21	I/R 22	I/R 23
Slovakia	148,28	116,27	112,24
Poland	132,39	98,17	87,99
Austria	252,97	291,07	252,97
Germany	400,04	355,23	275,80
Czechia	137,80	131,80	127,20

Source: own calculations

The table 7 presents physical affordability of apartments. It shows how many flats per inhabitant are available on the real estate market. Its clear the physical affordability has increased in all the shown countries.

Table 7 – Development of FS ratio within 2021 and 2023

Country	P/F 21	P/F 22	P/F 23
Slovakia	0,0038	0,0027	0,0048
Poland	0,0042	0,0040	0,0043
Austria	0,0048	0,0045	0,0055
Germany	0,0015	0,0013	0,0017
Czechia	0,0017	0,0018	0,0024

Source: own calculations

The HEX index summarize the partial housing affordability indicators. The result value of the indicator is shown in the table 8. As higher number of HEX as better the housing affordability in the country. It is shown in the table in the three of countries there has been indicated the drop of housing affordability since 2021 (Slovakia, Poland, Germany). In Austria and in Czech Republic there has been indicated improvement of housing affordability. The calculation of HEX shows the position of Czech Republic. Despite the fact of improvement of housing affordability in Czech Republic since 2021, the housing affordability is the worst in comparison to all the other countries.

Table 8 – Development of HEX index within 2021 and 2023

Country	HEX 21	HEX 22	HEX 23
Slovakia	3,20	1,49	2,66
Poland	4,00	2,38	2,42
Austria	7,85	8,70	8,03
Germany	4,34	3,04	3,12
Czechia	1,38	1,41	1,94

Source: own calculations

4 Conclusion

It is clear, the housing affordability is important to the social harmony. The aim of the paper was to find out what is the level of housing affordability in comparison to other countries involved into the research. The result of the research shows the housing affordability in the Czech Republic is the worst in comparison to other searched countries.

The two hypotheses were established as part of the research. Hypothesis H1: Housing affordability in Czech Republic is on average lower than in other compared countries. The results included in table 7 show the worst position of Czech Republic in comparison of other countries. The hypothesis H1 was certified.

Hypothesis H2: Housing affordability is decreasing in all of searched countries. The hypothesis was denied. In three of presented countries the housing affordability still decreases (Slovakia, Poland, Germany).

The situation in Czech Republic has improved a bit since 2021. There is probably the impact of increasing mortgage interests, which influenced the price of houses as well as total supply of the flats.

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Digitalization of the Public Administration in the Czech Republic

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Abstract: E-government is currently an important direction for all governments. Governments currently use web mailboxes, portals or other technologies to provide their services. However, in many countries, including the Czech Republic, e-government is not at a level that corresponds to developed countries. It is important for governments to understand the reasons why citizens do not use these services, to find out attitudes towards e-government and also to ensure quality e-government services. In the Czech Republic, e-government is based on three main pillars, namely CzechPoint contact points, data boxes for electronic communication and basic population registers. Recently, however, a citizen's portal or a national point for identification was also introduced. The aim of the paper is to examine the use of portals for accessing e-government services in the Czech Republic. The goal of the article is achieved through the analysis of secondary data obtained from the Czech Statistical Office. Correlation analysis is also used in the paper. According to the analysis, it can be concluded that e-government will develop in the Czech Republic, as its portals are used by more and more entities, and with greater intensity. Economic policymakers are recommended to communicate more intensively the positives of using e-government portals among citizens and ensured better digital skills of citizens.

Keywords: E-government, public administration, tax, administration

JEL Classification: H24, K34, O33

1 Introduction

According to Arsad and Asghar (2020), information and communication technologies are used in state administration as part of e-Government, in the provision of public services to citizens or other entities. E-government can represent an interconnected ecosystem that includes citizens, businesses and government agencies that use digital technologies (Mingyue et al, 2022). In this way, physical services provided by the state are replaced. E-government involves the interaction of five dimensions, namely: provision of information; communication with citizens; online transactions; integration of state authorities; citizen participation (Mingyue et al, 2022).

Although the benefits of e-Government are indisputable, there are still problems associated with their full implementation and acceptance by entities. The process of establishing e-Government is gradual and long-term, which requires constant control and investments of a financial, but also non-financial nature (Mingyue et al, 2022). The implementation of information and communication technologies within the public sector is slower than in the case of businesses, therefore there is less awareness of the issue, but at the same time more attention has been paid to this topic recently Zuiderwijk, Chen and Salem, 2021. The implementation of e- government brings greater transparency by providing easier access to government services or news. Based on greater transparency, there is greater trust in the government if e-government services are functional and truly effective. Furthermore, various e-government applications can facilitate more effective involvement of citizens in decision-making mechanisms (Al-Mushayt, 2019).

The quality of these digital public services affects the satisfaction of subjects and thus the entire e-government system. Entities require to ensure security and reliable services, which are also simple and easy to use (Mingyue et al, 2022). Citizens' trust in E-government also plays an important role. The higher the trust in the government, the greater the use of E-government. Furthermore, according to Morote (2020), the higher the income of the population, the higher the rate of use of E-Government. However, this conclusion is not always conclusive, for example Nam (2014). A similar conclusion can be made for citizens with higher education Morote (2020). According to Nam (2014), in the case where the population from cities predominates in a given country, there is also a more intensive use of e-Government, but this does not correspond, for example, to the research of Morote (2020), in whose study there was no relationship between the composition of the population and the use of e – proven to the government.

According to Zeebaree, Agoyi and Aqel (2022), citizens rather prefer the traditional form of using public services, due to a lack of trust or insufficient laws on security. According to Morote (2020), it is advisable for states to invest in e-Governemnet and increase citizens' confidence in their political actions. Citizens, as well as other entities, are constantly creating new requirements regarding their needs, and therefore expectations from new technologies and their application are also growing (Shouran, Priyambodo and Rokhman, 2019). Social media have a certain potential to satisfy citizens' needs (Linders, 2012).

Supriyadi, Sensuse and Sucahyo (2019) recommend using blockchain in state administration as part of e-government. Through which the government can be more transparent and controlled and thus the confidence of the citizens could be increased. Blockchain can be used for all transactions that are produced between stakeholders (Ismagilova et al, 2020).

The issue that is the subject of the article is also connected to the term smart cities, which use technology to increase the quality of life of citizens and improve the cooperation of interested entities with the aim of supporting sustainable development. Smart cities are designed on the basis of information and communication technologies with the support of the Internet of Things. Cloud computing, electronic objects, machine learning, etc. are used here.

According to Arsad and Asghar (2020), it is necessary to solve several challenges within e-Government. These challenges are: legal and regulatory; institutional; environmental; political; financial; procedural; structural; organizational; developmental; technical or managerial. Among the financial and economic challenges may be the loss of jobs, the financial costs of introducing information and communication technologies. Political and legal challenges include liability concerns, slow government response, technology ownership, legal regulations. Some ethical challenges include differences between human judgment and technology, discrimination, unethical use of data, manipulation of technology, privacy protection. Organizational and managerial challenges include resistance to data sharing, differing approaches and attitudes (Zuiderwijk, Chen, & Salem, 2021).

The aim of the paper is to examine the use of portals for accessing e-government services in the Czech Republic. These are CzechPoint services, the use of data boxes, the tax portal and the citizen portal.

2 Material and Methods

One indice is used to assess the level of digital services of states, namely the Digital Economy and Society Index (DESI). The Digital Economy and Society Index (DESI) tracks the level of European Union countries in terms of digital technologies. The main areas of this indicator include human capital, connectivity, integration of digital technologies and digital public services (Russo, 2019).

2.1 Model and Data

Basic methods such as comparison as well as Spearman's coefficient are used in the paper.

Spearman's coefficient of order correlation can be tested in the hypothesis of the independence of quantities. If the range is small, If we have doubts about the linearity of the investigated relation of quantities X, Y, the Spearman coefficient of order correlation (1) is used:

$$rs = 1 - \frac{6 \cdot \sum_{i=1}^{n} d_i^2}{n \cdot (n^2 - 1)},$$
(1)

where di are the differences of the serial numbers of the ordered values of the quantities X and Y. This coefficient is also suitable for ordinal variables. The significance level is chosen at 5 % (Hendl, 2015).

The data for this post was obtained from Czech Stastical Office and Eurostat data.

3 Results and Discussion

In 2020, the Czech Republic adopted a law on the right to a digital service, through which it is determined which services in electronic form the citizens of the Czech Republic are entitled to, based on the catalog of services. However, it is possible that the Czech Republic will not be able to fulfill its commitment by 2025, which is the date of application of this law.

In the Czech Republic, the Digital and Information Agency was established in 2023 under the purview of the digitalization of public administration of the Ministry of the Interior of the Czech Republic, (2023) and its main goal is to create e-documents and ensure centrally shared information systems, which is one of the problems of

e-Government, because some systems and portals are created separately and do not communicate with each other. It would also be appropriate for all public administration portals to have a similar design so that the individual interfaces do not appear confusing. Creating e-documents runs into legislation that is not yet prepared for this fact, and it would be appropriate to amend this fact legislatively. This agency should also focus on pre-filled tax returns, so that filling them out, or just confirming them, would be easier for subjects, and also on the area of electronic elections and better coordination of all digital activities. Currently, not only in the area of tax returns, it is necessary to enter data that the state should already know about citizens, or rather it knows them, but individual registers and portals do not always automatically exchange this data. (MV ČR, 2023a).

By 2022, over 2,000,000 citizens used citizen identity to communicate with the state online. Bank identity (more than 10 million logins), mobile eGovernment key (more than 5 million logins), National Identity Authority (approx. 2.8 million logins), then MojeID (approx. 800,000 logins) and then eObčanka (approx. 650,000 logins) were used as the most common ways to log in to e-government services. The most citizens logged in to a data box from all e-government portals or services in 2022. Other popular portals include the portal of the Czech Social Security Administration and the portal of the Ministry of Labor and Social Affairs (Nakit, 2023). It can be assumed that the number of logins and the use of online communication with the state will grow over time.

According to the Ministry of the Interior of the Czech Republic (2022), awareness of e-government services is increasing. For example, more than 50 are familiar with the Občana portal, more than 75% of the data box and 60% of the e-citizen. However, the problem is that these services are not used in a similar way (although the use is increasing). A big problem is that many citizens do not know how to use these services, or what they are actually used for.

3.1 Digital Economy and Society Index

According to the digital economy and society index, which monitors the progress of the European Union countries in this area, the Czech Republic is rather below average, see Figure 1, which is a consequence of the fact that this area was not given more emphasis in the past years or digitization took place very slowly

Figure 1 – DESI
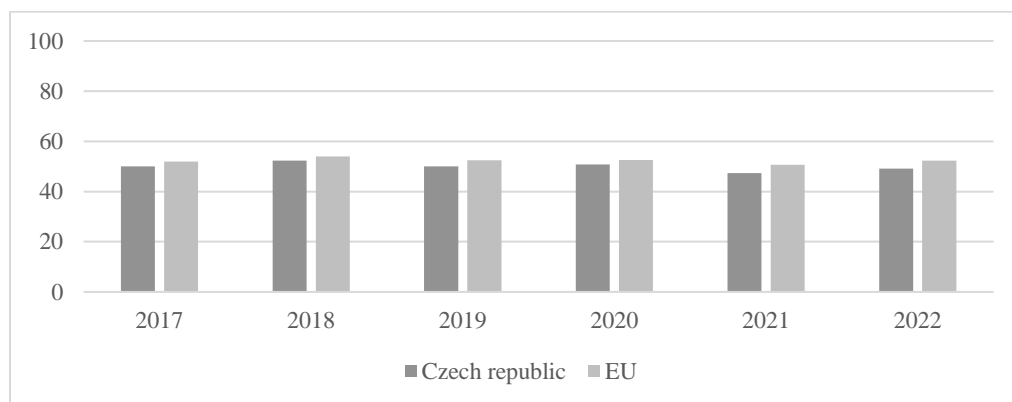
Source: Eurostat (2023), own processing

According to DESI in 2022, the Czech Republic was ranked 19th out of all EU countries, which is one of the worst positions for the entire period of measurement through this index, although the Czech Republic has a higher score in 2022 than, for example, compared to 2021. The Czech Republic's score is increasing at a slightly faster pace than the average EU score, even though it rather falls in the overall ranking of EU countries and this pace needs to be increased in all areas, especially involving a higher number of ICT experts.

In the area of human capital, the Czech Republic is at the level of the average of EU countries and in 2022 it will be ranked 15th, see Figure 2. 60% of the citizens of the Czech Republic have at least basic digital skills, respectively 24% have higher than basic skills, which is 6% more than the EU average, or 2% less. There are 4.6% of employed information and communication technology (ICT) specialists.

The low % of ICT professionals is one of the biggest obstacles to achieving a higher level of digitization. As a result, most companies have problems filling the positions of ICT experts. These are areas that should be improved in the Czech Republic, to a greater extent by expanding the curriculum to include digital skills, not only in the subject of informatics, but also in other subjects. At the same time, the state could become more involved in promoting digital skills in businesses Eurostat (2023).

**Figure 2 – Human Capital**
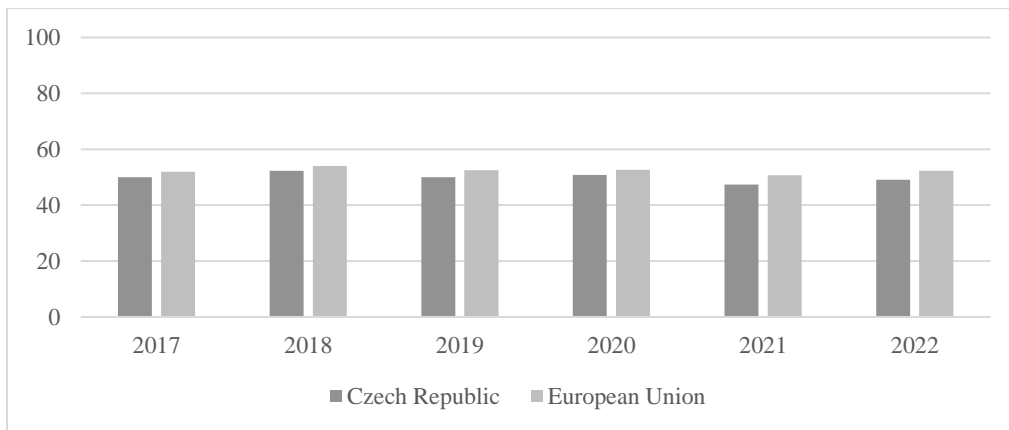
Source: Eurostat (2023), own processing

In the area of connectivity, the Czech Republic is rather below the EU average and in 2022 it was ranked 17th, see Figure 3. This is the DESI area in which the Czech Republic achieves the worst results. Compared to the EU average, the Czech Republic achieves poor results mainly: in the use of a fixed broadband connection with a speed of at least 100 Mb/s; very high capacity fixed network coverage; optical network coverage; 5G network coverage.

However, compared to 2021, there was a significant improvement in almost all measured areas in the Czech Republic, so it can be assumed that this trend will continue in the coming years. However, the Czech Republic should still invest funds in this area (which, however, could be a problem for the Czech Republic at the moment) and at the same time support their use, as the use of fixed broadband connection increased by only 1% compared to 2021. For e-government services, it is necessary to ensure that every citizen has access to the Internet and at least basic digital skills, because in the case of the introduction of digital services, there could be discrimination against these people, who would then not be able to use these services Eurostat (2023).

Figure 3 – Connectivity
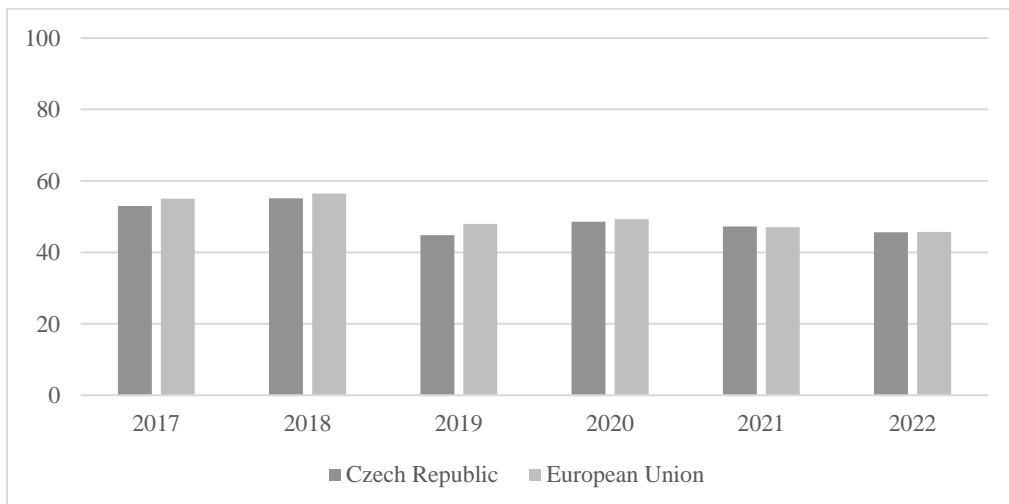
Source: Eurostat (2023), own processing

Figure 4 shows the development in the field of integration of digital technologies, where the Czech Republic achieves rather above-average values compared to the EU in the monitored years, the exception being the year 2022, in which it ranked 19th. Within this area, the Czech Republic lags slightly behind the EU average in the use of Big data, artificial intelligence, and above all in the use of electronic invoices. At the same time, the level of digitization in small and medium-sized enterprises should increase, reaching 53% in 2022. A higher level of digitization is related to the aforementioned problem of a lack of specialists in information and communication technologies Eurostat (2023).

Figure 4 – Integration of digital technologies
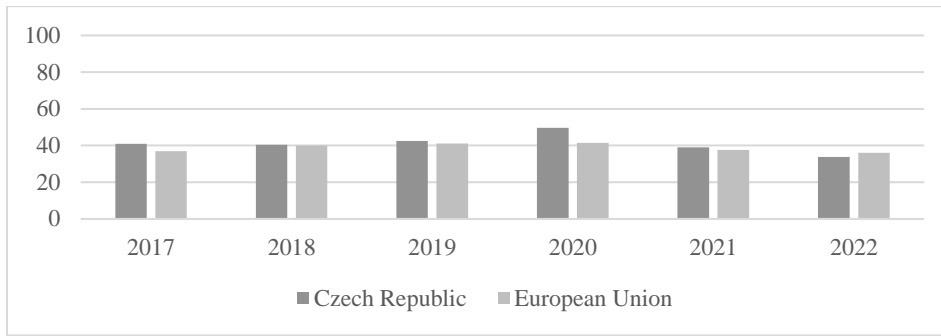
Source: Eurostat (2023), own processing

The Czech Republic also achieves poor results in the area of digital public services, as shown in Figure 5, and despite the fact that, for example, compared to 2021, Eurostat (2023) saw a significant improvement. In this analyzed area, the Czech Republic fares worst in the issue of pre-filled forms, where it achieves an average score of 41 out of a possible 100. However, the % share of e-government users is at a high level, and even above the EU average, reaching 76%. Digital public services for citizens and businesses are rated in 2022 at the level of the European Union Eurostat (2023). Although the supply and demand for e-government services are growing, the Czech Republic is still unable to increase performance in this area. In this area, it is advisable to focus on the positive perception of e-government services among citizens, for example through social networks and further invest in quality improvements and the creation of new services.

Figure 5 – Digital public services
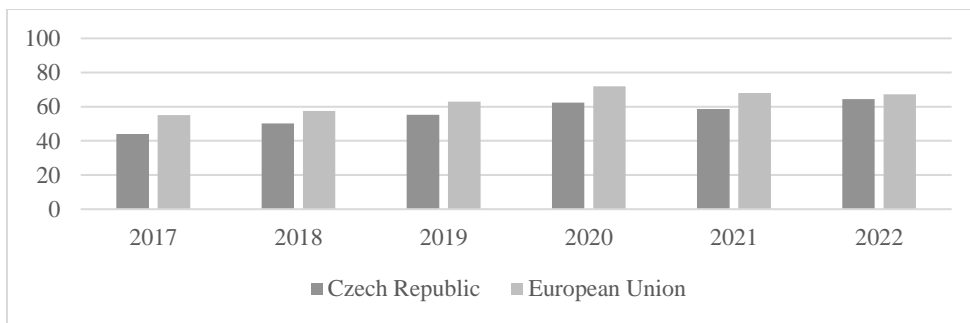
Source: Eurostat (2023), own processing

3.2 CzechPoint

The Czech Filing, Verification and Information National Terminal (CzechPoint) has been operating since 2008 as a filing office, verification point and information center where it is possible to obtain information and statements that are in the state register. Within the framework of CzechPoint, it is possible to verify various documents and signatures, as well as to find out about the possible course of proceedings that the state is conducting against the person in question. CzechPoint services can be used, for example, at municipal or city offices and workplaces of the Czech Post (Ministry of the Interior, 2010). Figure 6 shows the development of the number of established CzechPoint contact offices.

Figure 6 – Number of CzechPoint contact offices
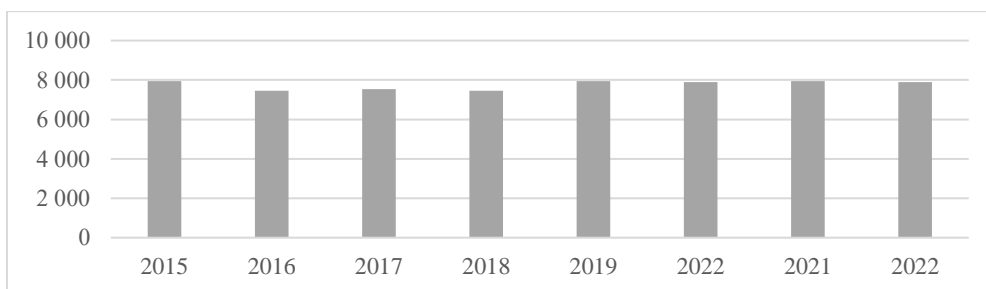
Source: ČSÚ (2023), own processing

The total number of CzechPoint contact workplaces has been at a similar level since 2015, on average around 7,700 workplaces. The largest number of these workplaces are in municipal and city offices, which represents approximately 80% of the share, and also in post offices, which represents approximately 11%, the remaining part is occupied by notaries and other entities. Taking into account the fact that some postal office branches will be abolished in 2023, it can be assumed that the number of these contact points will decrease (MV ČR, 2023).

CzechPoint provides a whole range of services, including, for example, various types of statements (most commonly statements from criminal records); submissions to the state administration, as well as extracts from basic registers; establishment of a data box; document conversion etc. However, the services it provides are limited, or it could provide more services, which would lead to the growth of greater interest on the part of citizens. Figure 7 shows the development of overall outputs from CzechPoint contact points (MV ČR, 2010).

Figure 7 – Outputs from Czech POINT contact points in thousands
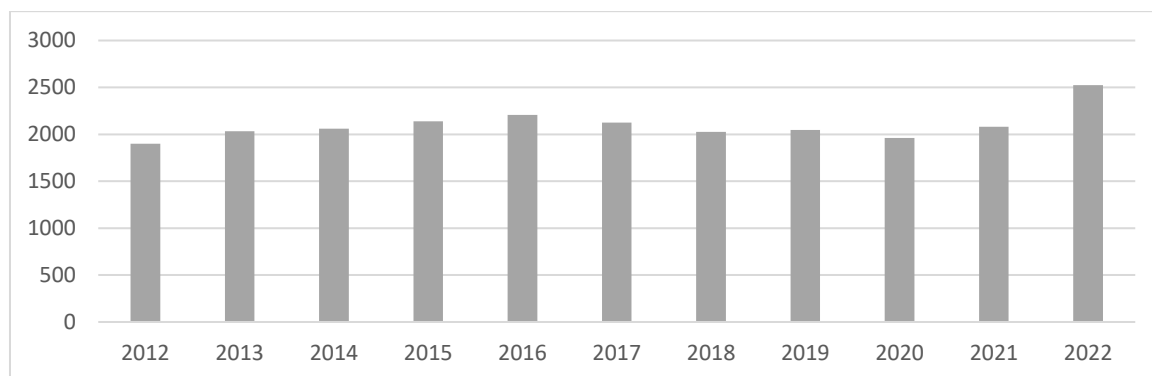
Source: ČSÚ (2023), own processing

The total number of exits within CzechPoint contact points increased by 625% in 2022 compared to 2012. Citizens are most interested in extracts from the Criminal Register, the Real Estate Land Registry, the Public Register, etc., which for the year 2022 represents an approx. 38% share of the total number of outputs, as well as the conversion of documents (approx. 28% share) or the establishment of a data box (approx. 6% share).

In the monitored years, however, there is a decrease in interest in extracts from various registers, especially in extracts from the Land Registry and the Public Register (in 2012, approx. 755 thousand citizens were interested in these services, while in 2022 it was 217 thousand citizens). On the contrary, there is a growing interest in the conversion of documents, especially the conversion of paper documents to electronic form (in 2012, approx. 91 thousand citizens were interested in this service, and in 2022 it was already 703 thousand citizens) and the interest in converting electronic documents is decreasing documents in the form of a document.

Above all, from 2022, interest in setting up a data box is also growing, which means citizens' interest in electronic communication with the state (in 2012, approx. 12,000 subjects were interested in setting up a data box, and in 2022 it was already 149,000).

No statistically significant (correlation) relationship was found between the number of CzechPoint workplaces and the number of exits from these workplaces (the value is 0.734). Therefore, a higher number of workplaces does not necessarily guarantee that citizens will increase the number of outputs that are realized through it.

3.3 Data boxes

In the Czech Republic, data boxes were introduced in 2009, which represent data storage used for communication with state administration authorities. Data messages are sent by state administration bodies through data boxes, but it is also possible to receive these messages from them. It is a substitute for communication in physical form (MV ČR, 2009) and their development is shown in Figure 8.

**Figure 8 – Newly established data boxes in thousand**
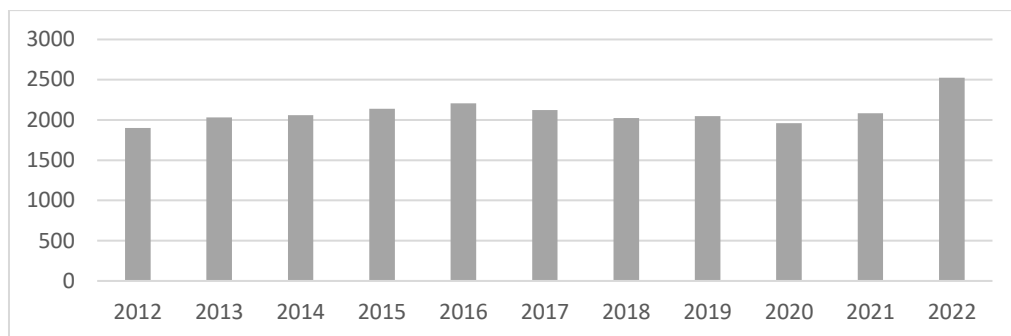
Source: ČSÚ (2023), own processing

From 2012 to 2022, there was an increase in the number of established data boxes by approximately 540%. From 2020, a faster increase in the number of established data boxes can be seen, which could have been caused by the Covid - 19 pandemic and also the upcoming obligation to set up a data box for selected entities from 2023 and also by the fact that more subjects are interested in electronic communication.

From 2020, the number of data boxes established at the request of subjects is also increasing more intensively, and their establishment by law is decreasing. Citizens and entrepreneurs have the largest number of data boxes. For the year 2023, approx. 2 million data boxes have already been set up, mainly thanks to entrepreneurs and other legal entities, and it can be assumed that there will be greater growth in the coming years.

As the number of data boxes grows, so do the transactions that are implemented through it, as shown in Figure 9.

Figure 9 – Transactions made via data boxes in thousands
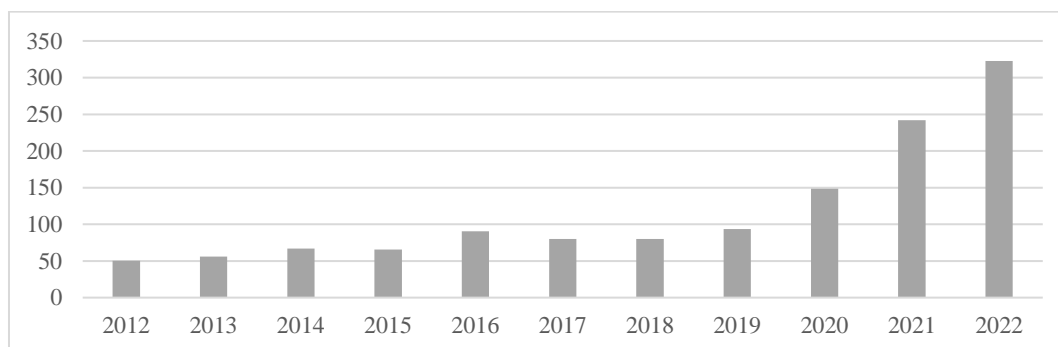
Source: ČSÚ (2023), own processing

In 2022, compared to 2015, there was an approximately 30% increase in the number of transactions carried out via data boxes. Among the subjects that carry out the most transactions are public administration bodies, which represent a share of approximately 70%, and legal entities, which represent a share of approximately 24%. Although the number of data boxes is smaller for these entities, they carry out far more transactions than other entities. Citizens have a share of approximately 1% in the number of transactions, and although this share is increasing slightly, it is still a small number and the state needs to intensify promotion and information about the possibilities of electronic communication.

A statistically significant (correlation) relationship was found between number established data boxes and the number of transactions made via data boxes (the value is 0.023). Considering the high value of the correlation coefficient, the obvious statement can be confirmed that the more data boxes are established, the more transactions will be made.

3.4 Electronic submissions for financial administration application and Portal MY taxes

Through the data box, it is possible to submit tax returns, which are compiled, for example, through the Electronic Submissions for Financial Administration (EPO) application. This application allows pre-filling of information, automatic calculation and also provides a variety of hints. After completing the tax return through this application, it is then possible to send this return through a recognized electronic signature; send via databox; print out and take

the return to the tax office physically (Finanční správa, 2014). About 3,697,000 were sent via the data mailbox in 2022. of tax returns, which is approx. 1,465,000 more than in 2015.

Tax returns filed through the EPO are shown in Figure 10.

Figure 10 – Tax returns filed in the Czech Republic via the EPO web application in thousnads
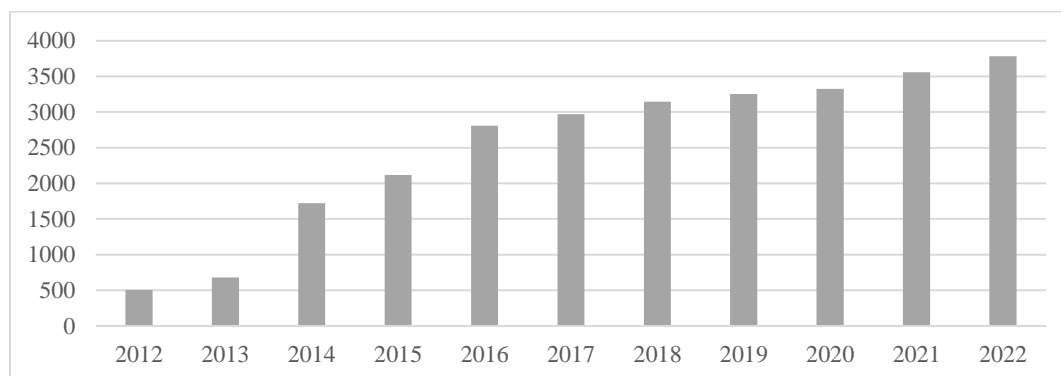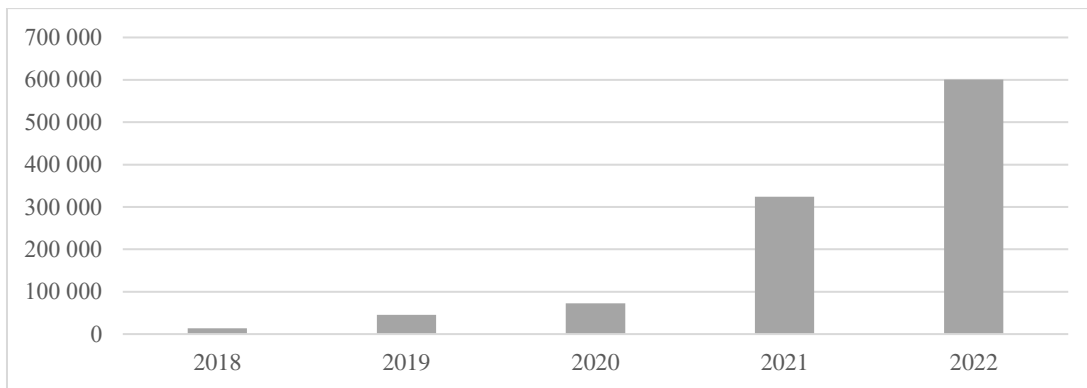

Source: ČSÚ (2023), own processing

The total number of tax returns filed through the EPO is increasing over time (in 2022 there was an approx. 650% increase compared to 2012). In this form, the majority of tax returns for value added tax are submitted, which is caused by the obligation of electronic submission from 2015. However, in 2014, there was already an increase in them by more than 200%. In 2022, value added tax accounted for approximately 70% of all electronically filed tax returns. In second place in terms of electronic submission of tax returns is personal income tax, which is experiencing more intense growth from 2021, when approx. 30% more was filed than in 2020. Furthermore, it is corporate income tax and road tax. For obvious reasons, the least number of electronic tax returns are submitted for tax on immovable property, but even this return is growing and, for example, in 2022 it was about 63% more than in 2021.

In addition to the data box, it is also possible to file a tax return in the Czech Republic through the modern and simple tax portal (MOJE daně), which was launched in 2021. To log into this portal, you can use a citizen card with an electronic chip (this option was created in 2018; bank identity (this option was created in 2021 and approx. 22% of people used it in 2022); log-in data to the data box; log-in data received from the tax office. Through these options, you can also log in to other public administration portals. The portal enables automation of filled-in data, automatic check or wizard when filling in. It also provides the user's tax account itself, tax calendar, etc. (MF ČR, 2021; ČSÚ, 2023).

3.5 Citizen portal

In 2018, the Citizen's Portal was introduced in the Czech Republic, which is used for communication with public administration authorities and it is possible to log into it using the citizen's identity. The portal provides access to hundreds of services, such as the portal of the Czech Social Security Administration, the Financial Administration, the Labor Office, eRecipe, eDisability, extracts from criminal records or the driver's points account, or it enables the creation of a data box. You can also submit a petition, but it is subject to the ownership of a data box, which may discourage some citizens. Some services are not yet available on the portal, such as extending documents, or changing them, or changing permanent residence, etc. (MV ČR, 2021). Its development in the number of registered users is shown in Figure 11.

Figure 11 – The number of registered users in the citizen portal

Source: ČSÚ (2023), own processing

The number of registered users increases every year. The largest year-on-year increase was recorded in 2021, when there was an approximately 350% increase in users compared to 2020, and further in 2022, when there was an approximately 85% increase in users. Simultaneously with the higher number of users, the number of logins is also growing, when in 2020 it was approx. 30,000 and in 2022 it was already approx. 3.5 million. At the same time, the number of electronic submissions is also growing, when in 2022 it was approximately 176,000. And the greatest interest is in extracts from Criminal Records. The vast majority of users register for the citizen portal through the National Identity Authority (NIA). It should be noted that the use of citizen portal services differs from the type of login, which differs in the degree of trustworthiness. Data boxes, for example, have low credibility, so logging in via this option is not recommended. It would ensure more traffic to the portal if the portal allowed for more services than is the case so far, although this number is increasing, it is still not adequate and this increase is slow

4 Conclusion

The example of the Czech Republic shows that more and more subjects are using e-government portals. e-Government services and portals currently play a vital role in all national governments, but, for example, according to DESI, the Czech Republic is not doing well in the area of the digital economy and rather lags behind the average of the countries of the European Union and is considered below average in this area. To improve its position in this indicator, the Czech Republic should focus on the development of digital knowledge taught in schools and also support the use of future technologies in businesses (cloud computing, big data, artificial intelligence, etc.). At the same time, it should raise awareness of these portals and explain the options for logging in in an appropriate way. In the Czech Republic, data boxes could be set up for all citizens who are already using one of the citizen's digital identity tools (as was planned during 2022), and with it, the obligation to submit income tax returns online could be introduced. Inadequate legislation is the problem itself.

However, from the point of view of e-government portals, they are being used more intensively in the Czech Republic, especially from 2020 onwards, as shown in the post. There is an increase in the number of established data boxes, including transactions carried out through them (This relationship was statistically proven in the post), the number of electronically filed tax returns also increases, and more entities use the portals of the public administration portal called the citizen's portal. A greater number of people are also starting to use the new tax administration portal called MY taxes. Overall, it can be said that the proportion of people who use the Internet to deal with public administration is increasing. Most often, it is downloading an official form and submitting applications. Above all, however, these are university-educated persons and according to persons with a high school diploma, and it can also be seen that the proportion of persons aged 55 and over is decreasing within the framework of electronic transactions, which indicates significant unevenness (ČSÚ, 2023). Currently, however, not as many citizens use these portals as they could. The reasons are, for example, fear of security or mistrust of technology. There are several other reasons why the Czech Republic is below the EU level in this area. For example, a low number of ICT experts, insufficient use of ICT in businesses, problems of penetration with internet connection, insufficient digital skills of citizens or reluctance of citizens to use these portals.

The European Union wants to achieve certain goals in the digital transformation of Europe by 2030. These include, for example, 80% of the population having basic digital skills, 75% of companies using big data, artificial intelligence and cloud computing, 100% of online public administration services and 80% of people having digital

identification (Eurostat, 2022). In order for the Czech Republic to achieve these set goals, it should deepen digitization more, and not only in public administration however, this faces a number of challenges, one of which is outdated legislation.

Limitations of the article that affect the analysis include, for example, the fact that some e-government portals are mandatory for some selected entities or some have been introduced recently and some have been operating in the Czech Republic for several years. There are other electronic services and portals in the Czech Republic that are provided by the state, due to their scope, this paper did not mention them, but these are potential areas for future research, including a detailed comparison with other European Union states.

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Public Green Spaces in Municipalities

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Abstract: Municipalities should take care of the all-round development of their territory and also the needs of citizens. It is for this reason that municipalities provide municipal services. There are many such services, one of them is the maintenance of public greenery, which this post will focus on. Six municipalities from the South Bohemian Region were selected for comparison. The aim is to compare public greenery from different points of view (share of public greenery expenditure in the total budget of municipalities, number of hectares of public greenery per inhabitant, average operating costs in thousands of crowns per hectare of public greenery) and possibly recommend how to reduce the financial burden. The monitored period is from 2017 to 2021. Given that the selected municipalities have different sizes and populations, the contribution will include the percentage of public green space on the area of the municipality, the average operating costs in thousands of crowns per one hectare of public green space in the year of the municipality, the share of expenditure on public greenery to the total expenditure in the municipality and the expression of the amount of greenery per inhabitant in the municipality. It was found that, according to the recommendations of the World Health Organization, all selected municipalities have enough public greenery per inhabitant. Regarding the management of public greenery, it is recommended to reduce the number of mowing grass areas or to plant low-maintenance plants.

Keywords: Management, municipalities, public greenery

JEL Classification: H41, H76, R11

1 Introduction

The focus of this article is on the intricate details of public greenery. Furthermore, it delves into the discourse, offering specific recommendations. Additionally, the article presents the proportion of total municipal expenditure allocated to public greenery. Supplementary charts are also provided.

This post presents a comprehensive comparison of public greenery in selected municipalities of the South Bohemian Region. Over the monitoring period spanning from 2017 to 2021, six municipalities, including Strakonice, Český Krumlov, Tábor, Prachatice, Písek, and Jindřichův Hradec, were carefully examined and analyzed. The goal of the contribution is a comparative analysis of public expenditures associated with the care of public greenery in the conditions of six selected municipalities for the period 2017-2021 according to the selected ones. The primary objective of this study is to assess and contrast the state of public green spaces from diverse perspectives, encompassing the share of public greenery expenditure in each municipality's total budget, the availability of hectares of public greenery per inhabitant, and the average operating costs in thousands of crowns per hectare of public greenery. Furthermore, this analysis endeavors to shed light on how these municipalities measure up to the minimum standards set by the World Health Organization (WHO) regarding public green spaces. The WHO's guidelines aim to enhance the quality of life and well-being of inhabitants, making it vital to explore whether these municipalities meet the recommended benchmarks in terms of green space per capita, green area quality, accessibility, and other crucial parameters. Ultimately, this examination seeks to identify opportunities for optimizing financial resources and streamlining the maintenance of public greenery. By incorporating WHO's recommendations and best practices, the municipalities can create sustainable and thriving green spaces while mitigating the financial burden associated with their upkeep.

Municipalities have a responsibility not only towards their citizens but also towards their territory. Providing municipal services, including the maintenance of local sidewalks, public spaces, and public greenery, is an integral part of this responsibility. In the current period, greater emphasis is being placed on environmental protection and sustainable development, which is why this post focuses on public greenery. Public greenery plays a crucial role in creating a pleasant and healthy environment for the residents of municipalities. It provides them with places for relaxation, recreation, and socializing. In addition, public greenery has many ecological benefits, such as

improving air quality and regulating temperature. Given its significance, it is important to monitor and compare its status in the selected municipalities.

The post will be divided into several chapters, including a characterization of each municipality, the importance of public greenery, and the financing of municipal services. The methodology and description of each municipality will be discussed. In conclusion, the public greenery in the municipalities will be compared, followed by recommendations for more efficient management of public greenery and reducing the financial burden.

2 Municipality

This section focuses on territorial self-government and the legal status of municipalities in the context of public green care in the South Bohemian Region. It will explore key aspects such as the legal basis and obligations of municipalities within the self-governing system. Furthermore, the management of public finances and the use of funds for the development and maintenance of the principles of green areas will be explained.

The municipality is governed by Act No. 128/2000 Coll. Act on municipalities (municipal establishment). This law is valid since May 15, 2000 and effective since November 12 of the same year. The law is divided into three parts, the first one concerns municipal establishments, the second part concerns joint and transitional provisions, and the last, third part deals with final provisions.

The characteristic features of the village are:

- citizens of the municipality,
- territory of the municipality,
- the right to self-government,
- the municipality as a legal entity,
- own property of the municipality,
- management according to own budget.

"Every village must be permanently inhabited by people. The population of the municipality is a personal characteristic of the municipality, belonging to its basic and necessary elements. Among permanent residents, the legal system singles out a qualified group of residents, with whom it associates certain subjective rights - the citizens of the municipality" (Koudelka, 2007, p. 105).

The entire territory of the Czech Republic is part of the territory of a municipality, with the exception of military districts where there is no self-government. As Koudelka (2007) states, even municipalities sometimes make a formal mistake, such that they define their territorial scope by the cadastre of the municipality, or by the cadastral territory. A cadastral territory is a technical unit consisting of a geographically closed and jointly registered set of real estate in the real estate cadastre (According to Act No. 256/2013 Coll., on the Real Estate Cadastre (Cadastral Act), § 2 letter h)).

The right to self-government is enshrined in the Constitution in Chapter I and Chapter VII, and then, of course, in Act No. 128/2000 Coll., on municipalities. Chapter I, Article 8 of the Constitution of the Czech Republic deals with guaranteeing the self-government of territorial self-governing units. "Municipal self-government in the Czech Republic is regulated by legal regulations, primarily by the municipal establishment. In a state governed by the rule of law, it is typical, and this is especially true for the field of public law, that the basic principles of a distinct legal field are defined in the regulations that make up the constitutional order of the state" (Koči, 2012, p. 13).

Legal entities are divided into private law and public law entities, depending on the interest in which they are established. A public legal entity includes territorial self-government units, i.e. municipalities and regions. The municipality is therefore a legal entity and is capable of rights and obligations, acts in legal relations in its own name and bears full responsibility resulting from these relations.

Municipalities have essentially the same position as any other owner when dealing with their property. The municipality is entitled to be the owner of any kind of property, whether it is tangible or intangible property, but unlike private owners, it does not dispose of private property but public property.

The budgets of territorial self-governing units are referred to as decentralized money funds, in which both the revenues that the municipality receives based on their redistribution in the budget system and the revenues generated by their own activities are concentrated, and these are distributed and used to finance public and mixed goods through public the local government sector, or through the private sector" (Provazníková, 2007, p. 53). The budget is the basic financial management tool of territorial self-governing units, it is drawn up for one calendar

year. The budget fulfills three basic functions: allocation, redistribution and stabilization. "Microeconomic stability is attributed to the allocation function. Through this function, public goods are secured" (Hejduková, 2015, p. 7). Under the term redistributive function, one can imagine the redistribution of finances among citizens in such a way as to reduce inequality in society. It is a redistribution from the budget of the region to the budget of municipalities, thanks to which it is possible to influence economic and social prosperity in municipalities. The stabilization function at the level of territorial self-government contributes to influencing the quality of life in the given territory, for example by building technical infrastructure. The budget is discussed and approved by the village council and subsequently by the council. While the usual budget is drawn up as balanced, i.e. planned expenditure equals planned income. However, there are also cases when the budget is organized as a surplus or deficit. "Due to the fact that municipalities are not able to secure the necessary public expenses and expenses for the activities of local governments from their own resources (sale or lease of property, etc.), they are covered from public revenues" (Kruntorádová, 2015, p. 25). Municipalities are usually provided with income from the state budget.

3 Public greenery in Municipalities

This section explores the care of public greenery in the South Bohemian Region from diverse perspectives. It delves into the legal status of municipalities, assesses the extent and quality of public greenery, and evaluates its impact on the environment and residents. The primary goal is to offer valuable insights into the current state and management of public greenery while formulating recommendations for its sustainable development. Additionally, a subsequent section will delve into the specific topic of financing public greenery in municipalities. It examines various sources of funding and establishes connections between investments in green areas and the budgets of municipalities. Key financial resources, including subsidies from European and national programs, will also be presented.

As stipulated by Act No. 128/2000 Coll., on municipalities, Section 2, the municipality takes care of the comprehensive development of its territory and the needs of its citizens; in fulfilling its tasks, it also protects the public interest. Whether the municipality will provide a particular service or not depends on the decision of the municipal council. By a decision, the service becomes a public service, and the municipality must ensure its operation and comply with relevant laws. Municipal services are services in the public interest that are created or organized to meet the requirements of citizens. These can include maintenance of local roads, sidewalks, public greenery, and public spaces, among others. The public service is provided either by the municipality itself or this responsibility can be transferred to another entity. In cases where rights and obligations are not directly defined by the law, they must be established by the contracting parties. In some cases, a fee may be charged for the service. The contribution focuses on public greenery.

According to the Building Act and the related Decree No. 501/2006 Coll., on general requirements for land use, the territorial plan divides the administrative territory of the municipality into areas with different modes of utilization. The decree defines 16 areas, including areas of public spaces (Section 7), which should include public greenery. This statement can be found in the Municipalities Act No. 128/2000 Coll., in Section 34, which states that public spaces include all squares, streets, markets, public greenery, parks, and other spaces accessible to everyone without restrictions, serving public use regardless of ownership of these spaces.

According to the Deník veřejné správy (2020), greenery gives municipalities a distinctive character and enriches the environment. It is evident at first glance and influences the initial judgment of the municipality.

There are many recommendations regarding the amount of greenery, with the most common measure being square meters per inhabitant. The WHO recommends a minimum of 9 square meters of green space per inhabitant. The European Environmental Agency considers it appropriate for public green spaces to be within a 15-minute walk from residential areas. (Bydlíme s přírodou – veřejná zeleň, 2010)

Effects of greenery

- increases air humidity,
- reduces and dampens temperature fluctuations,
- captures dust particles,
- reduces noise,
- performs an aesthetic function, etc. (Státní zdravotní ústav Praha, Význam městské zeleně pro veřejné zdraví, 2015)

Protection of public greenery can be regulated by a municipality through a generally binding decree. In Section 10 of the Act on Municipalities No. 128/2000 Coll., the municipality is obliged, in its separate jurisdiction, to issue a generally binding decree to ensure the cleanliness of streets and other public spaces, environmental protection, greenery in urban areas, other public greenery, and the use of municipal facilities serving the needs of the public.

The municipality must identify the subject and objective of regulation in the generally binding decree in accordance with legal regulations. Specific obligations for the protection of public greenery may include:

- maintaining greenery through regular mowing as determined by its owner or administrator,
- prohibiting damaging, destroying, or polluting public greenery,
- prohibiting entry onto flower beds,
- prohibiting cycling, motorcycling, and driving on public greenery, etc. (Ministerstvo vnitra ČR, Oblast veřejného pořádku, 2018)

Regarding the protection of public greenery, the municipality must not differentiate between the owners of public greenery and regulate only with respect to public greenery owned by the municipality. According to the Deník veřejné správy (2020), greenery gives municipalities a distinctive character and enriches the environment. It is evident at first glance and influences the initial judgment of the municipality.

3.1 Financing

The municipality pays for the services from its budget, but usually only partially. Funds for services are provided from the state budget, other budgets, or various programs. As part of the financing, the municipality can apply for the provision of various offered types of subsidies from European subsidy programs or National subsidy programs. A municipality can also take a loan or can ask for funding from its citizens, etc. (Evropský fond regionálního rozvoje, 2019)

The connection between the number of investments for environmental protection and the expenditure of public budgets is not clear-cut. The level of financing from own resources and priorities in the area of environmental protection play a big role here. (Ministerstvo životního prostředí, tisková zpráva, 2010)

The most important national financial resources from which environmental support is provided are environmental fees administered by the State Environmental Fund of the Czech Republic and income from the state budget. (Ministerstvo životního prostředí, Národní dotace)

Regarding the Operational Program for the Environment for the period 2021-2027, one of the priorities is the protection and care of nature and the landscape, these financial resources are limited to the stability of the landscape, the creation and preservation of natural elements in populated areas. One of the projects deals with the management and restoration of residential greenery, parks, gardens, alleys, etc. (Evropsky statutární a investiční fond, Operační program životního prostředí, 2022)

4 Methodology

The next chapter delves into the methodology employed to analyze the financing of public greenery in the South Bohemian Region. This chapter outlines the data collection methods and information sources used in selected municipalities. Additionally, it presents the procedures for comparing and linking investments in green areas to individual municipal budgets. The aim is to establish a transparent and dependable framework for evaluating the state of public green spaces from diverse perspectives, fostering comprehensive comprehension within the South Bohemian Region.

The contribution focuses on selected municipalities in the South Bohemian Region, specifically the municipalities of Strakonice, Český Krumlov, Tábor, Prachatice, Písek, and Jindřichův Hradec. These municipalities are district towns in the South Bohemian Region and serve as administrative centers for their respective districts in the region. The municipality of České Budějovice, as a statutory city, is excluded from the selection. The selected municipalities also perform state administration and have municipal offices with extended jurisdiction. These municipalities were chosen because they are district towns in the South Bohemian Region, serving as administrative centers for their respective districts in the region district towns within the South Bohemian Region. The selection of these municipalities ensures that the sample is representative of the region and includes key administrative centers.

Data collection was conducted through email communication or phone calls with the municipalities or their technical services. Some of the information was obtained from annual reports or the websites of the municipalities

or their technical services. Regarding the expenditures for a specific service, financial statements (budget execution of municipalities) or the information system Monitor financí, Monitor were used. Monitor is a specialized information portal that provides open access to budgetary and accounting data from all levels of state administration and self-government. Expenditures of the municipalities were monitored from 2017 to 2021. This approach allowed for a comprehensive evaluation of the financing and investments in public green spaces.

To ensure a meaningful comparison, the municipalities were assessed based on several criteria. First, their size and territorial area were considered. Additionally, the number of inhabitants in each municipality was taken into account. Since the selected municipalities vary in size and population, a comparison was conducted in the following manner:

percentage expression of public greenery on the area of the municipality: $\frac{area\ of\ the\ municipality\ (ha)}{area\ of\ public\ green\ space\ (ha)} * 100\ (\%)$ (similar research was also used by Adrian J. Marshall, Margaret J. Grose and Nicholas S.G. Williams in their article on From little things: More than a third of public green space is road verge),

average operating expenses in thousand crowns per hectare of public green space: $\frac{average\ operating\ expenses\ (thousand\ CZK)}{area\ of\ public\ green\ space\ (ha)}$,

percentage expression of expenditures on public greenery to the total budget in the municipality: $\frac{expenditures\ on\ public\ greenery\ (in\ CZK)}{total\ expenditures\ (in\ CZK)} * 100\ (\%)$ (this method is used by the authors Pavel Rousek and Simona Hašková in their study on the topic of Changes in the concept of public greenery based on and analysis of Czech municipal financing, for this reason this method was used, his method was also the inspiration for the above method average operating expenses in thousand crowns per hectare of public green space),

amount of public green space per inhabitant in the municipality: $\frac{area\ of\ public\ green\ space}{number\ of\ inhabitants}$ (this method was used to determine whether municipalities meet WHO recommendations).

These factors enabled gauging the management of public green spaces relative to the size and population of each municipality, providing valuable insights into the diverse approaches and practices. By utilizing this methodological approach and focusing on a representative selection of municipalities, the study obtained robust and relevant data for evaluating and comparing the financing and care of public green spaces in the South Bohemian Region.

A number of authors deal with the issue of financing public services from municipal budgets and propose their regular comparison, and the result is a proposal for adjustments that should lead to an increase in the efficiency of spending funds or greater satisfaction of residents who use these services. This can be written on any area financed from public budgets, e.g., in culture, transport, healthcare, education, public green areas, etc. For example, these include: Vavrek, R., Bečica, J. (2021); Vejchodská, E., J. Louda, L. Doubová (2017); Rousek, P., Haskova S. (2017); J. Kaderabkova, M. Jetmar (2010); PJ., Bryson (2008).

Selected Municipalities

The contribution deals with six selected municipalities of the South Bohemian Region. These are the municipalities of Strakonice, Český Krumlov, Tábor, Prachatice, Písek and Jindřichův Hradec.

5 Findings

Subsequently, the examination delves into the financing of public greenery in the South Bohemian Region and compares investments in green spaces with the budgets of individual municipalities. The goal is to provide a transparent and reliable framework for evaluating the situation in public green spaces from various perspectives in the South Bohemian Region.

Each municipality has a different area, and therefore the area of public green space also varies. The maintenance of public green spaces in each municipality (except Český Krumlov) is taken care of by the municipal technical services. In the case of Český Krumlov, it is the Department of Environment and Agriculture of the Municipal Office of Český Krumlov. As for the city of Tábor and Strakonice, the municipal technical services are also assisted by companies specializing in green space management.

Table 1 – Data on public green space in selected municipalities

	Public Green Space (ha)	Public Green Space (as % of area)	Average operating expenses for public green space (in thousands of CZK)	Operating expenses (per ha in thousands of CZK)
Strakonice	120	3.46	11 432	95
Český Krumlov	40	1.81	5 407	135
Tábor	105	1.69	25 230	240
Prachatice	25	0.65	9 551	382
Písek	100	1.58	13 111	131
Jindřichův Hradec	115	1.55	14 441	126

Source: Annual reports of selected municipalities, Own processing

As evident from Table (1), the municipality of Strakonice has the largest area of public green space, with 120 hectares. In terms of percentage, it is also the city with the highest amount of public green space relative to the city's area. The order of municipalities in terms of public green space is as follows: Strakonice with 3.46%, Český Krumlov with 1.81%, Tábor with 1.69%, Písek with 1.58%, followed by Jindřichův Hradec with 1.55% and Prachatice with 0.65%.

Expenses for public green space are influenced by both the municipality's area and the decisions of municipal authorities or technical services regarding beautification of the municipality. The size of expenses is further influenced by costs related to lawn mowing, tree planting, flowers, shrubs etc.

Table (1) provides average operating expenses in thousands of CZK for municipalities during the observed period. The highest average expenses were incurred by the city of Tábor. In this city, both the municipal technical services and specialized supplier companies take care of greenery, including certain parks and the city center. On the other hand, the lowest average operating expenses were recorded in Český Krumlov. One of the factors contributing to this is that Český Krumlov has the second smallest area of public green space, requiring fewer expenses for lawn mowing and similar activities.

The last column in Table (1) shows the average operating expenses (from 2017 to 2021) per hectare in thousands of CZK. The highest operating expenses are in Prachatice, amounting to 383,000 CZK, while the lowest are in Strakonice, with 287,000 CZK less, specifically 95,000 CZK.

Municipalities partially finance municipal services from their budgets. The amount of financial resources allocated to green space-related services depends on their priorities in the field of urban beautification, nature, and environmental protection. The following figure (1) visualizes the share of expenses for public green space in the total budget of municipalities.

Figure 1 - Share of expenses for public green space in the total budget of municipalities (as %, 2017 - 2021)
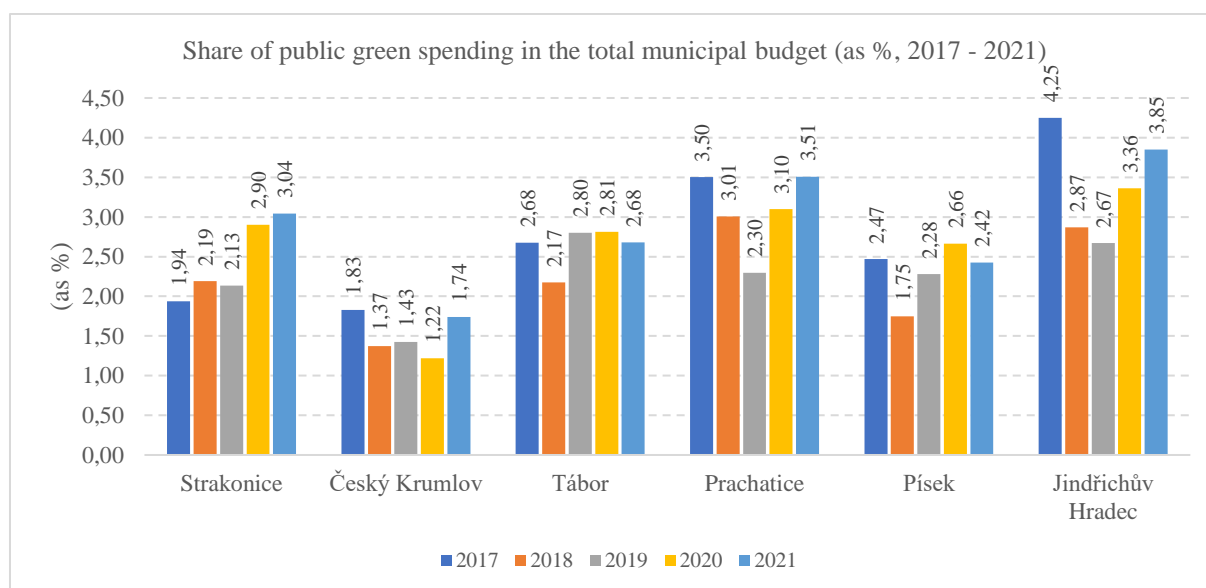
Source: Annual reports of selected municipalities, own processing

In Figure (1), the share of public green spending in the total municipal budget is presented. The data is shown in percentages for the period 2017-2021. Data analysis reveals that the share of public green spending in municipalities ranged from 1.22% to 4.25% of the total budget. The average share of public green spending in municipalities remained around 2.56% of the total budgets. The lowest spending on public greenery was observed in Český Krumlov in 2018 with a value of 1.22%, while the highest share was in the city of Jindřichův Hradec in 2017 with a value of 4.25%.

The municipalities of Strakonice, Tábor, Písek, and Jindřicův Hradec show a tendency to slightly increase their share of spending on public greenery during the observed period. The municipalities of Český Krumlov and Prachatice experienced minor fluctuations in the share of public green spending, with slight changes both upward and downward.

During the period 2017-2021, there was a gradual increase in the average share of spending on public greenery in municipalities. In 2017, the average share was 2.78%, which decreased to 2.23% in 2018. The following year, 2019, saw an increase to 2.27%. In 2020, the share reached a value of 2.68%. Data from 2021 indicate a further slight increase, with the average share of spending on public greenery reaching 2.87%. This trend suggests an increased interest by municipalities in investing in public greenery and the environment. Municipalities are gradually allocating a larger portion of their budgets to improve and maintain green spaces within their territories. This trend may reflect a growing awareness of the importance of the environment and the aesthetic appearance of public spaces for the quality of life of residents. However, specific values vary among individual municipalities. Some municipalities have a stable share of spending on public greenery, while others show fluctuations or gradual growth. This variability reflects different priorities, budgetary possibilities, and specific characteristics of each municipality.

As mentioned earlier, the WHO recommends a minimum of 9 m² of public green space per person, which corresponds to 0.0009 hectares per resident (WHO, Health indicators of sustainable cities, 2012). The following Table (2) and Figure (2) present the amount of public green space in hectares per resident in the municipality.

Table 2 - Data on public greenery per capita in selected municipalities

	Number of inhabitants (January 1st 2021)	Public Green Space (ha)	ha of public green space/inhabitant
Strakonice	22 428	120	0.0054
Český Krumlov	12 778	40	0.0031
Tábor	34 119	105	0.0031
Prachatice	10 706	25	0.0023
Písek	30 379	100	0.0033
Jindřichův Hradec	21 169	115	0.0054

Source: Annual reports of selected municipalities, own processing

Figure 2 – Hectares of public green space per inhabitant in 2021
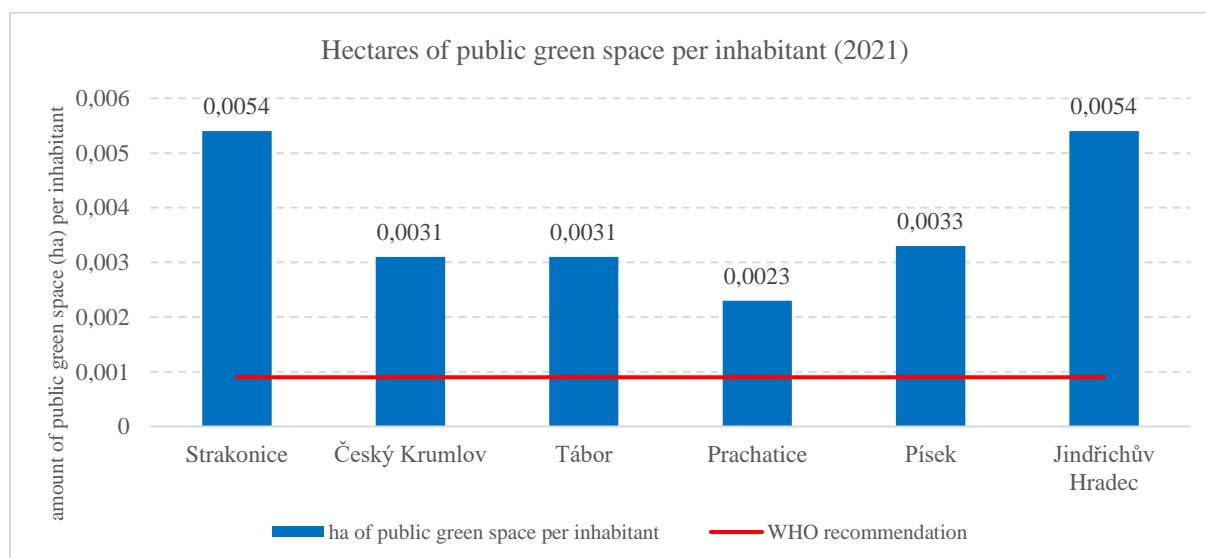
Source: Annual reports of selected municipalities, own processing

The data presented in Table (2) and Graph (2) provide valuable insights into the amount of public green space per capita in the selected municipalities. This information is crucial for assessing the adequacy of green spaces for the well-being and health of residents. Monitoring the amount of public green space per inhabitant is important as it helps ensure that there are sufficient outdoor areas for recreational activities, physical exercise, and relaxation. Adequate green spaces positively impact the quality of life, promote community cohesion, and contribute to a healthier and more sustainable urban environment. In the context of the WHO recommendation of a minimum of 9 m² of public green space per person, the data show that all selected municipalities in the South Bohemian Region surpass this standard by several times. This is a positive finding as it indicates a commitment to providing ample green spaces for the residents, contributing to the overall well-being and health of the communities.

Regularly monitoring and assessing the amount of public green space per capita is essential for urban planning and decision-making. It helps identify potential imbalances in green space distribution, enabling policymakers to prioritize areas with limited access to green areas. Additionally, tracking these metrics over time can help identify trends and changes in green space availability, which can inform future development and conservation efforts. In the Czech Republic, the long-term monitoring of public green space per capita may not have been a standard practice until now. However, with the growing awareness of the importance of green spaces for urban living, it becomes increasingly relevant for local authorities and planners to incorporate such monitoring into their strategies. By doing so, they can proactively address the needs of the residents and ensure that urban areas remain attractive, healthy, and sustainable places to live.

For instance, the municipality of Jindřichův Hradec fulfills this requirement more than sixfold. This indicates that all selected municipalities have an adequate amount of hectares per inhabitant. The highest number of hectares of public green space per capita is found in the municipalities of Jindřichův Hradec and Strakonice, followed by Písek, Český Krumlov, Tábor, and finally Prachatice.

6 Recommendations

Furthermore, recommendations are presented for the sustainable development of public greenery in the South Bohemian Region. It analyzes factors influencing expenses and suggests cost reductions, such as minimizing unused areas and introducing low-maintenance vegetation. The aim is to provide a comprehensive comparison and evaluation of the situation, along with valuable recommendations for optimal management.

As mentioned earlier, expenses on public greenery are influenced by the size of the municipality, the amount of public green space, frequency of grass cutting, tree and shrub maintenance, etc. The extent to which municipalities care for the greenery depends on the decisions of the municipal authorities or technical services. Additionally, expenses are affected by the weather conditions in a given year, such as the frequency of grass cutting or the need to plant new shrubs or trees due to drought, and so on.

In the case of reducing expenses on public greenery, it is recommended that municipalities decrease the amount of public green space. Municipalities can afford to do so because each of them already meets the recommended amount of hectares of public green space per inhabitant (0.0009 ha according to WHO). However, removing a portion of public greenery in municipalities may not be an ideal solution, as aesthetics are an important aspect of all municipalities, and it would also involve significant expenses from their budgets.

Expenses can be reduced if public green spaces in areas where residents do not spend much time are present, eliminating the need for frequent grass cutting. Another way to reduce expenses is by planting shrubs, trees, or flowers that require low maintenance and therefore do not need frequent trimming.

The aim of this contribution was to compare and assess data related to public greenery. It was found that in terms of average operational expenses per hectare of public green space, the city of Prachatice invests the most. If municipalities want to reduce expenses, it is recommended to utilize subsidies or decrease the frequency of grass cutting and plant low-maintenance vegetation. A comparison of public greenery across the total area of each municipality was also conducted. Regarding the amount of public green space, all municipalities meet the WHO recommendations, even by multiple times. (Sobková, 2022)

7 Conclusion

The aim of this contribution was to compare and evaluate data related to public greenery. It was found that in terms of average operational expenses per hectare of public green space, the city of Prachatice invests the most. This

indicates a higher commitment to maintaining and improving green spaces in Prachatice compared to other municipalities in the South Bohemian Region.

For municipalities looking to reduce expenses on public greenery, it is recommended to explore options like utilizing subsidies from regional or national funding sources. Moreover, considering a decrease in the frequency of grass cutting and introducing low-maintenance vegetation could potentially offer cost-saving opportunities without compromising the quality of green spaces.

As far as expenses for public greenery from the total budget in the municipality are concerned, the amounts range from 1.22% to 4.25% of the total budgets. In the monitored years, this amount changes in the municipalities. This variability reflects different priorities, budgetary possibilities, and specific characteristics of each municipality. Despite the differences in investment levels, it is noteworthy that all municipalities met the WHO recommendations for public green space. Moreover, surpassing these recommendations by multiple times indicates a positive commitment to providing sufficient green areas for the well-being and health of residents. However, it is essential to continuously monitor and maintain these green spaces to ensure their long-term sustainability and benefits. (Sobková, 2022)

In conclusion, this study sheds light on the financing and state of public greenery in the South Bohemian Region, providing valuable insights for policymakers, urban planners, and municipal authorities. Going forward, it is crucial to consider the identified recommendations and explore additional strategies to enhance the management and development of public green spaces in the region. Continuous efforts in this direction can contribute to creating more sustainable, vibrant, and livable communities for the residents of the South Bohemian Region

Acknowledgements

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Main challenges in the provision of social care services in the Moravian-Silesian Region

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Abstract: Social care services are the largest area of provision of social services to citizens, which must respond to the needs in the territory .The paper deals with the provision of social care services in the Moravian-Silesian Region, the aim of this paper is to evaluate the provision of social care services, to predict the need for these services depending on demographic trends and to identify the main risks in the context of the capacity Regional Network of Social Services in Moravian-Silesian Region. The main problems in the provision of social care services are problematic funding, the absence of statutory pay standards for direct care workers in both the private and public sectors, and mental health care reform. In the long term, the social service delivery system must address the adverse demographic trend of an ageing population, to which it is currently unable to respond, and the resulting unsustainable funding system and shortage of qualified staff.

Keywords: Social Services Network, social care, public finance, reform of psychiatric care, transformation, moravian-silesian region, services of general economic interest

JEL Classification: H53, P36, J14, J26

1 Introduction

The system of the provision and financing of social services in the Czech Republic has undergone a number of fundamental changes in the last few years, which have also significantly affected the form of their provision in the territory. The key act of these changes can be considered to be the transition of the financing of social services from Chapter 313 - MLSA of the state budget according to Section 101a of the Act on Social Services [14] intended to finance social services with a regional or local scope (Programme A) from the Ministry of Labour and Social Affairs ("MLSA") to the self-governing competence of individual regions in 2015. The second act was the instruction of the MLSA concerning public support and the provision of social services. Since 2016, the financing of social services from the above-mentioned systemic source requires the social service provider to be mandated to provide a service of general economic interest according to the European Commission Decision of 20 December 2011, No 2012/21/EU, on the application of Article 106(2) [11] of the "Treaty on the Functioning of the European Union to State aid in the form of public service compensation granted to certain undertakings entrusted with the operation of services of general economic interest" (the "Decision"). Thus, the regions had to deal not only with the embedding of subsidy programmes to support the provision of social services from Chapter 313 - MLSA of the state budget under Section 101a of the Social Services Act [14] into the self-government practice of their authorities, but also with the embedding of the system of state aid and financing in the form of compensation.

According to Section 95 of the Social Services Act [14], the Moravian-Silesian Regional Government and Regional Authority (collectively referred to as the "Regional Authority") is responsible for ensuring the availability of social services in its territory and for determining the network of social services. The network of social services in the Moravian-Silesian Region has been developed in the long-term process of the medium-term planning of social services and its principles are anchored in the Medium-Term Plan for the Development of Social Services in the Moravian-Silesian Region ("Medium-Term Plan"). The implementation of the system of public support and mandate to provide a service of general economic interest ("SGEI") also required the specification of this obligation and the specification of the Regional Network of Social Services down to the level of parameters of individual social services. All these facts have practically resulted in the existence of 14 different systems for the provision and financing of social services in individual regions. Each of these systems resolves its own specific problems and challenges, but the fundamental and key ones are common for the whole territory of the Czech Republic.

2 Methods and data

The following text focuses on the largest segment of social services, both in terms of financial requirements and capacity - social care services - in the Moravian-Silesian Region ("MSR"). Primarily the issue of social service operations is resolved, not investments, which also represent a key limiting factor for the development of social services and must not be neglected. The basic premise of the paper is that the availability of social services in the region is resolved through social services included in the Regional Network of Social Services in the Moravian-Silesian Region ("Regional Network"). The following analyses are only performed for services included in the Regional Network. This does not exclude the fact that social services outside the Regional Network are provided in the territory of the Region. These providers and social services are monitored and evaluated by the Region in cooperation with municipalities; in terms of the number of clients and the volume of care provided, this is a rather marginal issue.

The aim of the paper is to evaluate the provision of social care services in the MSR, to predict the need for these services depending on demographic trends and to identify the main risks in the context of the capacity Regional Network. Methodologically, the paper is built on a positive economic research approach, the key data sources are Data from applications for subsidies from Chapter 313-MLSA and Data from the internal MLSA's database OKslužby-poskytovatel.

3 The need for social care services in the territory of the MSR

There are 173 providers of 401 social care services in the Regional Network, with a capacity of 8,324 beds in residential care and 1,264 direct care positions in ambulatory and field care (as at 1.1.2023). Table 1 shows the structure of the Regional Network according to the individual types of social care services. During the year, the parameters of social care services, including capacity, change flexibly according to the needs of the territory.

Table 1 – Capacity of social care services in Regional Network, 1. 1. 2023

| Types of Social Services	Capacity in Regional Network		Types of Social Services	Capacity in Regional Network	
	Beds	Direct Care Positions		Beds	Direct Care Positions
Day Service Centre		36.6	Personal Assistance		299.8
Day Care Centre		224.2	Domiciliary Care		603.7
Homes for People with Disabilities	1,014		Supported Housing		60.9
Homes for the Elderly	4,238		Social Services in a Healthcare Facility	230	
Homes with Special Regime	2,229		Week Care Centre	19	
Protected Housing	565		Emergency Care		11.3
Respite Care	29	27.7			

Source: Regional Network of Social Services in Moravian-Silesian Region. Own processing

The largest number of clients in terms of the type of service is according to data from applications for subsidies from Chapter 313-MLSA in residential form in homes for the elderly (5,083 planned users in 2023), in outpatient form in day care centres (1,088 planned users in 2023), and in field form in domiciliary care services (9,178 planned users in 2023). The social service should be provided primarily in the natural environment of the client and only in a residential facility when his/her unfavourable social situation does not allow it. The basic difficulty in assessing the need and adequacy of the coverage of the territory with the capacities of individual types and forms of social services is the lack of clear criteria and quotas that should be met in the Regional Network for the territory. From its position, the Regional Authority cannot have the ambition to set uniform criteria for the need for social services throughout its territory, it does not have the necessary local knowledge. Although a large amount of data is collected from providers and from municipalities (either in the MLSA reporting system or through the Regional Authority's own collection), it is not possible to extract explicit data that would allow setting uniform criteria reflecting the real needs of the territory. It is not possible to proceed from the reported numbers of rejected applicants reported by providers due to full capacity, because of duplications when an applicant is reported for several social services. In addition, the Regional Authority does not have a legal mandate to collect personal data on service applicants, which would allow the elimination of these duplications within the region.

Moreover, each area is specific, and the economic level of the population, its cohesion and family relationships are also key. While in some parts of the region there is a tendency to resolve the negative social situation for as

long as possible through caring persons using ambulant or field social services, elsewhere there is a tendency to prefer residential social services. Therefore, the whole system of updating the Regional Network in the MSR is based on close cooperation with public authorities - municipalities and social service providers. Each time the Medium-Term Plan is updated, a review of the Regional Network is realised with the individual public authorities from the municipalities with extended competence and municipalities having municipal authority with delegated competence. The individual parameters of the social services are evaluated, uncovered needs in the territory and development plans are identified. The provision of social care for citizens is a self-governing competence of individual municipalities, therefore negotiations are realised with representatives of both the local administration and elected self-governing bodies. The process of defining the SGEI in the Regional Network is illustrated in Figure 1.

**Figure 1 - Process for defining the SGEI in the Regional Network**
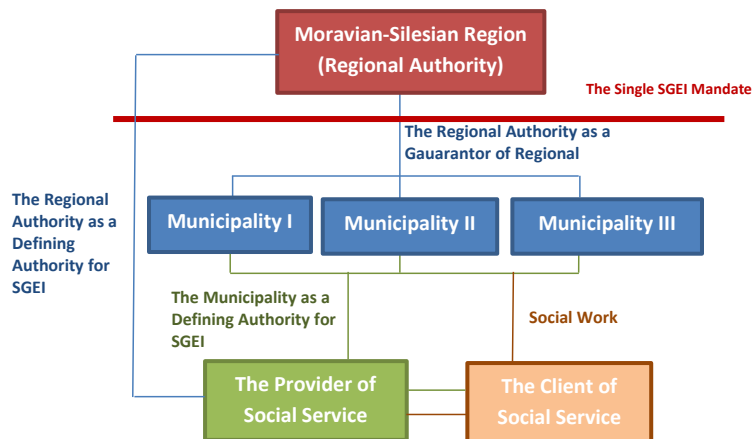
Source: Own processing

The priority of the regional authority is to support the caring persons and to cover 100% of its territory with an accessible field social care service. Of course, this does not automatically mean stagnation or a reduction in the capacity of residential social services. In residential services, the preference is to provide the service in the least restrictive environment, preferably community-type, which should respect the individual needs of its users. An emphasis is placed on maintaining self-sufficiency and the possibility of using natural resources for as long as possible. This is also why the process of transformation of large-capacity residential services has been implemented in the region for a long time (for more details see Main reform processes in the provision of social care services in the MSR). The above also corresponds to the structure of the number of users in the individual types and forms of social services according to the degree of dependence on care (see Figure 2). In the ambulant and field form of provision, the largest share of users is in level II and III of dependence (29.1% in level II, 26.8% in level III), in the residential form, the largest share of users is in level IV and III of dependence (36.5% in level IV, 34.6% in level III).

The whole process is affected by the unfavourable demographic development of the Czech Republic. Although seniors are not the only age category of social care services, they are clearly the largest group. Population forecasts in the Czech Republic show, as in all European Union countries, that the population is ageing. The increase in the number of elderly people will necessarily be reflected in an increase in the number of recipients of care allowances, as well as in an increase in the need for field, ambulant and residential social care services. It must be stated that the current system is not prepared for this demographic trend. [3] In terms of the forecast of demographic development until 2035, the number of inhabitants over 80 years of age in the total population of the Czech Republic will increase approximately twice, in the territory of the MSR this increase is 83.6% and is the third lowest among the individual regions. If by 2035 the capacity of residential facilities for the elderly (homes for the elderly, homes with special regime) remains the same as in 2020, then the availability of these services per 1,000 persons over 80 years of age in the Czech Republic would fall from 131.1 places in 2020 to 65.8 places in 2035. [3] In the MSR, it would fall from 143.6 places in 2020 to 78.1 places in 2035 and would be the second highest among the regions after the Ústí nad Labem Region (95.9 places), the lowest would be in the Hradec Králové Region (36.5 places. In order to maintain the same level of availability of these services as in 2020 by 2035, the capacity in MSKR would have to increase by **5,999 places** to 13,153 places. Therefore, on average, the capacity

of these services in each territory of the administrative district of a municipality with extended competence in the MSR should increase by 273 places in this period. [4]

Figure 2 - Estimation of the structure of users in social care services in the Regional Network according to the degree of dependence on care (2023)
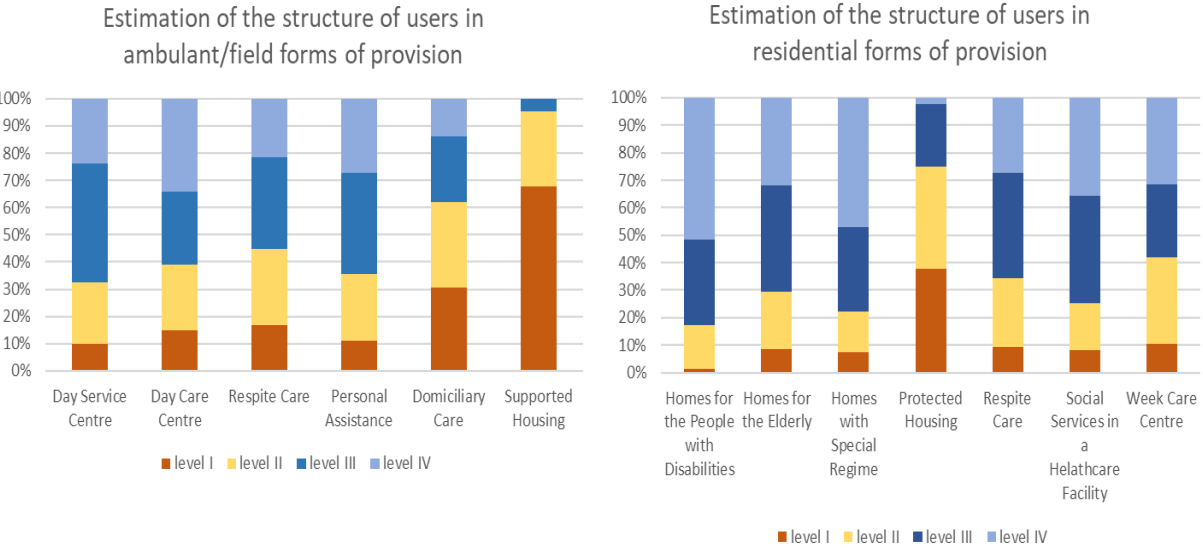
Source: Data from applications for subsidies from Chapter 313-MLSA for the year 2023. Own processing

For field social care services (personal assistance, care services, respite care provided in field form), the average number of direct care positions in the MSR is 3.83 per 1,000 inhabitants in the 65+ age category. If the same level of accessibility were to be maintained in 2035, the capacity of these services would have to be increased by **154.14 direct care positions** (on average 7 direct care positions in each territory of the administrative district of a municipality with extended competence in the MSR). It should be added that the above modelling works only with demographic developments and does not take into account some other factors, such as in particular the trend of increases in the number of people suffering from dementia or severe mental disorders [1]. On this basis, changes in the structure of the services provided can be expected in favour of services with a higher level of support, especially residential services, including adequate coverage of qualified and motivated staff in direct care (for more details see Staffing of social care services in the MSR).

4 Optimalisation of social care services in the Regional Network

One of the key challenges that the Regional Authority will continue to address is the gradual optimalisation of existing services in the Regional Network. The Region Authority has two tools for this - as already mentioned above, negotiations with public contracting authorities to revise the Regional Network during the updating and continuous evaluation of the Medium-Term Plan in order to assess the availability and need for social services and the implementation of controls on the fulfilment of the parameters defined in the SGEI obligation for social service providers included in the Regional Network (within the framework of the mandate to provide SGEI).

As part of the process of the Medium-Term Planning of social services, models of the optimal functioning of individual types of social services are created and continuously updated on the basis of discussions with social service providers and developments in practice. These models include optimal staffing in direct care in relation to the target group, material and technical standards, time availability of the service, optimal ratio of direct and indirect work, workload/occupancy of the social service, networking of social services with each other and with follow-up services, etc. The models represent the target form of social services in the Regional Network, where the services are directed through the methodological action of the Regional Authority (the Regional Authority also realises methodological support for selected types of social services within the ESF-supported projects, where the selected social services are directed to the form defined in the social service model, and during the controls of the parameters of the Regional Network recommendations are proposed to providers to modify the provision of social services so that they are in line with the defined models). The core parameters with a link to the quality of the

provided service are gradually becoming mandatory criteria for entering the Regional Network with the status of "basic", i.e., they become a necessary condition for subsequent systemic financing from Chapter 313-MLSA of the state budget.

In the current Medium-Term Plan proposal for 2024 - 2026, the mandatory criteria are:

- minimum staffing standard for direct care workers in residential social care services - homes with special regime, homes for the elderly, homes for people with disabilities, for the entry of new capacities of social services into the Regional Network,
- material and technical standard - a maximum of double rooms and a minimum proportion of single rooms, specification of social facilities according to the characteristics of the service provided (household, individually situated rooms, the so-called cell system), for the entry of new capacities of residential social care services into the Regional Network (with the exception of homes registered exclusively for the target group of homeless persons),
- minimum size of social service in ambulant/field form of 1 full-time direct care position.

A new indicator of occupancy for residential social care services, expressed as a minimum percentage of occupancy, i.e., the average occupancy of bed capacity by a client in a residential service, has been set in the new Medium-Term Plan proposal . This indicator serves as a basis for evaluating the fulfilment of the SGEI obligation. It is expected that these indicators will be extended to ambulant and field services in the coming period. The emphasis in the optimalisation of the existing social care services in the Regional Network is on covering the needs of the territory. There is a network of field services throughout the region, the issue is the sufficiency of capacity, where there is a constant increase in the number of direct care positions of field social care services. Between 2020 and 2022 there has been an increase of 14.9 direct care positions in the Regional Network for nursing services and 11.7 direct care positions for personal assistance and these are the largest capacity increases in the Regional Network in general.

In terms of residential services, there is a lack of capacities for some specific target groups, such as clients with mental illness with atypical behavioural manifestations that require special care (so-called dual diagnoses, see below "Main reform proceses in the provision of social care services in the MSR") and in some areas residential services for the target group of homeless persons (especially homes with special regime). Insufficient capacities of residential social services are generally reported, but it can be stated that the coverage of the region with bed capacity is currently sufficient, e.g., the availability of residential services for the elderly (homes for the elderly and homes with special regime) in the Moravian-Silesian Region is about 12.5% higher than the national average (Czech Republic = 131.1 places per 1.000 persons over 80 years of age, MSR = 143.6 places). [4] As already mentioned above, the data reported by social service providers as the number of rejected applicants for capacity reasons are distorted, especially by the duplication of applicants for several services in the region, or citizens from other parts of the republic, and because of hidden reserves in the existing network of ambulant and field services.

It seems crucial to set up a system of ambulant and especially field social care services so that care can take place in the home environment for as long as possible without the need to use residential social services. The current network of ambulant and field social care services in the MSR is mainly dealing with the problem of time availability, where there are still providers who provide services 8 hours a day from Monday to Friday. Furthermore, it is crucial to be linked to home care, to the emergency care system, or to use similar technologies such as SOS bracelets. At the moment, the region is monitoring these aspects, especially in cooperation with public authorities and social service providers. The problem of maintaining the number of informal carers is also a challenge for home care, especially due to the inefficient care allowance in the Czech Republic, which does not allow for the full compensation of income from employment in cases where it is not realistic to work while informally caring (this also reflects the unwillingness of some employers to accept part-time employment due to the informal care of a family member). Informal care is also highly demanding on the psyche of the caregiver, therefore the Regional Authority has long supported the work of self-help groups and other activities to support informal care (currently, for example, within the Supporting Heroism that is not visible III project).

For residential services, the main challenge is to address health care, especially in relation to the increasing need for health care in social services, the insufficient number of health personnel and the problematic efficiency of reimbursement for health services from health insurance companies. It is also the development of existing services in terms of adapting to changing clientele, e.g., the previously mentioned increase in the number of people with mental disorders among social care clients, in residential services the elimination of people whose needs, due to

long-term negative health conditions, correspond to level I or II dependence on care, for whom care can be managed in the home environment with the help of ambulant or field social and health services.

5 Main reform processes in the provision of social care services in the MSR

The Regional Authority has been implementing a long-term transformation process of residential social services, which leads to improving the quality of life of people with disabilities, especially on the basis of the strategic material Concept of Quality of Social Services in the Moravian-Silesian Region (including the transformation of residential social services). The transformation as a systemic change took place in 2008, but since 2003 materials, documents and pilot projects have been prepared. As part of the regional social care service transformation, three castles were abandoned, namely the Hošťálkovy Castle, the Jindřichov ve Slezsku Castle , the Nová Horka Castle and the Opava Monastery. By 2020, more than 40 investment projects had been completed, which brought improvement in the quality of life to more than a thousand people with disabilities living in the MSR. The total cost of the project was CZK 800 million. The last castle in Dolní Životice, where 75 people with mental and combined disabilities now live, is being prepared for abandonment. In relation to the implemented transformation process, it is necessary to react by creating new social services enabling care in the most natural environment, such as small capacity homes with a special regime of a community type, small protected housing, supported housing, etc. The implemented change also increases the requirements for quality direct care staff and the increased need for financial resources for the provision of the transformed services (the cost of providing a bed in a small specialised social service is much more expensive than the cost of providing a bed in a large-capacity institutional-type home).

The second main reform process impacting on the provision of social care services is the reform of psychiatric care in the Czech Republic, based, among others, on the Strategy for the Reform of Psychiatric Care (Ministry of Health of the Czech Republic, 2013) [5] and the National Action Plan for Mental Health 2020-2030 [6]. The main tools for achieving the goals are restructuring the system of services (both health and social), creating a functional network of these services and changing the approaches and mindsets of care workers. The Regional Authority is continuously developing a sub-network of services for people with mental illness in the Regional Network; 3 specialised mental health centres ("MHC") and 1 multidisciplinary team for children and youth ("MDT", as a precursor of a full-scale MHC) have been established in the main centres of the MSR.

The MHC operates on the basis of cooperation between the health service and the social prevention service in the form of social rehabilitation, MDT in cooperation with the social activation service for families with children. According to the standard of care in the MHC [9], it is assumed that the MHC will care for approximately 320 clients per 100,000 inhabitants, which corresponds to 3.2 per-milles of the population. To reach this standard, there would need to be 11 - 12 MHCs in the MSR. The estimated number of people with dg. F2, F3 and F42, F60-61 with 3rd degree disability pension, i.e., with a serious course of the disease, according to recommendations of the MLSA for the transformation of services for people with mental illness [2], is over 3,000 in the MSR. If the Regional Authority wanted to achieve this standard, it would have to ensure the necessary staffing and financial sustainability. These social prevention services must be complemented by a network of social care services.

In terms of the type of social service provided, the main service for the care of people with mental illness is a home with special regime. Most of them provide care for people with various forms of dementia (about 1,800 clients projected for 2023, according to data from applications for subsidies from Chapter 313-MLSA). Some of them specialise in providing support to people with serious mental illness (approx. 140 expected clients for 2023 in specialised facilities, according to data from applications for subsidies from Chapter 313-MLSA). Another residential service for clients with a lower intensity of support is the sheltered housing service. It is also a priority for the Regional Authority [10] to focus on supporting this target group in its natural environment for as long as possible, health permitting (similarly above in Optimalisation of social care services in the Regional Network). In this respect, services such as independent living support, personal assistance, respite services are key. In view of the ongoing transformation of the Opava Psychiatric Hospital, it is necessary to develop social services that can provide care for people who stay in hospital for a long time without any medical reason.

Since 2020, the capacity of supported housing in the Regional Network for this target group has increased by 3.1 direct care positions, social rehabilitation as a social prevention service has increased by 31 direct care positions (including MHC), the social activation service for families with children in MDT by 5.5 direct care positions, from residential services there was an increase in sheltered housing by 22 places, in aftercare services by 13 beds, and the capacity of homes with special regime and homes for people with disabilities is gradually being built (the provision of at least 24 beds is expected to start in 2023, with project preparation for others being approved).

However, it is not only about building new capacities, but mainly about increasing the competencies of direct care staff in the field of care for people with mental illness, e.g., focusing on people with cognitive deficits, people with serious mental illness (SMI), people with neurotic problems and strengthening the staff of ambulant and field services for people with atypical behavioural symptoms requiring specific support. This is also key to ensuring the needs of informal carers.

6 Staffing of social care services in the MSR

In the long term, the biggest problem is ensuring social care services with an adequate number of quality and stable staff in direct care, especially in remote parts of the region (Osoblažsko, Vítkovsko, etc.) and for the target group of persons with higher care requirements (especially persons with mental disorders, with atypical behavioural manifestations). This problem is more significant in the case of private organisations that remunerate their staff with wages. In contrast to local authority contributory organisations, which remunerate salaries by using regulated salary scales, they are unable to offer competitive remuneration for the same workload.

The reason for this is certainly the amount of public finance available to providers to cover the operating costs of social services. Contributory organisations are backed by their founders, who cover losses from their budgets, while private non-profit organisations depend on allocated annual subsidies. This financial uncertainty and the absence of legally obligatory remuneration standards in the private sector results in a continuously-widening gap between wages and salaries, but also between the range of employee benefits that social service providers are able to offer. For illustration, Figure 3 shows the distribution of average annual wages and salaries (including health and social insurance contributions) per full-time position in social care services provided by contributory organisations of the Regional Authority (MSR), contributory organisations of municipalities (M) and private organisations (mainly non-governmental non-profit organisations, NGOs) assumed for the year 2023. The median values in contributory organisations of the Regional Authority are CZK 585,402, in contributory organizations of municipalities CZK 568,141 and in private organisations CZK 523,771. The higher values achieved in the contributory organisations of the Regional Authority are also influenced by the difficult target group of service clients, which also require higher salaries for direct care workers.

In the context of the above-mentioned predictions on the development of social care services, the problem of a lack of direct care staff will become even more acute. If it is stated above that by 2035 an additional 5,999 places in homes for the elderly and homes with special regime will be needed in the MSR, there would have to be an increase in direct care staff (according to the currently set minimum staffing standard for the new capacities to be included in the Regional Network) in the amount of approx. 150 full-time social worker positions and approx. 2,400 full-time social service worker positions, i.e. a total of approx. 2,550 full-time direct care workers positions. With the above modelling of field social care services, there would have to be an increase of about 155 full-time direct care worker positions by 2035. In order to maintain the current availability of social care services for the elderly (the largest target group of social care services in the MSR), there would have to be a **total increase of at least 2,705 full-time direct care worker positions** (excluding the necessary health care staff in residential services).

Figure 3 - The distribution of average annual wages and salaries per full-time position among social care service providers in Regional Network in the year 2020 (in CZK)
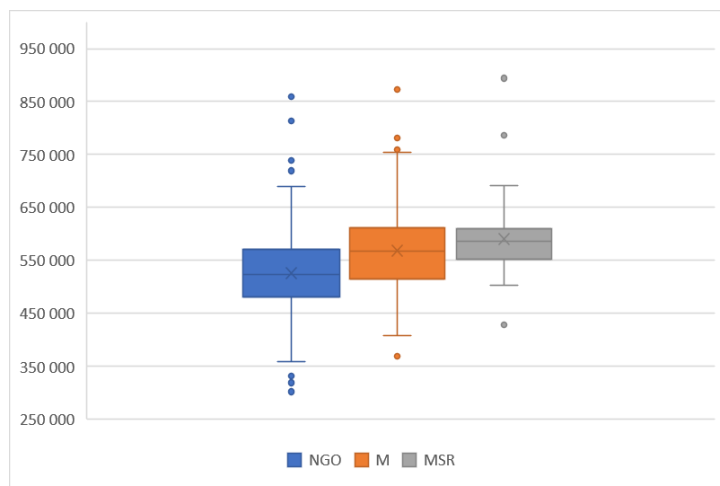
Source: Data from the internal MLSA's database OKslužby-poskytovatel. Own processing

There is a clear need to take steps to keep the existing qualified staff and increase the attractiveness of the profession. The Regional Authority is involved in project activities that target this issue, e.g., within the international project 2020-1-CZ01-KA202-078220 Supporting attractiveness of health and social care professions in regions (SHAKER) within Erasmus+ to exchange experiences and share good practice within partner regions in FR, PL, CZ and NL to increase awareness of social and health professions and the attractiveness of their studies [4]. Cooperation in this area is also established with the School of Social Sciences in Ostrava and a Memorandum of Cooperation with the University of Ostrava.

7 Financing the operating costs of social care services in the MSR

The system of financing the operating costs of social care services in Regional Network is based on two main sources, namely financial resources from Chapter 313 - MLSA of the state budget redistributed through the regional subsidy ("subsidy from Chapter 313 ", a share of approximately 40% of the projected resources in 2023) and payments from users of social services (including the care allowance, a share of approximately 35.6% of the projected resources in 2023). The subsidy requirements of social service providers from Chapter 313 for 2023 are in the amount of CZK 2.773 million; the subsidy is distributed by the Regional Authority in two rounds, with the core part of the subsidy being distributed in the regular round in March and a reserve (max. 5% of the subsidy allocated to the MSR from the state budget) primarily to cover the costs of new capacities in Regional Network or extraordinary needs of the year, which is distributed in September. Currently, CZK 2,246 million is provided for social care services, which represents approximately 81% of the social care providers' requests. Table 2 shows the percentages of the main sources of financing for the operating costs of social services by legal form (contributory organisations of the Regional Authority, contributory organisations and other organisations of municipalities - M, other private organisations - NGO). Social care services represent the largest amount of operating costs of social services in the Regional Network, and they receive the largest amount of subsidies from Chapter 313 (for 2023 the expected costs of social care services represent 85.6% of the total operating costs of social services in the Regional Network, subsidies to social care services currently represent 79.4% of the total subsidies provided from Chapter 313 to social services in the Regional Network). Personnel costs are the largest part of the operating costs of social care services, accounting for 62.7% of the planned costs in the year 2023.

Table 2 - Planned proportion of resources for financing social care services in the Regional Network in 2023 (in %)

Legal Form	Payments from Users	Chapter 313 Subsidy	Municipal Budget	Payments from Health Insurance Companies	Regional Budget (except Chapter 313 Subsidy)	Other Sources
MSR	35.2	39.0	0.3	4.6	6.3	14.6
NGO	31.9	36.3	8.9	5.8	2.2	14.9
M	38.5	27.5	22.3	4.6	0.0	7.2
Regional Network (total)	**35.6**	**33.2**	**12.4**	**5.0**	**2.3**	**11.5**

Source: Data from applications for subsidies from Chapter 313-MLSA for the year 2023. Own processing

The redistribution of the subsidy from Chapter 313 is within the self-governing competence of individual regions, which are bound by the terms of the Decision on the provision of subsidies from Chapter 313 - MLSA of the state budget to regions. These conditions represent the basic framework, but the regional authorities are given some freedom to set their own rules (they must be approved by the MLSA). After the transfer of financing from Chapter 313 to the regional authorities in 2016, a system of calculating the subsidy in the MSR for a specific social service is based on the previous year's subsidy (to maintain the year-to-year continuity of financing and stability of the social service). [8]

The same subsidy per bed/direct care positions in each type of service is not guaranteed. For this reason, a class system is set up in each type of social service, whereby the percentage of the Chapter 313 subsidy in the previous year is calculated for each service on the established normal costs according to the capacity in the Regional Network (the maximum allowable operating costs for the calculation of the compensation announced in Chapter 313 subsidy programme for the relevant year) and then the average percentage of the Chapter 313 subsidy in that type of service. According to the deviation between the percentage of a specific service and the average percentage in a given service type, the services are classified into 5 classes, with Class 1 being the service with the lowest percentage of subsidy (the largest negative deviation from the average) and Class 5 being the service with the highest percentage of subsidy (the largest positive deviation). The purpose of the classes is to gradually converge the subsidy per direct care bed/direct care positions in the Regional Network in a given service type (see Conditions

of the subsidy programme for the support of the provision of social services financed from Chapter 313 - MSPV of the state budget in the MSR for more details).

According to the classes, the allocated amount for a specific year is divided among providers, with approximately 3% of the allocated amount per year left for so-called individual assessment, when social services are favoured according to the priorities in the MSR (see chapters above) and the extraordinary needs of social services in a given year (e.g., extraordinary repairs). In 2023, services responding to the psychiatric care reform, transformed services with a difficult target group, and field social care services operating in a larger area, were individually assessed. In addition, the Regional Authority annually announces a subsidy programme for private non-profit organisations to support the provision of social services (for 2023 in the amount of CZK 80 million), in the primary purpose of financing personnel costs. For service providers in the Regional Network (except for contributory organisations of the Regional Authority), a subsidy programme is announced to support the quality of social services, which is partly intended to support investment activities (for 2023 in the amount of CZK 40 million).

This system encounters in particular the difficulty of the unpredictability of financial resources, both for the Regional Authority as administrators of the Regional Network and for the providers of social services. The annual determination of the allocation from the state budget does not allow for adequate financial planning, and the deadline for the MLSA's decision on the allocation of subsidies to the regions (usually January of the current year) does not allow the Regional Authority to distribute the subsidy to social service providers before the beginning of the year. Thus, providers are faced with uncertainty about how much funding they will receive from the Chapter 313 subsidy and with the problem of ensuring cash flow at the beginning of the year. To ensure cash flow early in the year, the Regional Authority provides repayable financial assistance from its Social Services Fund to non-profit private organizations in the Regional Network.

The annual determination of the allocation in the state budget without any automatic valorisation is dependent on annual government negotiations, not always reflecting legislative changes in salaries, inflation, or capacity increases in regional networks, etc. The allocation is distributed among the regions by a historically established indicative number set out in the Annexe to the Social Services Act. Also problematic is the yield of reimbursements from health insurance companies (the provider is not sure in advance whether and when the health service will be reimbursed) and the share of resources from municipal budgets in the financing of services in the Regional Network (there is no legal obligation for municipalities to finance social services, which is why the Regional Authority set the rules of the mandatory share of municipal subsidies in the financing of social services, see the Medium-Term Plan for the inclusion of services in the Regional Network and the penalty for an unjustified year-on-year decrease in the municipal subsidy when calculating the draft subsidy from Chapter 313). In addition, everything is complicated by the necessity of financing social services in the form of a compensation payment with the annual evaluation of avoiding overcompensation (the annual evaluation is required by the MLSA), when social service providers in the Regional Network obligated to provide SGEI are not allowed to generate a profit (due to the unequal conditions of social service providers, the Regional Authority does not allow profit under the set conditions of compensation payments for SGEI).

8 Conclusion, results and discussion

Social care services are the largest area of social services in the Regional Network (in terms of the number of clients, employees and operating costs). The Regional Authority is dealing in the provision of these services with the main challenges, which are currently problematic financing, the absence of legally obligatory remuneration standards for workers in direct care in the private and public sector, and the reform of psychiatric care. In the long term, the social service delivery system must solve the unfavourable demographic trend of population ageing, to which it is currently unable to respond, and consequently the unsustainable financing system and the lack of qualified staff. [13]

The MLSA, as manager of the social service sector, is aware of these problems and has long been encouraged to act by the Association of Regions of the Czech Republic, the Association of Social Service Providers of the Czech Republic, the scientific community and other actors. According to the plan of legislative works, key legal arrangements are being prepared, which should resolve the aforementioned problems – especially the planned amendment to the Act on Social Services, which is to set a new system of financing social services (including criteria for the availability of social services in the territory), the new Profession Act, which will unify the remuneration of social workers and workers in social services in direct care in the private and public sector and ensure decent wages/salaries for them and the currently prepared proposal of a law on long-term social-healthcare, with the new system of payment from health insurance companies. It seems crucial to designate the funds intended

to finance social services from the state budget as a mandated expenditure and to provide them at least in a three-year perspective. [12] These legislative proposals have ambitious assumed terms of validity and effectiveness, the MLSA organises working groups with stakeholders and key actors in this area, but the regional authorities have not yet been introduced to a clear idea of the new system. The main frameworks of these amendments to the Act on Social Services and the new Profession Act are planned to be completed in the middle of this year.

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What is the impact of higher representation of women in leadership positions in municipal politics? An analysis of the determinants of transparency in Slovak local governments

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Abstract: This paper examined women's contribution and change to municipal politics, especially regarding local municipalities' transparency level. The theoretical part discusses the representation of women in municipal politics and their impact on municipalities' transparency, efficiency, and competitiveness. The analytical part analyses the determinants of transparency in the 100 largest municipalities in Slovakia from 2010-2022. Results show that EU countries with higher representation of female mayors are less prone to corrupt practices. However, in the largest municipalities in Slovakia, the influence of the gender of the municipality's chief executive has not been shown. The size of the municipality, the proportion of the population in the post-productive age group, the political orientation of the municipal leader, and voter participation in municipal elections can be considered determinants of transparency in these municipalities over the analysed years.

1 Introduction

Women have long been under-represented in leadership positions in politics in many countries. The number of women in representative bodies tends to be inversely proportional to the centrality of the institutions, with the number increasing as the transition from the national to the local level is made (Carbone and Farina, 2020). This paper aims to analyse the impact of higher female representation on changing the political environment and the content of proposed policies. What changes can be expected? Does a higher representation of women in politics tend to change legislation to be more open to women, families, or children? Or how does the higher representation of women affect the level of transparency and effectiveness of local governments?

From a democratic perspective, transparency and the associated dissemination of information are crucial to the participation of different social groups in decision-making. We will focus on the local level because decisions taken at this level directly impact citizens' lives (Björkdahl and Somun-Krupalija, 2020). The main objective of this paper is to analyse the determinants that influence the level of transparency of the 100 largest cities in Slovakia. Previous research suggests that countries with more women in politics may be less prone to corrupt behaviour. For this reason, we extend the current research by Slovak authors by asking whether the gender of the top city official has a significant impact on the level of municipal transparency while we also seek to uncover other factors that are key in municipal transparency.

2 Women in municipal politics: their contribution and the changes associated with increasing their representation in the politic

Author Drude Dahlerup, who has been working on the topic of gender equality in politics since the 1970s, has identified several areas that can be influenced by increasing the representation of women in politics. They ranged from their empowerment in the political sphere to changes in reactions to women politicians, changes in political discourse and political culture, changes in policy decisions and changes in performance and effectiveness (Dahlerup, 1988). However, she focused on women's representation at the national level; we aim to examine primarily the local government level. According to several authors, women's representation at the parliamentary and governmental levels has been thoroughly researched, but analysing local government may help fill the research gap (Medir et al.,2022; Maškarinec and Klimovský, 2017). Several authors, such as Sundström and Wängnerud (2018), view the exploration of this issue as a 'blind spot', with most elected politicians and politicians serving mainly in local councils rather than parliaments. It is crucial to thoroughly investigate the notable implications of

increased female representation in the administration of local governments. This exploration is critical due to the growing importance of local governments within a multilevel governance system (Medir et al., 2022).

The question then arises, what changes can we expect as women's representation at the local government level increases? Furthermore, what impact does the gender of the chief executive of a municipality or city have on local government governance?

Increased representation of women in local government as mayors may influence how local government spending is allocated. Women mayors may tend to spend more on 'traditionally female' issues compared to men, where education, health care, and social assistance fall. Conversely, less money goes to transport and urban development. In this way, women in local politics strengthen the substantive representation of their female constituents as they address issues primarily associated with women (Funk and Philips, 2018). Councils governed by women mayors tend to have lower annual interest and debt repayment obligations, thereby contributing to the economic efficiency of municipalities and cities. They also spend more on security and social support (Hernández-Nicolás et al., 2018).

Women in leadership positions in municipal government are more likely to design policies linked to women's interests and needs (Smith, 2014). Despite a growing number of studies showing that women in political office represent more women's issues than men (Alberti, Diaz-Rioseco and Visconti, 2022), some studies have found no significant differences in the policies implemented by male and female mayors (Vasarico, Lattanzio and Profeta, 2022; Ferreira and Gyourko, 2014; Geys and Sørensen, 2019), and differences in the distribution of finances within local governments have not been confirmed (Ferreira and Gyourko, 2014). The different results on the role of women in policymaking can be explained through limited opportunities for implementation due to political party affiliation, or that gender differences in policymaking are gradually erased during post-election bargaining between male and female politicians, or that the policy preferences of men and women may not even differ across the population (Funk, Gathmann, and Gathmann, 2015).

At the same time, a positive relationship between the presence of women in government and improved performance has been demonstrated (Opstrup and Villadsen, 2015; Brudney, Hebert, and Wright, 2000). At the local level, there has also been a positive relationship between the presence of women and the effectiveness of municipalities, but only if the number of women on the council is relatively high. If women's representation is low, the strength of their voice and personal characteristics decreases, negatively affecting effectiveness (Ríos, Guillamón and Cuadrado-Ballesteros, 2022b). However, gender equality per se, according to the findings of other authors, may not have a positive impact on the level of effectiveness of local government. A. M. Riós and colleagues (2022a) found that more sustainable municipalities regarding gender equality and women's rights are also less efficient. This may be due to the prioritisation of gender policies, which affects the actual allocation of municipal expenditures. This can lead to increased spending at the expense of efficiency.

Another benefit often discussed at the national level is the link between corruption, the level of transparency of the state and the political leader or representative. Countries with more women in government may be less susceptible to corrupt behaviour. At the same time, according to analyses, women are less likely to engage in bribery than men. Also, in hypothetical situations, women are less likely to endorse corrupt behaviour. (Swamy, et al., 2001). Hovever, the number of years in political office is hypothesised to be associated with more significant opportunities to engage in immoral practices. By being relatively new to the policymaking process, female politicians' unfamiliarity with corruption networks may account for their lower involvement in corrupt practices (Klašnja, 2015). Do we observe similar patterns at the local government level?

Although interest in transparency policies and the need for gender mainstreaming is growing, the intersection of these areas continues to receive little attention from the scholarly community (Pano et al., 2022). According to several authors, the increasing representation of women in local governments contributes to increasing information transparency and reducing information asymmetry (Araujo and Tejedo- Romero, 2016). Patterns have also been shown at the local government level and the national level, as female mayors are less prone to corrupt behaviour compared to male mayors (Brollo and Troiano, 2016). Other authors dealing with this issue in Portugal are also inclined to this claim, adding that municipalities led by mayors with a greater number of consecutive terms show lower levels of transparency (Tavares and da Cruz, 2014).

3 What factors influence the level of transparency in municipalities and cities?

Interest in public accountability and transparency in government is growing globally. Transparency reduces the likelihood of corruption, creating better conditions for economic growth, development, and efficiency, which positively impacts public administration's functioning. However, research has primarily focused on the national

and regional levels with less attention on local government (Sol, 2013). Municipalities and cities play an essential role in promoting transparency as they are responsible for the management of public resources, the decision-making processes that are concluded at the local government level and finally, ensuring public access to information that can encourage citizen engagement and participation in governance (Borry, 2012). Increasing the level of transparency can positively impact building citizens' trust in government and strengthening community relations. In this subchapter, we analyse the determinants that influence the level of transparency in local governments.

Focusing on the variables analysed in previous research, Tab. 1 provides an overview of the determinants examined when analysing the level of transparency in municipalities and cities. The authors classify the studied determinants into several groups, such as Sol (2013) socio-demographic, fiscal, economic, and institutional. Among the most frequently studied determinants we can include:

- the size of the municipality (Guillamón et al.,2011; Caamaño-Alegre et al.,2011; N. Ribeiro, et al.,2017; E. Sičáková - Beblavá, et al.2016; Tavares and Da Cruz, 2014),
- unemployment rates (Guillamón et al., 2011; N. Ribeiro, et al.,2017; E. Sičáková – Beblavá, et al., 2016),
- level of education (N. Ribeiro, et al.,2017; E. Sičáková - Beblavá, et al.,2016; Tavares and Da Cruz, 2014),
- population participation in elections (Caamaño-Alegre et al., 2011; E. Sičáková - Beblavá, et al., 2016; Tavares and Da Cruz, 2014),
- mayoral ideology (Caamaño-Alegre et al., 201; N. Ribeiro, et al., 2017; Tavares and Da Cruz, 2014; Sol, 2013).

Several studies have also investigated the education, gender, or age of the mayor (Guillamón et al. 2011; Sol, 2013; Tavares and Da Cruz, 2014). Other authors have looked at the age of the population, examining the proportion of older adults in the municipality or the population's average age (N. Ribeiro et al., 2017) and at the financial transparency of the municipality, examining variables such as the municipality's debt, the municipality's public expenditures, or the municipal budget balance (Brás and Dowley, 2021).

Table 1 – Determinants of municipal transparency

Socio-economic factors				
Municipality size	Income per capita	Uneployment rate	Number of people aged 15 to 74 who use the internet	Education level
Population ageing index	Average age of the population	Purchasing power	IT area employees	Share of older people
Index of economic activity	Tourism Activity Index	Tax revenue per capita	Transfers per capita	Population density
Political and institutional factors				
Political ideology	Herfindahl 's index	Share of women in the city council	Gender of the mayor	Voter turnout in local elections
Percentage difference in municipal election victories	Number of political parties	Left-wing ideology	Incumbent coalition	Age and education of the mayor
Fiscal factors				
Municipal budget balance per capita	Municipal public expenditure to GDP per capita	Financial autonomy	Debt	Municipal deficit per capita

Source: own elaboration based on literature

4 Methodology

The paper's main objective is to reveal the key factors influencing transparency in Slovakia municipalities. The analysis is complemented by examining the interdependence between the representation of women mayors in municipalities and cities and the level of transparency, efficiency, and competitiveness. The situation of the Slovak Republic is set in the context of the European Union countries. The paper aims to explore the correlation between the presence of women mayors and the level of municipal transparency. We draw on previous research by other authors and hypothesize that municipalities that female mayors lead exhibit higher levels of transparency.

The first step is to analyse the relationship between the representation of women in municipal leadership and competitiveness indicators in EU countries using Pearson's correlation coefficient to reveal possible correlations.

The second part of the analysis focuses on the Slovak Republic and aims to reveal the determinants of transparency of the 100 largest municipalities between 2010 and 2022.

The analysis is limited to examining the 100 largest cities in the Slovak Republic, as Transparency International's transparency assessment of Slovak municipalities provides only these data. This sample is diverse, and we base our description of data from the Statistical Office of the Slovak Republic for 2022. In terms of city size, the range is from 8 348 inhabitants (Veľký Meder) to 475 000 inhabitants (Bratislava). The cities also differ in population density, with the most populous of the sample being the Košice KVP district (12 385 inhabitants/km^2) and the least populated city being Kolárovo (98,71 inhabitants/km^2) (Statistical office of the Slovak republic, 2023). The transparency rating of municipalities itself takes values ranging from 35 (Nová Dubnica) to 88 (Partizánske) (Transparency international Slovakia, 2023). The OLS model allows to reveal statistically significant indicators of the transparency of Slovak municipalities.

In examining the relationships between the representation of women in local government leadership positions and perceived corruption, government effectiveness, and country competitiveness, we draw on the results of several international indices using the Pearson correlation coefficient and the most recent data available. The level of corruption in the is represented by the Corruption Perceptions Index (CPI), where the higher a country's score, the more transparent the country is and the lower the level of corruption. In other words, countries with the lowest levels of corruption have the highest scores (Transparency International, 2023). The index takes values from 0 to 100. The competitiveness of EU countries is analysed using the World Competitiveness Ranking, with the best-performing country scoring 1 and the least competitive country scoring 63. Government effectiveness is analysed through the Government Effectiveness Indicator, part of the World Competitiveness Ranking, taking values from 1 to 63 (International Institute for Management Development, 2023). The percentage of female mayors in EU countries is analysed for 2022 based on data available in the European Institute for Gender Equality (EIGE) database. All EU countries are examined except Malta due to this country's unavailability of CPI results.

Based on the results of other authors and theories regarding women's representation in the political sphere and their impact on the political environment and culture, we make several assumptions:

- We assume a positive relationship between women's representation in mayoral offices and the level of competitiveness and efficiency of a country.
- We assume that countries with higher levels of gender equality in municipal politics will have lower levels of corruption.

The analysis of Slovakia's level of transparency between 2010 and 2022, using a regression model, builds on the findings of Sičáková, Beblavý, Kolárik, and Sloboda (2015), who analyse the determinants of transparency between 2010 and 2014 in their paper. In doing so, they examined the level of transparency, party affiliation, political competitiveness, internet usage, unemployment and education levels, local government size, and whether the mayor holds office for at least two terms. Their results show increasing levels of transparency over the years, with municipality size and incumbent mayors emerging as statistically significant factors. In this paper, we extend the analysis to the characteristics of the mayor, analyse the impact of his/her gender on the level of local government transparency, and extend the model to include several demographic variables such as the average age of the population, the proportion of the population that is post-working age, and population density. We also rely on the arguments of other authors who consider an active civil society, and thus the participation of residents in local elections, as a crucial factor influencing the transparency of local government. All years during which the transparency index of the 100 largest municipalities was constructed are analysed, i.e. 2010, 2012, 2014, 2016, 2018 and 2022. In the case of 2022, several explanatory variables from 2021 are used. Table 2 shows the variables studied, their units of measurement and their expected impact on municipal transparency.

Table 2 - Determinants of transparency in Slovakia - variables analysed

Variables		Abbreviation	Unit of measurement	Expected impact	Source
Dependent variable	Transparency	Transparency	Scale 0-100	X	Transparency International Slovakia
Independent variables	Gender of mayor	Mayor_gender	0 – men 1- women	+	Statistic office of Slovak republic (ŠúSR)
	Proportion of the population of post-productive age	Elderly	%	Undefined	ŠúSR
	Municipality size	Municipality size	Number of inhabitants	+	ŠúSR
	Registered jobseekers	Job applicants	Number of inhabitants	Undefined	ŠúSR
	Average population age	Average population age	Average age	-	ŠúSR
	Population density	Population density	Person per km^2	+	ŠúSR
	Turnout in elections	Participation election	%	+	ŠúSR
	Party affiliation of mayor	Right wing	1-right-wing 0- other	-	ŠúSR
		Left wing	1-left-wing 0- other	+	ŠúSR
		independent	1-Independent 0- other	+	ŠúSR

Source: own elaboration based

Based on a study of the literature and the authors' previous results in this area, we put forward several hypotheses:

1. Municipalities led by a female mayor exhibit higher levels of transparency.

We hypothesize that women in city leadership positively affect the level of transparency (see results e.g. Brollo and Troiano, 2016; Tavares and Da Cruz, 2014). We also build on the results of Guillamon et al. (2011), which show that female mayors tend to engage less in corrupt practices, commit corrupt acts, and exhibit higher levels of transparency (Guillamón et al.,2011).

2. Leftist and independent city leaders positively influence the level of transparency of local governments.

In doing so, we draw on the results of other authors who find that leaders of left-wing parties tend to be more transparent (Guilamón et al., 2011; Grimmelikhuijsen and Welch, 2012).

3. Municipalities with higher voter turnout in elections are more transparent. (Guilamón et al., 2011).

We assume that greater citizen engagement may contribute to an environment conducive to local government officials' need for greater openness and transparency.

At the same time, we want to identify the impact of a higher representation of the population of post-working age on the level of transparency, as the authors' results differ. According to Esteller- Moré and Pol Otero (2012), Alt and others (2006) and Santiago and others (2010), fiscal transparency consolidates as the proportion of the population of post-working age increases; on the other hand, Albalate (2012) reports a differential impact of this population group on the level of transparency depending on the way transparency is assessed. There are also different views on the impact of unemployment on municipal and urban transparency. Some authors assume that the level of transparency decreases as the unemployment rate increases (Guillamón et al., 2011; N. Ribeiro et al., 2017), while others, such as Alcaraz - Quiles et al. (2014), believe that as the number of unemployed increases, the pressure on political leaders increases, forcing them to increase the transparency of the services provided and the information disclosed. The regression equation of the OLS model of transparency using the variables listed in Table 2 takes the following form:

$$Transparency = \beta_0 + \beta_1 mayor\ gender + \beta_2 Elderly + \beta_3 \text{ municipality size} + \beta_4 \text{ job applicants} + \beta_5 average\ population\ age + \beta_6 population\ density + \beta_7 participation\ election + \beta_8 right\ wing + \beta_9 left\ wing + \beta_{10} independent + u_t$$

We tried to avoid possible bias in the OLS analysis by verifying the assumption of normality (Jarque-Bera normality test), model specification (Bayesian information criterion), autocorrelation (Breusch-Godfrey general autocorrelation test) as well as heteroskedasticity (Breusch - Pagan test). Multicollinearity is tested using the variance inflation factor. The statistical significance of the model is verified by the F-test of statistical significance. Statistical significance is tested at a significance level of $\alpha = 0.05$.

5 Results

Calculation of Person correlation coefficients was used to analyse the correlation between the percentage of female mayors in EU countries and competitiveness, government efficiency and corruption in these countries. This was expected to show a positive correlation between female representation, competitiveness, and efficiency. We also predicted that countries' corruption levels will decrease as the number of women in mayoral positions increases. All values take on a moderate level of correlation. In comparison, the relationship between female mayoral representation and country competitiveness and government efficiency is negative. Our findings are similar to those of Riós and colleagues (2022a), who argue that gender equality can negatively affect the efficiency of local governments. Municipalities that exhibit higher levels of gender equality are also less efficient. This may be due to the prioritisation of gender policies that affect the allocation of municipal spending. This may lead to increased spending at the expense of efficiency. However, our assumption linked to lower levels of corruption in countries with higher representation of women in municipal politics was correct and is consistent with the results of other authors.

Table 3 - Pearson 's correlation coefficient results

	World Competitiveness Ranking (WCR)	Government efficiency	Corruption Perceptions Index
Share of female mayors	-0,58	-0,46	0,56

Source: Own elaboration

The OLS model analysed the determinants of transparency in the 100 largest Slovak local governments from 2010-2022. The model satisfies the normality assumption, while the problem of heteroskedasticity and autocorrelation was solved through HAC correction. The original model was burdened with multicollinearity. For this reason, the independent variable was removed. The goodness of fit of the variables used was verified through the Bayesian information criterion. Based on the results of this test, the variables analysing the gender of the mayor, her/his party affiliation to the right, population density and the number of registered job seekers were removed. We consider the proportion of the population of post-working age, the size of the municipality, the participation in the elections and the party affiliation of the mayor/mayor to the left-wing party as statistically significant variables. Statistical significance of the average age of the population was not found. The results of the tests of assumptions and p-values of the variables are presented in Annexes A1 and A2. The final OLS model and the impact of the variables on the level of transparency in local governments in Slovakia are presented below.

$$Transparency = 50{,}61 + 1{,}08\,\text{Elderly} - 0{,}167\,average\ population\ age + 4{,}62e^{-05}\,\text{municipality size} - 0{,}22\ participation\ election - 3{,}81\ left\ wing$$

Based on the above equation, the transparency of Slovak local governments is most negatively influenced by the mayor's party affiliation and the residents' participation in elections. The level of transparency is positively influenced by the size of the municipality and the representation of the post-working-age population. Our assumptions were met only in the case of municipality size.

6 Conclusion

Transparency is essential to good governance and plays a crucial role in building citizens' trust in local government. This paper aims to contribute to the analysis of this issue at the level of local governments and to deepen the understanding of the determinants of transparency in Slovakia while trying to find the intersection of this topic with the issue of gender equality in municipal politics. Although women continue to be underrepresented in political offices in many countries worldwide, it is possible to observe their positive influence on changing the political environment. EU countries with a higher representation of women as mayors are less prone to corruption and immoral practices. Since transparency and efficiency are the cornerstones of good governance, we analysed the determinants of transparency in Slovak municipalities. Among other factors, the effect of the mayor's gender on the level of transparency of local governments was analysed, but it was not statistically significant.

However, it is essential to note that the 100 largest local governments were analysed, and according to the results of Sloboda (2015), women hold the office of mayor mainly in small Slovak towns. This may explain the conclusions of Zagrapan and Spáč (2022), who focused on proactive transparency and, thus, providing data without prior request in the context of transparency of local governments in Slovakia. Their results suggest that women in municipal leadership contribute to increasing proactive transparency. Conversely, municipality size and the percentage of the post-working population were statistically significant variables that positively influenced the level of transparency of Slovak local governments. These results are in line with the findings of other authors. However, our assumptions were not fulfilled in the case of mayors advocating left-wing ideology and citizens' participation in local elections, as these variables negatively affect the level of transparency of Slovak local governments.

Although the use of regression analysis in examining the determinants of transparency allowed us to reveal statistically significant factors that influence the level of transparency in the largest municipalities in Slovakia, they do not directly determine the causal relationship between the variables under study. There are also significant differences in the strength of the relationship between the level of municipal transparency and the statistically significant variables. Even though the size of the municipality or participation in elections are statistically significant variables, their impact on municipal transparency is very low, especially in the case of municipal size. If the size of the municipality increases by one inhabitant, holding other variables constant, the transparency value increases by $4.62e^{-5}$. On the contrary, the variable left- wing political orientation of the mayor has the largest effect. The results suggest that if the mayor is of left-wing political orientation, holding other variables constant, the value of municipal transparency will increase by 3.81 points. However, it should be noted that municipal transparency is a complex indicator that is simultaneously influenced by many factors, which limits the explanatory value of the explanatory variables.

The paper analysis was also limited by the poorer availability of data for Slovakia, which is related to the number of municipalities subject to the transparency assessment. This limitation prevented examining the situation in smaller municipalities and towns, which are characterised by a higher representation of women in municipal politics. As shown in the theoretical part of the paper, the issue of transparency at the local level, not only in Slovakia but also in other EU countries, still offers many unexplored areas for researchers. One of the barriers may be the need for more data availability that would allow us to analyse the context in this area in greater depth.

Authors' views on the impact of gender on municipal transparency vary, and it would be helpful to explore this correlation through other forms of research. One of the options is analysing a variable that is available for a larger number of municipalities by considering several variables that portray the profile of the municipal leader, such as his/her education, length of time in office, age, or to analyse the impact of the gender composition of councils on the transparency of local governments. According to D. Dahlerup (1988), a critical mass of women in political institutions can lead to greater representation of women's interests and a more inclusive and democratic political process. The question is offered, can the representation of women in local councils be the key to positive change and, therefore, increase transparency in municipalities and cities? These questions will be the subject of our further research.

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Annex

Table A1 – Statistical significance of variables in the OLS model

	β standard deviations after HAC correction
Elderly	0,000549 **
Average population age	0,74036
Municipality size	$9{,}332e^{-07}$***
Participation election	0,003 **
Left wing	0,0004 ***

Note: meaning of stars: *p<0.05, **p<0.01, ***p<0.001

(Resource: Own processing based on outputs from RStudio)

Table A2 – OLS model assumptions

Model assumptions	Test	p-value	H0
Statistical significance of the model	F- test of statistical significance	0,302	Do not reject
Normality	Jarque-Bera test	0,065	Do not reject
Heteroscedasticity	Breusch-Pagan test	0,00374	Reject
Autocorrelation	Breusch-Godfrey test	$2{,}45e^{-14}$	Reject
Multicolinearity	Variance inflation factor	Values < 10	Do not reject

(Resource: Own processing based on outputs from RStudio)

Reimbursement of Regional Expenses from Transfers

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Abstract: The contribution is focused on the issue of the structure of revenue and expenditure of regions in the Czech Republic (CR). Transfers make up the decisive share of regional budget revenues and are supplemented by own revenues, i.e. mainly revenues from the tax sharing. However, the high share of the regions' revenue from transfers is reflected in varying degrees in the regions' expenditure categories. The goal of the contribution is to evaluate within the budgets of the regions, what share in covering their expenses is made up of own resources and, on the other hand, is made up of transfers. The use of transfers is different from use of own revenue in that they are designated only for a specified purpose. The structure of the regions' expenditures is monitored on the basis of the budget structure, where the application of the sectoral and economic classification of the breakdown of financial operations enables the performance of economic analyses. However, these two points of view are not applied to all financial operations, which does not make it possible to fulfill the goal of the contribution in the usual way. The connection of revenue from transfers with the expenses of the regions is therefore determined by the need to ensure the necessary set of data, which can only be provided directly by the individual regions. Based on specific data from the regions, the contribution evaluates the extent to which transfers contribute to expenses in the decisive expenditure categories of the regional budgets.

Keywords: Region, transfer, budget, revenue, expenditure

JEL Classification: H52, H71, H72

1 Introduction

Regional budgets are part of public budgets in the CR, which are one of the three types of territorial budgets (in addition to regions, they also include budgets of municipalities and budgets of voluntary associations of municipalities). From a regional level, the territory of the CR is divided into 14 regions. However, these regions differ from various points of view, especially in terms of the size of the territory and the number of inhabitants. From their budgets, the regions ensure the provision of public goods on their territory within the scope of powers that have been transferred to the regions. The competences of all regions are the same, however, the region of Prague has a certain specificity, which is identical to the municipality of Prague, and therefore, in terms of financing, both the rules for regions and the rules for municipalities are applied here. It is not possible to separate these two parts of Prague's economy[8].

The existence of regional budgets is based on the theory of fiscal federalism, which, according to Peková (2011), is based on the existence of multiple levels of government, i.e. on the existence of a vertical and horizontal structure of different levels of government, including territorial self-government, (see also Musgrave (1994), Oates (1991)) and defines the levels of government along vertical and horizontal lines with the aim of optimal distribution of competences and responsibility between them and achieving the optimal degree of decentralization.

The method of creating resources for territorial budgets and the conditions of the beginning of the 21st century within the framework of the issue of fiscal federalism must currently respond to changes in the area of information technology, innovations, inequalities in the area of fiscal decentralization caused by globalization etc. (Boadway, Dougherty, 2018) and the issue of fiscal decentralization in globalized world creates new perspectives on the indicators of government levels in different countries (Dougherty, Phillips, 2019).

The criteria for shared and entrusted taxes create individual conditions for individual decentralized budgets. Current real conditions modify the conditions for providing appropriate tax resources to decentralized budgets, or theoretical knowledge in this area should be developed (Tománek, 2015), it is mainly about the role of tax revenues

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[8] Therefore, the contribution is not devoted to Prague and thus affects only 13 regions.

and provided transfers to territorial budgets, incl. issues of assessing tax autonomy within fiscal federalism (Blöchliger, 2011).

From the point of view of financing, a combined model of fiscal federalism is applied for the regional level of budgets in the CR, where the resources for managing the regions are made up of their own revenue, mainly from taxes, but also revenue from transfers. The regions' own revenues are primarily their shares on taxes, given by the tax sharing, and non-tax and capital revenues. From the point of view of transfers, one part of the transfers provided to the regions has an entitlement character, where each region receives transfers regularly every year according to the relevant criteria. This mainly includes transfers to transferred performance of state administration, to education, to rail transport, to social services. The second part consists of transfers from central budgets and the EU budget, where the regions submit their individual requests. Transfers provided to the regions are thus not provided in general, but for selected expenses and to varying degrees. The difference between resources from transfers and own revenue is mainly that transfers are always provided for a purpose and must therefore be used in accordance with the contract with the transfer provider.

The aim of the contribution is to evaluate within the budgets of the regions, what share in the payment of their expenses is made up of own resources and, on the other hand, transfers, from the point of view of the main areas of expenses of the regions. The problem with this evaluation is the lack of records on the connection of relevant sources from transfers and relevant expenses.

2 Material and Methods

2.1 Methodology

In order to fulfill the goal, it is necessary to ensure data on the economy of the regions, both from the point of view of the regions' expenditures and, on the other hand, from the point of view of their own revenue and revenue from transfers. Data on the economy of the regions are normally available in the information system Monitor of the Ministry of Finance of the CR. Following the classification of financial operations in the budget structure, this system allows obtaining relevant data for individual regions. Due to the fact that the budget structure has certain limitations, in some cases the Monitor system is not able to provide all the necessary data, which is a case related to the aim of the given contribution.

From a methodological point of view, the main problem for the fulfillment of the set goal is that, although it is possible to identify own resources in the budgets of the regions, which are in no way tied to expenditures, but the main part of the resources of the regional budgets consists of received transfers, which are tied to a purpose, but the transfer (according to of the name) does not yet determine what it is to be used for and therefore this cannot be obtained from the Monitor.

Every year, the individual regions handle hundreds of different subsidies, which cannot be linked to expenses in the reporting. Objectively, this linking in individual regions can only be carried out "manually" with knowledge of the matter by employees of the regional authorities, which can only be done by the regions themselves (it is additional work for the regional authorities, with the fact that it is not directly usable for the individual regions). The necessary data for the purposes of the given contribution were obtained by using the documents prepared by the regions, which the regions voluntarily agreed upon during the work on changing the tax sharing. The observed time period for the years 2017-2019 then allows you to get a more extensive idea than if it was just one year. In addition, this period is before the period of the Covid-19 pandemic, which somewhat affected the economic parameters of the regions.

A structured view of the economy of individual regions (published on the MF CR Monitor information system) is given by the structure of the budget composition. The budget composition (Decree of the Ministry of Finance of the CR No. 323/2002 Coll. until 2021 and Decree of the Ministry of Finance of the CR No. 412/2001 from 2022) applies 12 aspects of classification of financial operations to the economy of the regions, and for the given purpose of the analysis, in particular, the economic classification and sectoral aspect are applicable.

In frame of economic classification, the budget composition at the roughest level distinguishes on the revenue side: tax revenue, non-tax revenue, capital revenue and received transfers. Expenditure are divided into current and capital, and the financing class e.g. solves issues when the budget is not balanced. Other sorting levels are item grouping, item subgrouping, and items.

The sectoral point of view applies 6 groups[9] at the roughest level, the next sorting levels are sections, subsections and paragraphs. The indicator of own revenue is determined as the difference between total revenue and revenue from transfers. Given that the source of the region's economy can also be borrowed funds (loans, bonds, etc.), it follows that this calculation of own resources also includes these borrowed resources, which the region will have to repay in the future.

Individual financial operations of the regions can be identified from these two points of view, however, this identification is not complete, because each budget expenditure can be identified both from the sectoral point of view (paragraphs) and from the economic classification of view (items), but not all revenues can be identified in this way; each revenue can be affected from a economic classification of view (items), but not from a sectoral point of view (paragraphs). The problem of disability of a sectoral point of view mainly concerns the class of tax revenues and transfers. However, while tax revenues are reflection of the tax sharing and these funds are used for non-purposeful purposes, they are not binded to the territory of the respective region, and therefore are not needed for analytical evaluation, then transfers are provided purposefully for a specific expenditure, but this is no longer possible according to the budget structure to link with the relevant expenses. The received transfers are divided by the budget structure only according to the source (from which budget the transfer is provided) and divide them into investment and non-investment, so it is no longer possible to determine in which area of expenditure the transfer is used.

The aim of the contribution is to find out to what extent the transfers were used in selected expenditure categories of the regions. This cannot be found in the commonly available Monitor information system. The only way to find out the answer is to carry out an analysis of the individual budgets of all regions, to identify individual transfers in them and assign them individually to the relevant expenditure category. There are therefore hundreds of transfers for regions every year, where even the name of the transfer does not yet have to determine the relevant expenditure category, and this binding can therefore only be made on the basis of detailed knowledge of how the transfer is used.

The structure of the regions' expenses is quite broad, it would be very extensive to cover the expenses of the regions in all details (at the level of paragraphs). Therefore, in connection with the goal of this contribution, the expenses of the regions were divided into the most significant expenditure area[10] and in such a way that the evaluation affect all expenses of the regions. 13 out of 14 regions of the CR are included in the evaluation, i.e. data for Prague, which represents the combination of region and municipality, is not used here, and the results for regions would thus be distorted. The evaluation of the rate of transfers for the fulfillment of the goal of the solution is then given by linking information on regional expenditures and transfers.

2.2 Analysis

The structure of regional revenues according to individual revenue classes shows that the decisive share in regional revenues is made up of received transfers, followed by tax revenues and, to a very small extent non-tax and capital revenues (see Table 1).

Table 1 - Revenue structure of 13 regions in 2017 – 2019 (CZK, %)

Type of revenues	2017	2018	2019	2017 – 2019	2017-2019
Tax revenues	64 426 760 858	68 969 303 236	74 975 592 919	208 371 657 013	33,29 %
Non-tax revenues	3 634 211 843	5 457 804 904	6 674 256 876	15 766 273 623	2,52 %
Capital revenues	346 242 457	317 535 726	409 160 028	1 072 938 211	0,17 %
Received transfers	113 243 630 978	131 059 715 567	156 480 118 485	400 783 465 030	64,02 %
Total revenues	181 650 848 153	205 804 361 451	238 539 130 327	625 994 333 876	100,00 %

Source: Own processing based on Monitor

The high share of revenue from transfers indicates the degree of independence of the regions in their management. The degree of independence, expressed as a share of own revenue in total revenue, was only 35.98% in the

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[9] Expenditure groups from 2022 consist of: 1. Agriculture, forestry and fisheries, 2. Industrial and other sectors of the economy, 3. Services for natural persons, 4. Social affairs and employment policy, 5. State security and legal protection, 6. General public administration and services.

[10] The term "expenditure area" is used in the contribution for various expenses, which from the point of view of the budget structure can be represented by a paragraph, section, subsection or group.

monitored period 2017-2019. However, this low level of independence in regional management is not equally reflected in all areas of regional management.

The basic structure of regional expenditures by group shows that the largest part of regional expenditures is represented by the group Services for the population, which is represented by 67.53% of expenditures. However, this group of expenditures includes several sectors of expenditures, such as education, culture, healthcare, environment, etc. It is therefore more appropriate to monitor regional expenditures at a more detailed level than groups (see Table 2). In addition, expenditures on industrial and other sectors of the economy (19.33%) and social affairs and employment policy (9.00%) are more significantly represented in regional expenditures.

For this analysis, the expenditures of the regions in the two largest groups (groups 2 and 3) were divided into individual sectors and other significant expenditures, respectively. in such a way that they affect the complete structure of the regions' expenditures. Within this structure of expenditures, education (57.13%) has the largest representation in regional expenditures, followed by roads (10.27%), social affairs and employment policy (9.00%) and transport services (8.21%). Other areas of expenditure are represented in the structure of expenditure to a lesser extent (see table 2).

Table 2 - Expenditures of 13 regions in 2017 – 2019 (in CZK, %)

	Expenditure area	Expenditures (CZK)	Share of the total expenditure of the regions (%)
1	Agriculture, forestry and fisheries	358 182 260	0,06
21	Industry, construction trade and services	2 171 736 996	0,36
221	Roads	62 755 361 516	10,27
222-9	Transport service	50 160 729 050	8,21
23-25	Water management and others	2 991 668 039	0,49
31-32	Education	349 068 522 500	57,13
33	Culture	13 596 468 886	2,23
34	Sports and hobbies	4 880 921 277	0,80
35	Healthcare	33 442 812 820	5,47
36	Housing communal services and territorial development	4 497 696 982	0,74
37	Environmental protection	7 070 157 736	1,16
38	Other research and development	3 152 000	0,00
39	Other activities	63 225 126	0,01
4	Social affairs and employment policy	55 015 706 151	9,00
5	State security and legal protection	2 195 137 881	0,36
6	General public administration and services	22 719 395 607	3,72
In total		610 990 874 826	100,00

Source: Own processing based on Monitor

If we then follow the selected expenditure areas in the total share of the regions' resources from transfers, then almost 80% are transfers to education, about 11% are transfers to the area of social expenditure, in third place are transfers to roads (3.8%) and the other areas are participating in total transfers up to approx. 2% (see table 3).

Projection of individual expenses and the size of transfers shows how individual expenditure areas of the regions are covered by transfers. The largest share of resources from transfers is reflected in regional expenditures on education (91.33%), followed by environmental protection (82.65%) and social affairs (79.47%). The only monitored area of expenditure without support from transfers is expenditure on other research and development (see table 3).

Table 3 - Transfers to 13 regions and share of own resources in 2017 – 2019 (in CZK, %)

	Expenditure area	Transfers (CZK)	Share on transfers (%)	Share of resources from transfers in expenditure (%)
1	Agriculture, forestry and fisheries	50 381 008	0,01	14,07
21	Industry, construction trade and services	197 979 502	0,05	9,12
221	Roads	15 208 573 648	3,79	24,23
222-9	Transport service	8 329 312 151	2,07	16,61
23-25	Water management and others	106 371 145	0,03	3,56
31-32	Education	318 794 626 258	79,38	91,33
33	Culture	1 086 095 516	0,27	7,99
34	Sports and hobbies	714 112 829	0,18	14,63
35	Healthcare	2 533 621 530	0,63	7,58
36	Housing communal services and territorial development	660 361 360	0,16	14,68
37	Environmental protection	5 843 733 813	1,46	82,65
38	Other research and development	0	0,00	0,00
39	Other activities	2 390 029	0,00	3,78
4	Social affairs and employment policy	43 720 760 360	10,89	79,47
5	State security and legal protection	133 499 679	0,03	6,08
6	General public administration and services	4 201 188 570	1,05	18,49
In total		401 583 007 398	100,00	65,73

Source: Own processing based on Monitor and documents from the regions

3 Results and Discussion

On the basis of the analysis carried out, it appears that from the point of view of the independence of the budgets of the regions, expressed by the share of own resources, i.e. resources other than transfers, in the total revenue, the regions are independent in only about 35.98%. However, this statement needs to be moderated somewhat, primarily from the point of view that although transfers make up two thirds of the regions' revenue (65.73%), but approx. 52% of the total revenue of the regions is mainly due to the fact that the regions are only a kind of transfer bridge between the state budget and entities in the field of education.

Transfers to regions in education are fully determined by the state (Ministry of Education) directly to individual schools in regions, and regional budgets here only play the role of an intermediary in the transfer of resources. This is related to the state administration carried out by the regions in the field of education. Thus, the region cannot intervene at all in the method of distribution of funds to schools. Given that the amount of funds from these transfers to education is large in volume and makes up about half of the total revenue of the regions, the view of the degree of independence of the regions' budgets is significantly distorted. In the field of education, the regions spend additional funds from their own resources for the operation of schools, where the regions are the founders.

The second most important area in terms of the low level of own resources is the environment, where the share of resources from transfers is 82.65%. In this area, the high level of transfers is again largely connected to the implementation of state policy in the area of the environment, and the regional budgets are the distribution between the state budget and the residents of the regions, where the funds were used in the form of pot subsidies for the residents.

In terms of resources, the area of social affairs is represented by transfers in the amount of 79.47%. Here, the regions apply their competence in the distribution of transfer resources to a greater extent than in the case of education or the environment. These are funds (transfers) provided to social service organizations. The problem with the volume of these transfers for individual regions is their constant amount and the absence of criteria according to which these resources should be provided to the regions.

The next expenses areas in terms of shares of transfers are already represented relatively less. This is the area of expenditure on roads (24.23% of transfers), where transfers are provided to regions annually mainly from the state transport infrastructure fund for road repairs, and the criterion used is the length of roads in the region.

The share of transfers of 18.49% in the field of public administration expenditure is connected with transfers that the state provides to regions for the delegated operation of state administration.

In the field of transport services, the share of transfers (16.61%) is primarily given by funds provided annually to the regions to compensate the costs of railway transport in the ensuring of transport services in the regions.

Expenditure areas with a share of transfers below 15% are expenditure on agriculture, forestry and fishing, expenditure on sports and hobbies, expenditure on housing, communal services and territorial development, etc.; they are connected with various non-entitlement transfers from the state budget, state funds and the budget of the European Union, i.e. these resources from transfers only supplement the regions' own resources to a lesser extent.

4 Conclusion

The contribution showed to what extent own revenues are used in the management of the regions in relation to the size of subsidies. Overall, the level of economic independence of the regions in terms of resources is relatively low (about one third) and therefore there is a high share of transfers. However, the analysis showed that this high share of transfers is created mainly by the effect of regional budgets as a transfer bridge between the state budget and other entities, where the regions essentially cannot intervene with their decision-making (the regions must use these transfers for other entities according to the rules set by the transfer provider).

The amount of resources from subsidies varies between the spending areas of the regions, transfers acts by the highest share on the spending of the regions especially in the areas of education, the environment and social affairs.

From the point of view of the size of the transfers, the regions receive the most transfers in the field of education, social affairs and roads. The mentioned transfer areas have been provided regularly to all regions in recent years.

In the area of transfers to roads and the social affairs of this area, however, from the point of view of the objective conditions of individual regions, the question arises as to whether there are objective rules for providing these transfers to individual regions. The said contribution did not deal with these questions in more detail, however, in connection with the mentioned two types of transfers, the question can be asked whether the mentioned system of their provision is suitable.

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Evaluation of selected conservatories of the Czech Republic from the position of an applicant for study

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Abstract: Conservatories represent a level of education for young talented artists. They are significant institutions specializing in dance, music, or dramatic arts. A questionnaire survey in the form of closed-ended questions was conducted on a selected class sample with artistic focus. The article has two goals: a partial goal and a main goal. The partial goal of the article was to map the issues of legal norms and founders of conservatories in the Czech Republic. The main goal of the article was to showcase the possibilities and conditions of individual conservatories, how they present themselves to potential applicants through their websites or social media, and the subsequent perspective of the applicants on how each institution appears to them and how they evaluate them among themselves. As a result of the partial goal, the most common legal form was identified as a subsidized organization, the most common founder being the region, and the majority of conservatories in the Czech Republic being publicly established. Regarding the main goal, the applicant gave the highest evaluation to three conservatories: Pardubice Conservatory, P.J. Vejvanovský Conservatory, and Jaroslav Ježek Conservatory and Higher Vocational School.

1 Introduction

Conservatories, in general, fall within the scope of education and represent a level of education for young artists. The issue of education has been a long-standing concern, as discussed by Bečica and Vavrek (2021). Education is an integral part of the public sector, as stated by Peková (2012). This article focuses on the evaluation of conservatories, which are organizations in their own right, and this process is referred to as benchmarking, as also mentioned in other areas of the public sector, such as healthcare by Vaňková (2021) and transportation by Vaňková, Vrábková, and Ivan (2016). Public finances are also interconnected with the public sector and are addressed in the publication by Tománek (2021).

The theme of conservatories falls within the realm of creative arts, constituting a highly specific part of the education system, which is commonly referred to as a monopoly in the given region. The evaluation was conducted on a sample of young applicants through the Google Forms platform. It took the form of a questionnaire, which was administered in the 22nd week of this year. As part of the survey, a class of 30 students from the basic art school in the Moravian-Silesian Region was approached, and the data return rate was 100%.

The table below provides an introductory overview of conservatories. It includes basic information about the conservatories currently in the Czech Republic. The header indicates the name of the respective conservatory, its legal form, the founder, and the last column specifies the type of school - whether it is a conservatory.

Table 1 - Overview of basic information about conservatories in the Czech Republic

NAME OF CONSERVATOR	LEGAL FORM	FOUNDER	TYPE OF SCHOOL	
Prague Dance Conservatory and SOŠ, s.r.o.	limited company	the company's manager	private	
Duncan Center Conservatory	funded organization	Capital City of Prague	state	
Brno Conservatory	funded organization	South-Moravian region	state	
Church Conservatory of the German Order	school legal entity	Bailiva Čechy, Morava a Slezsko	church	
Evangelical Academy Conservatory	school legal entity	Českobratrská církev evangelická	church	

Janáček Conservatory in Ostrava	funded organization	Moravian-Silesian Region	state
Conservatory, Teplice	funded organization	Ústí Region	state
Dance center Prague – conservatory, z. ú.	institute	the company's manager	public service company
Pardubice Conservatory	funded organization	Pardubice Region	state
Jan Deyl Conservatory and Secondary School	funded organization	Ministry of Education, Youth and Sports	state
International conservatory Prague	limited company	the company's manager	private
Conservatory, České Budějovice	funded organization	South Bohemian region	state
Prague Conservatory	funded organization	Capital City of Prague	state
Dance Conservatory of the Capital City of Prague	funded organization	Capital City of Prague	state
Conservatory, Pilsen	funded organization	Pilsen Region	state
P.J. Vejvanovský Conservatory, Kroměříž	funded organization	Zlín Region	state
Dance Conservatory Brno	funded organization	South-Moravian region	state
Jaroslav Ježek Conservatory and Higher Vocational School	funded organization	Capital City of Prague	state

Source: own processing

The partial goal of the article was to map the issues of legal norms and founders of conservatories in the Czech Republic. The overview shows that, according to the legal form, the largest representation is a funded organization (13), then a limited company (2) and a school legal entity (2), the only representation is an institute (1). The most common founders of conservatories are the regions, then the Capital City of Prague, churches, the ministry or, in the case of private schools, private persons represented by an executive (the company's manager). The last important basic information is the type of conservatory. In the Czech Republic, we have 13 state conservatories, 2 private, 2 church and 1 conservatory designated as a public service company.

To fulfill the main goal of the article, six conservatories out of a total of 18 were selected and analyzed from several perspectives - the year of establishment of the conservatory, the current range of study programs, duration of study and completion requirements, website appearance, utilization of social media, and overall impression on the applicant. A common characteristic of the selected conservatories is their legal form - they are subsidized organizations and also publicly established schools funded by public resources.

For the evaluation of conservatories, annual reports and school websites, which are the main source of information for applicants, will be used in this contribution. The common feature of the selected conservatories is their legal form – they are funded organizations and they are also state schools.

2 Material and Methods

Each of the 6 conservatories was assessed with 3 questions, and the more points it received, the better impression it made on the applicant and the higher the chance that the applicant may be interested in it in the future. The point results are then transformed into a graphical representation for clearer visualization of the scores.

The practical part is focused on achieving the main goal. The evaluation was conducted using the following table:

Table 2 - Websites of conservatories and their social networks

	not at all	no	few	yes	very much
1. How did the school's website impress the applicant?	1	2	3	4	5
2. Are the websites for applicants user-friendly?	1	2	3	4	5
3. Do applicants find detailed information about the teaching staff of the conservatory on the school's website?	1	2	3	4	5

Source: own processing

The first and second questions are focused on the initial impression of the applicant - how they evaluate the website environment of the conservatory at first glance - whether they can navigate through the various sections, whether they find all the information in one place, or if they have to look for other information on different pages. The

questions are aimed at aesthetics; conservatories seek artists, and their websites should represent them. The third question targets the teaching staff who will guide the students throughout their studies, and information about them should definitely be available on the websites. The scale assesses how much information the applicant can find on the website.

Following that, there is a smaller table containing 2 questions with possible answers of yes or no.

The fourth question focuses on the school's educational system that the applicant will use on a daily basis during their studies. Therefore, a link to the specific system should definitely be provided for quick and daily access. The fifth question addresses social media - whether the conservatory presents its work to the online world on major social platforms, where young people are frequently active.

Table 3 - Websites of conservatories and their social networks

	YES - NO
4. Is there information about the school's information system, which students use during their studies, available on the school's website?	
5. Does the conservatory manage social media accounts? (Instagram, Facebook, YouTube, etc.)	

Source: own processing

To fulfill the main goal of obtaining the perspective of the applicants on individual conservatories, a questionnaire survey was used. The questionnaire survey is one of the techniques for gathering information, where necessary data are collected from a selected sample (participants under investigation). Types of questionnaires include open-ended questions, where the respondent formulates their own answer, closed-ended questions, where the respondent chooses from given options, or a combination of open-ended and closed-ended questions. In this article, closed-ended questions were used, meaning respondents had to choose from a given scale or respond with "yes" or "no."

Table 4 - Year of establishment of the conservatory

Janáček Conservatory in Ostrava	1953
Pardubice Conservatory	1978
Jan Deyl Conservatory and Secondary School	1976
Dance Conservatory of the Capital City of Prague	1945
P.J. Vejvanovský Conservatory	1949
Jaroslav Ježek Conservatory and Higher Vocational School	1991

Source: own processing

Table 5 - Offer of study fields, length of education and graduation

NAME OF CONSERVATOR	FIELD OF STUDY	LENGTH OF STUDY (number of years)	GRADUATION
Janáček Conservatory in Ostrava	Dance	8	absolutorium
	Music, Singing, Contemporary dance, Musical dramatic art, Music (combined form), Singing (combined form)	6	absolutorium
Pardubice Conservatory	Music, Singing, Music (combined form), Singing (combined form)	6	absolutorium
Jan Deyl Conservatory and Secondary School	Music, Singing	6	absolutorium
	Piano tuning and related instruments	4	matriculation exam
Dance Conservatory of the Capital City of Prague	Dance	8	absolutorium
P.J. Vejvanovský Conservatory	Music, Singing	6	absolutorium
Jaroslav Ježek Conservatory and Higher Vocational School	Music, Singing (Popular Singing) Musical dramatic art (Musical)	6	absolutorium

Source: own processing

3 Results and Discussion

The results of the evaluation of website and social media presence as perceived by applicants are presented in the table below:

Table 6 - Point assessment of conservatories

	Janáček Conservatory	Pardubice Conservatory	Jan Deyl Conservatory	Dance Conservatory	P.J. Vejvanovský Conservatory	Jaroslav Ježek Conservatory
1.	4	5	3	2	5	5
2.	4	5	3	3	5	5
3.	3	3	3	3	3	3
OVERALL	**11**	**13**	**9**	**8**	**13**	**13**
4.	YES	YES	YES	YES	NO	YES
5.	YES	YES	YES	YES	YES	YES

Source: own processing

Based on the total points in the table 6, the selected conservatories ranked as follows (see figure 1):

Figure 1 - Representation of points graphically
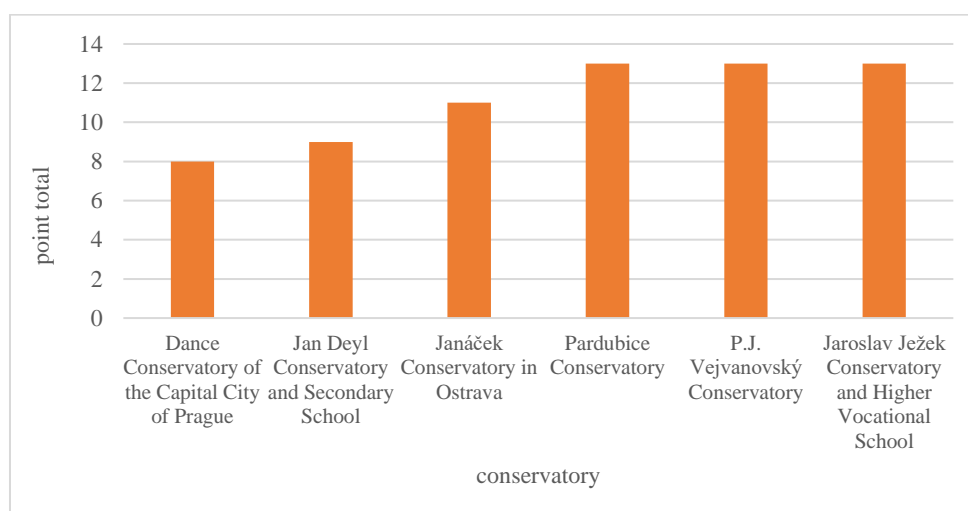
Source: own processing

For applicants, the length of tradition and history that a conservatory possesses can be crucial. A longer tradition is often associated with greater prestige and reputation in the field of arts. Such a conservatory can also provide its students with a broader range of opportunities when seeking employment both within our country and internationally. The long-standing tradition can also reflect the quality of education, including a highly skilled faculty, institutional support, and effective teaching methods in both the theoretical and practical aspects of study.

There are several differences among the conservatories. Some offer only 1 or 2 fields of study (Jan Deyl Conservatory and Secondary School and Dance Conservatory of the Capital City of Prague) compared to others that have 3-8 fields of study, enriched with a combined form of education. This factor can be crucial for attracting prospective students in the future.

The duration of studies is mostly 6 or 8 years, culminating in the form of a graduation (absolutorium). The only exception is the instrumental tuning program, which is offered in conjunction with a secondary school connected to the conservatory.

The overall evaluation highlights the importance of factors such as tradition, study offerings, quality of websites, and presence on social media in attracting and informing potential applicants. Strengthening these aspects can contribute to further development and success of conservatories in the Czech Republic.

The recommendation for conservatories is as follows. Focus on introducing applicants to the teaching staff on the school's website, including their achievements and glimpses into their artistic careers. Be highly active on social media, showcasing the hard work of artists and thereby attracting new young students to pursue a path of study at the conservatory.

4 Conclusion

Conservatories in the Czech Republic are significant institutions that provide education and training for young talented artists in various disciplines such as dance, music, and dramatic arts. They contribute to the development of culture and art in the country. Conservatories primarily focus on practical training and performances, allowing students to showcase their talents before an audience. However, they also include a theoretical component to provide a well-rounded education. The success of students at national and international levels plays a crucial role in the reputation and future development of conservatories. Their achievements contribute to the cultural and artistic landscape of the Czech Republic. There are currently 18 conservatories in the Czech Republic, spread throughout the country. They have various legal forms, with funded organizations being the most common. The founders include regions, the Capital City of Prague, churches, and private individuals. The evaluation of conservatories focused on specific indicators. These included the establishment's year, study program offerings, website evaluation, and social media presence. The length of tradition and history of a conservatory can influence its prestige and reputation. Established conservatories often provide more opportunities for employment and reflect the quality of education and faculty expertise. Conservatories offer a range of study programs and specializations, with most programs having a duration of 6 or 8 years. Some programs, such as instrument tuning, have a shorter duration. The quality of conservatories' websites is crucial as it serves as the primary source of information for prospective students. Websites that are modern, clear, and visually appealing tend to attract more interest from applicants. Providing detailed information about the teaching staff, including their achievements and artistic journeys, can motivate applicants and give them insights into the expertise available at a particular conservatory. Most conservatories have information systems for students and teachers on their websites. Social media presence is also important, as it allows conservatories to showcase their students' work, events, and performances. The partial goal was achieved through the overview of legal norms and operators of the respective conservatories. The main goal was to map the perspective of applicants on these conservatories, which was evaluated through a questionnaire survey using closed-ended questions based on the preferences and views of young individuals aspiring to pursue education in the artistic field.

Acknowledgements

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Evaluation of the local accessibility of inpatient psychiatric care in the Czech Republic

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Abstract: Mental health, and more specifically the mental health deficit, has been at the forefront of national political concern over the last 20 years. The main reason for this is the rapidly increasing burden that mental illness and poor mental health are placing on societies. States are responding to this reality with reform measures, particularly in terms of ensuring financial support and access to mental health services. The aim of the article is to evaluate the local accessibility of inpatient psychiatric care in the Czech Republic based on the data of the General Health Insurance Fund of the Czech Republic as of 1 February 2023. For the evaluation, the ArcGIS Online geographic information system was used and the travel time according to the Government Regulation No. 307/2012 Coll. Within the framework of the follow-up inpatient care, there are significant differences between the regions. The lowest accessibility is observed in the Moravian-Silesian, Karlovy Vary and Liberec regions. The highest accessibility of this type of health care is in the capital city of Prague, the South Moravian Region and the Vysočina Region.

1 Introduction

Mental health is defined as a state of overall well-being that encompasses an individual's ability to realise his or her potential, to cope with the normal stresses of life, to work productively and effectively, and to contribute to society. Mental health is not simply the absence of mental disorders, but is a state in which an individual can adapt to change and deal with the ordinary problems of life, maintain good relationships with other people, and have a sense of meaning and satisfaction with his or her life (WHO, 2023). Mental illnesses include both psychological problems and stresses on the body and diagnosed mental and behavioural disorders (e.g. schizophrenia, phobias, depression, developmental disorders).

The mental health of the population is becoming a very topical issue nowadays, which is being addressed by many European countries, including the Czech Republic. The Green Paper approved by the European Commission in 2005 points out the problems in the population, namely that mental illness adversely affects one in four people and can result in suicides, which are the cause of many deaths; mental illness leads to depressive behaviour; and that there is still stigma, discrimination, disregard for human rights and disrespect for the dignity of people suffering from mental illness (Green Paper, 2005).

Within the Czech Republic, the Health 2030 Action Plan emphasises the importance of preventing mental illness and promoting mental health in all age groups. The Health 2030 Action Plan sets out measures to improve the mental health of the population and reduce the burden of mental illness on society. The strategy for the reform of psychiatric care, which was approved on 8 October 2013, identifies the main problem areas of the current system of institutional psychiatric care and, in particular, mentions the fact that the accessibility of psychiatric care is insufficient in many regions, the lack of integration of health and social care for patients with mental illness and the complete absence of services provided to the patient in his natural social environment. The National Action Plan for Mental Health 2020-2030 also focuses on the issue of ensuring the accessibility of psychiatric care in the Czech Republic and emphasises its importance.

Ensuring the accessibility of covered health services in a given area is a fundamental task of health insurance companies, which also traditionally collect public health insurance premiums and reimburse contracted providers for health services. These providers form the network of contracted providers of the health insurance company, as stated in Article 46(1) of Act No 48/1997 Coll., on public health insurance and on amendment and supplementation of certain related acts, as amended. Thus, the diction of the relevant Act implies that the health insurance company is obliged to conclude contracts on the provision and reimbursement of health services with a sufficient number

of providers so that the insured of the respective insurance company is provided with a professional range of covered health services and also that the conditions of local and time accessibility based on Government Regulation No. 307/2012 Coll., on the local and time accessibility of health services are met in their provision (Svejkovský, Vojtek, Arnoštová et al., 2016).

Local accessibility is defined as the appropriate distance of the place of provision of covered services in relation to the place of residence or place of domicile of the insured and is determined by the commuting distance in minutes according to the relevant medical fields or services provided by outpatient or inpatient care providers as the furthest possible. The time accessibility is indicative of the time period corresponding to the urgency of the service and is set for scheduled covered services.

Although the diction of the legislative regulations speaks only about two dimensions of accessibility of covered health services, it is necessary to mention other formats of accessibility, such as institutional accessibility, which is defined by the capacity (in particular the office hours) of a given provider, informational accessibility or the patient's access to relevant and comprehensible information and, last but not least, economic accessibility, which is conditioned by the financial intensity of the health care provided at the time of its provision and depends on the financial possibilities of both the provider and the patient (insured) (Vrabková, Vaňková, 2015).

The aim of this research (paper) is to evaluate the local accessibility of acute and long-term inpatient psychiatric care in individual regions of the Czech Republic based on the analysis of data from the General Health Insurance Fund of the Czech Republic as of 1 February 2023. The results can be used to develop measures to improve the situation in the provision of psychiatric care and to promote the prevention of mental health of the population.

To support the aim of the paper, two research questions RQ1 and RQ2 were formulated:

RQ1: Is the local accessibility of acute psychiatric care providers in the Czech Republic ensured according to the legal limits?

RQ2: Is the local accessibility of long-term psychiatric providers in the Czech Republic ensured according to the legal limits?

The assessment of the accessibility of health services has become a very important basis for the decision-making of both health insurance companies in the Czech Republic and other health policy actors. Modelling the accessibility of health services has been addressed by a number of authors worldwide, as evidenced by the number of published articles on this topic.

Šidlo et al. (2017), as part of the TAČR OMEGA project, focused on a comprehensive assessment of access to primary health care in the Czech Republic. They conducted an analysis of regional differentiation in the number and demographic structure of medical care capacities. As a result of their investigation, they developed model projections of the future evolution of the number and structure of primary health care physicians and their capacities, including regional estimates. They used ArcGIS 10.5 software and its NetworkAnalyst extension to define isochrones/accessibility zones. They used average speeds by road type from the literature (Hudecek, 2010), which were validated using available route planners (Google Maps and Mapy.cz).

The authors of the article Štych et al. (2018) evaluated the change in the accessibility of psychiatric services between 2012 and 2017 for selected groups of patients in the Czech Republic. The calculations were performed in ArcMap 10.5 and NetworkAnalyst. It was found that the distribution of psychiatric service providers who provided care to patients with schizophrenia did not change between the years studied, and there was no significant improvement in local accessibility in 2017 compared to 2012.

The impact of the implementation of the National Mental Health Protection Programme on ensuring access to psychiatric care in Poland was discussed by Bazydlo and Karakiewicz (2015). They investigated the issue through document analysis and a diagnostic survey (interviewing psychiatric care providers). Their research revealed that the number of outpatient providers for addiction treatment, entviromental treatment teams and psychiatric rehabilitation units has increased and the waiting time for psychiatric care in both outpatient and inpatient settings has significantly decreased.

Access to health services plays a critical role in promoting equity in health and quality of life, according to Luis and Cabral (2016). The authors modelled the accessibility of health services through a geographic information system and the aim of their research was to assess the geographical accessibility of health services and to estimate the future demand for these services. They worked with two scenarios, namely accessibility by car and accessibility

for patients on foot. The results showed that the Mozambique region faces significant inaccessibility to health services and that there are significant regional variations across the territory.

The aim of the article by Vaňková, Vrabková (2023) was to evaluate the capacity accessibility of psychiatric care in the regions of the Czech Republic using the TOPSIS Technique multicriteria analysis for the years 2012 and 2021. The evaluated set of units included 28 observations (variants), where each variant worked with 10 criteria that reflected the capacity of both outpatient specialized psychiatric care and inpatient care in the regions. The results showed that the current psychiatric care reform, while attempting to respond to regional differences in the provision of psychiatric care, is proceeding at a very slow pace. It was found that disparities persist across regions in the accessibility of capacity of doctors, nurses, acute care beds and the number of outpatient providers. In conclusion, it was recommended to create a comprehensive network of psychiatric care in the regions of the Czech Republic based on the interconnection of health and social care, to support the establishment of new acute care units and to create and improve the quality of activities of Mental Health Centres.

Shortt, Moore (2006) addressed spatial accessibility to provide planned health care. They did not only address the location of a given health service provided, but using Geographical Information Science techniques, they evaluated the spatial interaction between health services and population preferences.

A systematic review on the use of GIS in the context of accessibility analysis of planned health care has been published by Khashoggi, Murad (2020). The authors focused on the development of the application of analytical approaches using GIS to support two essential aspects of health care planning in particular, namely, within an epidemiological approach and also in terms of spatial inequalities in access to health care to determine the optimal distribution of resources in the health care system. In conclusion, GIS is an effective tool to support spatial decision-making in public health through applying the evolving analytical approaches to dealing with healthcare planning issues. This requires a literature review before preparing relevant studies, particularly because of the continuous development of GIS technologies.

2 Material and Methods

The subject of the assessment of the accessibility of psychiatric care was the local accessibility of covered health services, which in the Czech Republic are provided by health insurance companies. The aim of this research is therefore to evaluate the local accessibility of the contracted providers of psychiatric care of the General Health Insurance Company of the Czech Republic (hereinafter referred to as GHIC) in terms of the specified travel time defined by the Government Regulation No. 307/2012 Coll., on the local and time accessibility of health services, which is based on the already mentioned Act No. 48/1997 Coll., and Act No. 372/2011 Coll., on health services and conditions of their provision, as amended. Commuting time is defined in the Government Regulation as *'the time in whole minutes which corresponds to the effective accessibility of a place by means of transport at a speed appropriate to the type of road and in accordance with the law governing road traffic'*.

To support the research objective, two research questions were established:

RQ1. Is the local accessibility of acute psychiatric care providers in the Czech Republic ensured according to the legal limits?

RQ2. Is the local accessibility of long-term psychiatric care providers in the Czech Republic ensured according to the legal limits?

Network analysis was used to analyse the commute times. The analysis focused on contracted providers of the GHIC providing acute and follow-up or long-term psychiatric inpatient care. According to the last published statistical yearbook of GHIC with data as of 31 December 2021, health care of this insurance company was provided for 5.9 million inhabitants (insured persons) of the Czech Republic. Thus, it has a nationwide coverage and its market share is approximately 56.36%.

2.1 Data

The data used for modelling local accessibility is based on the List of contracted health service providers by specialty as of 1 February 2023 published on the GHIC website. As already mentioned, GHIC is the dominant health insurer in the Czech Republic and therefore has a contract with almost all health care providers, which also results from its contractual policy and obligations set by the relevant law (Act No. 551/1991 Coll., on the General Health Insurance Company of the Czech Republic, as amended).

Acute inpatient health care in the field of psychiatry is provided for insured persons of the GHIC by a total of 34 contracted health care providers, who provide care at a total of 36 contracted facilities, as documented in Table 1. These facilities are considered as separate healthcare facilities in the analysis. Table 1 shows that GHIC has the largest representation of contracted health care facilities in the capital city of Prague and the South Moravian Region. On the contrary, the smallest number of workplaces, namely one, is registered in the Zlín, Liberec, Pardubice, Karlovy Vary and Central Bohemia regions.

Table 1 - Number of health service providers and facilities in the Czech Republic in the field of psychiatry 3_5, as of 31 December 2021

Regions	Number of care providers at inpatient units		Number of beds total	Total number of doctors (PPP)	Number of nurses (PPP)
	Entities (ID number)	Medical facilities (ID number)			
Capital City of Prague	6	6	476	126.5	355.9
Central Bohemian Region	1	1	30	6.7	17.8
South Bohemian Region	2	2	108	23.3	93.0
Pilsen Region	3	3	146	31.2	100.6
Karlovy Vary Region	1	1	77	11.0	44.2
Ústí nad Labem Region	2	3	126	20.9	88.8
Liberec Region	1	1	76	18.0	62.5
Hradec Králové Region	3	3	111	27.2	77.4
Pardubice Region	1	2	105	17.3	54.5
Vysočina Region	2	2	92	13.6	64.6
South Moravian Region	5	5	219	46.7	162.8
Olomouc Region	2	2	86	20.7	33.0
Zlín Region	1	1	25	4.0	15.7
Moravian-Silesian Region	4	4	187	34.7	102.4
Czech Republic	**34**	**36**	**1869**	**401.9**	**1 273.1**

Source: Yearbook of the General Health Insurance Fund of the Czech Republic, 2021. Own elaboration

Notes: PPP = calculated number of workers (according to full-time capacity; the worker's time is capped at a maximum of 1.0 worker per identification number of departments, or both identification number of facilities and identification number of provider)

The situation is different in the field of long-term or follow-up inpatient care in psychiatry. Table 2 shows that the Karlovy Vary and Liberec regions do not have any beds for follow-up care in this field of medicine and that this care is mainly provided by psychiatric hospitals/medical centres, other facilities or general hospital beds. The largest number of contracted providers is registered in the Vysočina Region (Psychiatric Hospital Jihlava, Psychiatric Hospital Havlíčkův Brod, Children's Psychiatric Hospital Velká Bíteš, PATEB s.r.o.), the South Bohemia Region (Psychiatric Hospital Červený dvůr, Psychiatric Hospital Lnáře, Psychiatric Hospital Písek a.s. and Children's Psychiatric Hospital Opařany). The same number of health service providers in the field of psychiatry is also recorded in the Ústí nad Labem Region (Psychiatric Hospital Horní Beřkovice, Children's Psychiatric Hospital Louny, Psychiatric Hospital Petrohrad).

Table 2 - Number of health service providers and facilities in the regions of the Czech Republic in the field of OLU psychiatric, as of 31 December 2021

Regions	Number of care providers at inpatient units		Number of beds Total	Total number of doctors (PPP)	Number of nurses (PPP)
	Entities (ID number)	Equipment (ID number)			
Capital City of Prague	2	3	1014	82.8	527.5
Central Bohemian Region	2	2	535	26.3	305.4
South Bohemian Region	4	4	360	19.1	174.5
Pilsen Region	1	1	1095	53.2	682.2
Karlovy Vary Region	0	0	0	0.0	0.0
Ústí nad Labem Region	4	4	599	34.2	336.9
Liberec Region	0	0	0	0.0	0.0
Hradec Králové Region	1	1	56	2.9	25.3
Pardubice Region	1	1	26	1.6	10.3
Vysočina Region	4	4	1135	60.1	732.8
South Moravian Region	1	1	629	34.2	332.4
Olomouc Region	2	2	632	33.4	355.2
Zlín Region	1	1	707	36.7	417.6
Moravian-Silesian Region	1	1	839	38.9	420.2

| Czech Republic | 24 | 25 | 7627 | 423.4 | 4 320.2 |

2.2 Methods

The main method for processing the map outputs was a geographic information system. A geographical information system (GIS) represents a framework for the collection, management, analysis, and visualisation of data. A GIS enables the analysis of spatial location, organization of data in layers, and data visualisation in the form of maps and 3D scenes. Organization of data in layers has rules in which different types of data are stored in two basic data model types-vectors and rasters. For the case of the vector data, it is then distinguished whether the object will be represented as a point, line, or polygon. The most significant element of a GIS is its ability to perform spatial analyses where the basic types of analyses include network analysis. These analyses are mainly used when evaluating transport accessibility. For this work, tools for the modelling of access zones (service areas) implemented in the ArcGIS environment were used. The access zones in the map are visualized as polygons with clearly defined borders (Vrabková, Ertingerová, Kukuliač, 2021).

The basis for the analysis of the local accessibility of health services is the creation of coordinates of the locations of individual providers of psychiatric care. The basis for the network analysis was the road network. Distances on this network were transformed into time data. To do this, each section of the network was assigned an average speed at which that section could be travelled by car. The average speed was applied to 50 km/h. These values were then used in a formula to calculate the time required to cover the length of the network section.

Data on the road network were provided by the Road and Motorway Directorate of the Czech Republic and were evaluated using the above-mentioned method. To assess the time accessibility of hospitals, eight-time intervals (15, 30, 45, 60, 90, 105, 120 and over 120 minutes) were determined and service areas corresponding to these intervals were created. The maximum time is set at 120 min according to Government Regulation No. 307/2012 Coll. Above 120 minutes, the time limit is not met. The location of acute and long-term inpatient psychiatric care providers was determined from their addresses and polygons were created using network analysis to represent these service areas (Hudečka, 2016).

3 Results and Discussion

The assessment of the accessibility of inpatient psychiatric care was examined in terms of ensuring local accessibility, which means ensuring compliance with the specified travel times according to the relevant government regulation (No. 307/2012 Coll.), which came into force on 1 January 2013 and has not changed in content until the present time (July 2023). ArcGIS Online geographic information system was used for the evaluation, through which it is possible to link locations and data using interactive maps. The government regulation defines local accessibility as the time spent by a patient in transportation for health care and defines the maximum possible limits of travel to a given provider of a given medical field or service. However, this regulation does not define the mode of transport, i.e. whether the practitioner should be transported by public transport or by private car. However, it is assumed that the patient will use private car transport to get to a particular provider. It is also not clearly stated on what day and at what specific time the patient will visit the provider. For this reason, a time of 8 a.m. Monday was set for modeling local accessibility. Since the government regulation does not specify the provider's capacity utilization (physician hours, office hours), health care providers are placed on equal footing. The created list of inpatient psychiatric care providers includes acute care and long-term (follow-up) care providers, where the main data source was the ID number, name of the health service provider, address of provision (street, descriptive number, postal code, municipality, region, GPS coordinates) and the union of care. Municipalities with a population of more than 20,000 are also identified in the maps due to the fact that health services are expected to be more available there. In addition, a colour scale was established to distinguish defined time intervals. The green colour indicates that there is the shortest travel time, while the red colour indicates that the travel time is either reached at 120 min or not met at all.

Figure 1 illustrates the local accessibility of acute inpatient psychiatric care in the Czech Republic. Annex A provides an inventory of inpatient facilities that provided acute inpatient care and had a contractual relationship with the GHIC as of 1 February 2023. As can be seen from the figure and the annex, acute inpatient psychiatric care is provided by eight university hospitals (with the exception of the St. Anne's University Hospital in Brno and the University Hospital Královské Vinohrady), regional and district hospitals with comprehensive care, as well as psychiatric hospitals/treatment centres. The establishment of acute psychiatric care beds in psychiatric

hospitals/treatments is being implemented in the context of the reform of psychiatric care and the gradual establishment of mental health centres (Jann et al., 2022).

From the map in Figure 1 it can be seen that the travel time set by the government decree of 120 minutes is almost met throughout the Czech Republic, except in the peripheral areas of the territory. The largest red area of the territory is marked in the north-west in the Bruntál district, which is, however, mainly made up of forests. Furthermore, it can be stated that a commute time of up to 45 minutes is available for about 90% of the Czech population, as also stated by Jann (2022).

Figure 1 - Local accessibility of an acute psychiatric care
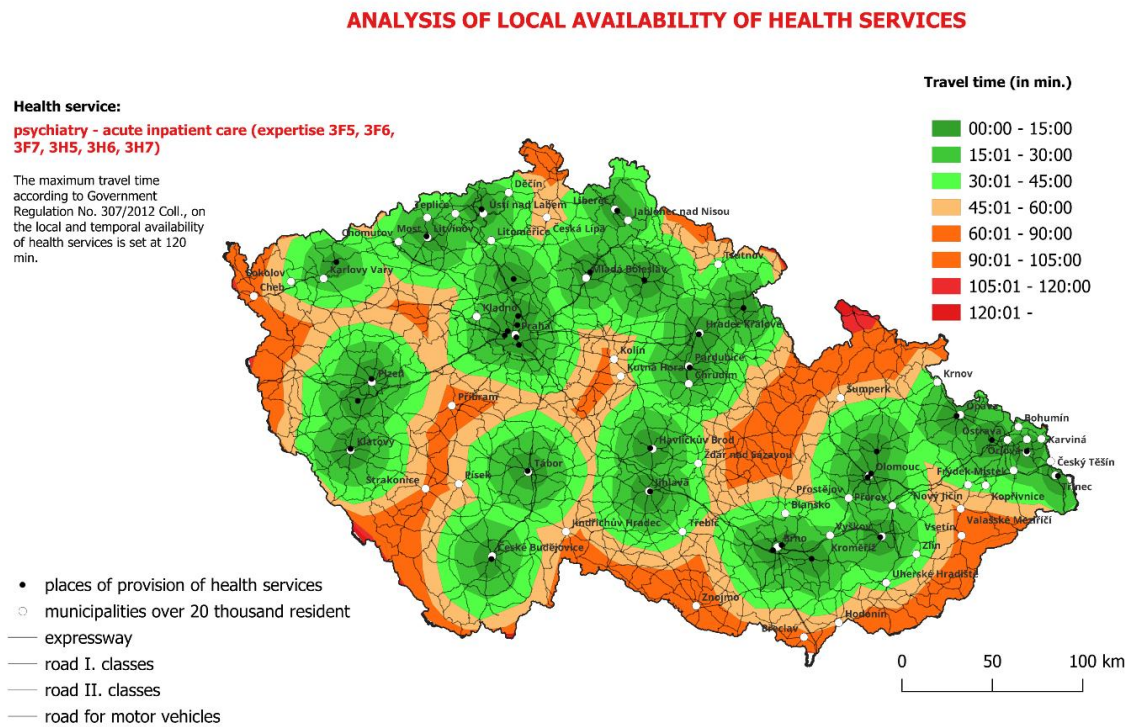
Source: QGIS, own processing

The geographic accessibility of long-term (follow-up) psychiatric care has been somewhat unchanged in recent years. Its status is documented in Figure 2 and the list of contracted providers of psychiatric health services in Annex A. The figure shows that there are considerable differences in accessibility in the regions of the Czech Republic. The most accessible care is available to the inhabitants of the capital city of Prague, the Central Bohemia, Pilsen, South Moravia, Olomouc and Vysočina regions. Relatively less accessible is the long-term psychiatric care in the Pardubice Region, where this care is provided by Albertinum, a specialist medical institute, in Žamberk, and in the Karlovy Vary Region, where psychiatric care is provided by the Ostrov Hospital, s.r.o. The red colouring on the map is visible near the statutory city of Trinec, where the travel time of patients to the place of provision of the health service is at the limit of the government regulation.

Figure 2 - Long-term impatient psychiatric care

ANALYSIS OF LOCAL AVAILABILITY OF HEALTH SERVICES
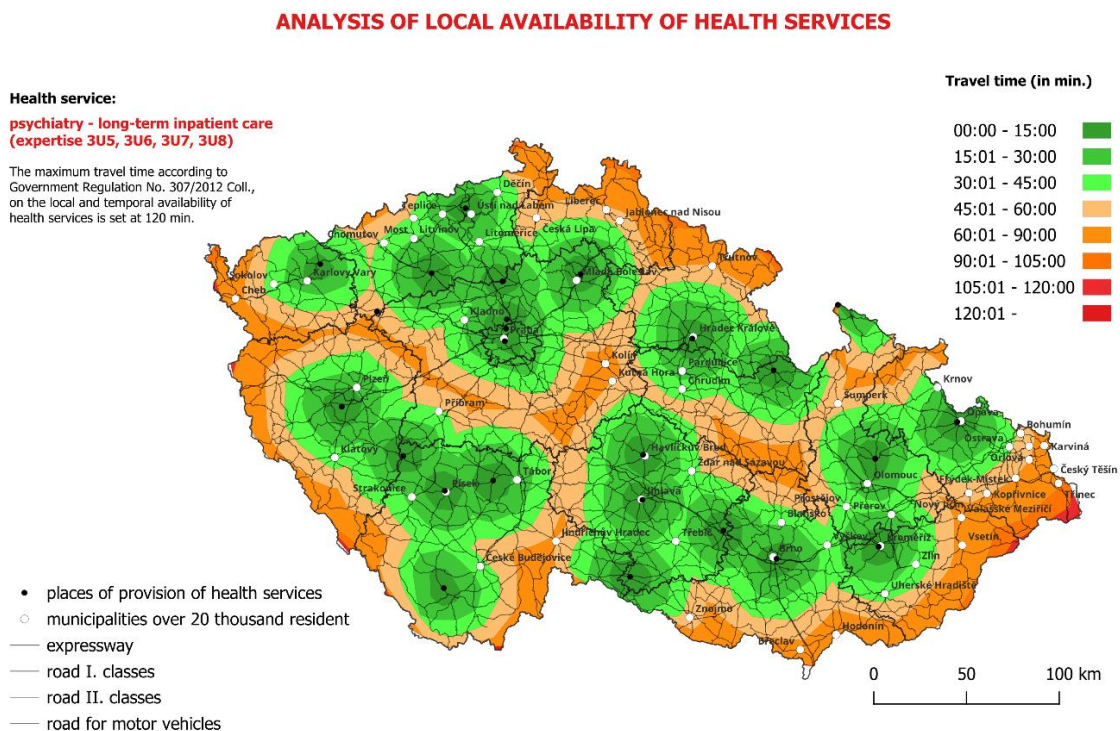
Source: QGIS, own processing

4 Conclusion

The accessibility of public services is a primary determinant of the quality and performance of the services provided. Accessibility is seen as equal access to services for all citizens. Ensuring it is the responsibility of the actors involved in public policies. In the case of health services, local accessibility is an important part or obligation of the contractual policy of health insurance companies, imposed by the relevant legislation. The aim of the research was to build on previously published outputs on the analysis and modelling of local accessibility of psychiatric care (Štych et al., 2018, Jann et al., 2022) and to verify how local accessibility evolves over time. Local accessibility is viewed as the reasonable distance of the place of provision of covered health services relative to the insured's place of residence or the insured's place of residence.

The aim of this research (paper) is to assess the local accessibility of acute and long-term inpatient psychiatric care in individual regions of the Czech Republic based on the analysis of data from the General Health Insurance Fund of the Czech Republic as of 1 February 2023. For this purpose, two research questions were set to address whether local accessibility is ensured within the established legislative standards, which are determined by the travel time to the place of health service provision. The assessment of local accessibility was carried out using the Arc GIS Online geographical information system. The spatial analysis was based on the following parameters: car traffic, 8am Monday.

On the basis of the results presented in the map outputs, it can be concluded that the local accessibility of acute inpatient psychiatric care and subsequent long-term psychiatric care is ensured in accordance with Government Regulation No. 307/2012 Coll., on the local and time accessibility of reimbursed health services. The accessibility of psychiatric follow-up care has not changed in recent years. According to the regional comparison, it can be seen that there are significant differences between the regions of the Czech Republic. Improvements in accessibility over the last five years can be observed for acute inpatient care. This objective is linked to the reform of psychiatric care, which aims at the creation of acute psychiatric care beds in psychiatric hospitals and clinics as well as the gradual establishment of mental health centres.

In practice, ensuring local accessibility faces a number of challenges, as Knorová (2020) notes. At the system level, these include the fact that the presence of a given health service provider within the driving distance set by the relevant standard does not mean that this provider has spare capacity. Also, according to Act No. 48/1997, §11(1), the insured person has the right to choose a provider that meets his/her health needs and that has a contract

with the health insurance company with which the insured person is registered. Last but not least, the practice is faced with the problem that the insured does not indicate the address of the current residence, but the address of the insured's permanent residence. On the other hand, the insured of a given health insurer has the right to submit a request or notification to the insurer's contracted provider for care.

Acknowledgements

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Appendix

Table A List of contracted health service providers in the field of psychiatry as of 1 February 2023

ID	Name of provider	Country	Expertise
64165	General teaching hospital in Prague	PRA	3F5, 3U5, 3U8
64190	Thomayer Hospital	PRA	3F6
64203	University Hospital in Motol	PRA	3F6
61383082	Military University Hospital Prague	PRA	3F5
64220	Bohnice Psychiatric Hospital	PRA	3H5, 3U5, 3U6
23752	National Institute of Mental Health	STC	3F5, 3U5
68691	Kosmonosy Psychiatric Hospital	STC	3H5, 3U5
26068877	Hospital České Budějovice, a.s.	JHC	3F5
583600	Psychiatric hospital Červený Dvůr	JHC	3U8
28092732	Psychiatric Hospital Písek a.s.	JHC	3U5
668168	Psychiatric hospital Lnáře	JHC	3U5
26095203	Hospital Tábor, a.s.	JHC	3H5
667421	Children's Psychiatric Hospital Oparany	JHC	3U6
26360527	Klatovy Hospital, a.s.	PLK	3H5
669806	University Hospital Pilsen	PLK	3F5
669792	Psychiatric hospital in Dobřany	PLK	3H5, 3U5, 3U6
47714913	Hospital Ostrov s.r.o.	KVK	3H5, 3U5
673552	Psychiatric Hospital Horní Beřkovice	ULK	3H5, 3U5, 3U8
831034	Louny Children's Psychiatric Hospital	ULK	3U6
829137	Psychiatric hospital St. Petersburg, p.o.	ULK	3U5
25488627	Regional Health, a.s.- Disease. Most, o.z.	ULK	3H5
25488627	Regional Health, a.s. - Masaryk Hospital, o.z.	ULK	3F5
25413244	SENIOR CZ, s.r.o.	ULK	3U5
27283933	Regional Hospital Liberec, a.s.	LBK	3H5, 3H6
179906	University Hospital Hradec Králové	HKK	3F5, 3U8
26001551	Regional Hospital Jičín a.s.	HKK	3H5
26000202	Regional Hospital Náchod, a.s.	HKK	3H5
27520536	Hospital of Pardubice Region, a.s.	THEN	3H5
196096	ALBERTINUM, professional medical institute, Žamberk	THEN	3U5
179230	Psychiatric Hospital Havlíčkův Brod	VYS	3H5, 3U5, 3U6, 3U7, 3U8
600601	Psychiatric Hospital Jihlava	VYS	3U5, 3H5
26940281	PATEB s.r.o.	VYS	3U5
842052	Children's Psychiatric Hospital	VYS	3U6
60555530	Military Hospital Brno	JHM	3H5
65269705	University Hospital Brno	JHM	3F5, 3T5
160105	Psychiatric Hospital Brno	JHM	3H5, 3U5, 3U7, 3U8
92584	Hospital Znojmo, contributory organization	JHM	3H5
212423	Detention Prison and ÚpVZD Brno	JHM	3H5
98892	University Hospital Olomouc	OLK	3F5
843954	Psychiatric hospital Šternberk	OLK	3H5, 3U5, 3U6, 3U7
60800691	Military Hospital Olomouc	OLK	3H5
851388	Psychiatric Hospital Marianna of Orange	OLK	3U5
567914	Psychiatric hospital in Kroměříž	ZLK	3H5, 3U5, 3U6, 3U8
26816407	CNS-CENTRUM TŘINEC s.r.o.	MSK	3H5
844896	Havířov Hospital, contributory organization	MSK	3H5
843989	University Hospital Ostrava	MSK	3F5
844004	Psychiatric hospital in Opava	MSK	3H5, 3U5, 3U6, 3U7, 3U8

Remark: 3F5 - acute inpatient care psychiatry - type F; 3F6 - acute inpatient care child and adolescent psychiatry - type F; 3H5 - acute inpatient care psychiatry - type H; 3T5 - 3T5 - intensive inpatient care psychiatry - type T; 3U5 - long-term inpatient psychiatry care - Type U; 3U6 - long-term inpatient child and adolescent psychiatry care - Type U; 3U7 - long-term inpatient gerontopsychiatry care - Type U; 3U8 - long-term inpatient addictive diseases care - Type U.

Multi-Criteria Evaluation of Municipal Management using TOPSIS Technique: Bilateral Case Study on Slovakia and Czechia

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Abstract: Effective management of public and private funds is an area for every economic entity that is subject to more and more control. Currently, municipalities not only in the Slovak Republic are evaluated based on a single criterion - indebtedness, while other attributes of their management are not taken into account. The aim of the presented manuscript is to compare results the TOPSIS technique on the basic sample of 2940 municipalities in the Slovak Republic with the results of the same application on the research sample no. 2 which consists of 602 municipalities in the Czech Republic. The comparison is realized using 8 criteria, 2 sets of weights defined by the MW method and expert group and verified via several methods, like Kendall rank coefficient, Levene test and Mann-Whitney test. One of the results of the performed analyzes is pointing out the differences resulting from separate or joint assessment of municipalities in both countries.

1 Introduction

The economic activity is usually regulated by legislation that defines the scope of its activities. According to Act no. 460/1992 Coll. (Constitution of the Slovak Republic) "territorial self-government consists of a municipality and a higher territorial unit". The basic unit is the municipality, which is enshrined in the Constitution and defined by Act no. 369/1990 Coll. on municipal establishment.

The municipality is defined by special regulations in the Slovak Republic as well as in the Czech Republic. In both countries, the basic general definition is based on their Constitution (Act No. 460/1992 Coll., or Act No. 1/1993 Coll.), while referring to other special laws. The Constitution of the Slovak Republic understands a municipality as an independent territorial self-governing and administrative unit of the Slovak Republic, bringing together persons who have permanent residence on its territory. The Constitution of the Czech Republic describes it more simply, as a territorial community of citizens with the right to self-government.

A municipality can be viewed as a social organism that is defined geographically and is relatively stable (Tóth, 1998). Mates, Wokoun (2001), like Wildmannová, Šelešovský (2001), consider the municipality as a basic territorial self-governing community of citizens. In agreement with Koudelka (2000), they identified the territory and the population as the basic attributes of the municipality. As the last, third, characteristic attribute of the municipality, they identified self-government, or the right to independence, which is implemented through a local referendum and self-government bodies. All these authors are based on legal regulation. Act No. 369/1990 Coll. on municipal establishment describes a municipality as an independent territorial self-governing unit of the Slovak Republic. It is a legal entity that, under the conditions established by law, manages its own property and revenue independently. In the Czech Republic Act No. 128/2000 Coll. on municipalities understands by this term the basic territorial self-governing community of citizens.

Under the conditions of the Slovak Republic, the management of municipalities is governed by the Act no. 583/2004 Coll. on Budgetary Rules of Territorial Self-Government, which considers its indebtedness as the only evaluation criterion of the municipal management (§ 19): "The municipality is obliged to introduce a recovery regime if the total amount of its obligations after the maturity date exceeds 15% of the actual current revenue of the municipality of the previous budget year and if it has not paid any recognized obligation within 60 days from its due date." The recovery regime represents a loss of freedom over the administration of the municipality's own finances. At the same time, the law (§ 17) adds that the municipality can accept repayable sources of financing (i.e. credit, loan) to fulfill its tasks only if:

• the total amount of the debt of the municipality or higher territorial unit does not exceed 60% of the actual current revenue of the previous budget year and

• the amount of annual installments of repayable sources of financing, including the payment of revenues, will not exceed 25% of the actual current revenue of the previous fiscal year.

In the Czech Republic, the management of municipalities is regulated by Resolution of the Government of the Czech Republic no. 1395/2008 on monitoring the management of municipalities monitored in the form of a system of informative and monitoring indicators (SIMU). As the name itself suggests, SIMU contains a total of 21 indicators, including the rule of budgetary responsibility, debt per capita, and others.

Neither the Slovak Republic nor the Czech Republic have a framework (including legislation) that would evaluate the comprehensive management and efficiency of municipal management. We consider its absence to be the main research problem of the submitted manuscript. This absence of a municipal management evaluation system formed the starting point for establishing the goal of the presented research, which is to evaluate and compare the management of municipalities in Slovakia and the Czech Republic using the TOPSIS technique in one year (Technique for Order of Preference by Similarity to Ideal Solution).

2 Material and Methods

A total of 8 criteria were identified for the evaluation of the management of municipalities in the framework of the previous already published research. The identification of individual criteria was based on consultations with representatives of municipalities and public administrative. Our goal was to jointly identify a group of basic criteria that best reflects the real state of management of a specific municipality and that would offer an alternative to the currently valid assessment according to the law. In the first phase, a group of 28 criteria was presented to them, which after several meetings and discussions was minimized to the following group of monitored criteria:

- R1 – total expenditure per capita,
- R2 – share of liabilities in total assets of municipality,
- R3 – total revenue per inhabitant,
- R4 – budget balance per inhabitant,
- R5 – return on assets,
- R6 – current expenditures per capita,
- R7 – liabilities per capita,
- R8 – current revenue per capita.

In our opinion, the given set of criteria meets the requirements set for such a set by Fotr, Dědina, Hrůzová (2000), i.e. completeness, operability, non-redundancy and minimal scope.

The importance of individual criteria is determined differently, while in the first case the MW (Mean Weight) method is used, which considers all criteria to be equal. In the second case, the weights are determined by an expert sample of 25 experts. Experts assigned weights using Fuller's method, i.e. a total of 28 pairs of criteria were evaluated. Each expert distributed a total of 28 points, while the importance of the criterion represented the share of points obtained by the given criterion against all distributed points.

The TOPSIS technique application in combination with both sets of weights is applied on 2 research samples, while:

- research sample no. 1 consists of 2940 municipalities in the Slovak Republic - the complete basic set of all municipalities in the Slovak Republic (Bratislava, Košice were divided into urban districts),
- research sample no. 2 represents a sample of municipalities of the Czech Republic (602 randomly selected municipalities) with the following structure.

**Table 1 – Structure of the research sample no. 2**

region	1 – 199	200 – 499	500 – 999	1000 – 4999	5000 – 9999	10000 – 49999	total
Central Bohemian	26	36	24	20	3	2	111
South Bohemian	14	19	13	11	1	1	59
Plzeň	11	16	11	9	1	1	49
Karlovy Vary	3	4	3	2	0	0	12
Ústí nad Labem	8	11	7	6	1	1	34
Liberec	5	7	5	4	1	0	22

Hradec Králové	10	14	9	8	1	1	43
Pardubice	10	14	9	8	1	1	43
Vysočina	16	22	15	12	2	1	68
South Moravian	15	21	14	12	1	1	64
Olomouc	9	12	8	7	1	1	38
Moravian-Silesian	7	9	6	5	1	1	29
Zlín	7	10	6	5	1	1	30
Total	**141**	**195**	**130**	**109**	**15**	**12**	**602**

Source: Own processing

Due to time constraints, we work with a sample set of municipalities in the Czech Republic (research sample no. 2). The proportional random selection procedure was applied, i.e., it represents a set of randomly selected municipalities depending on size (number of inhabitants) and regional affiliation. The largest group are municipalities with 200 to 499 inhabitants, which represented almost a third of the basic as well as the sample set. The basic set has only 20 cities with more than 50,000 inhabitants (of which 5 have more than 100,000 inhabitants). For this reason, these cities are not included in the research sample. The Central Bohemian region has the largest representation with 18.32% of the base, or 18.44% to the research sample. The Karlovy Vary region has the fewest municipalities. Such a research sample ensured sufficient reliability while maintaining a confidence interval of 0.05 and a confidence level of 99% (calculated according to the "sample size calculator").

Figure 1 – The principle of operation of the TOPSIS technique. Source: Tramarico et al. (2015)
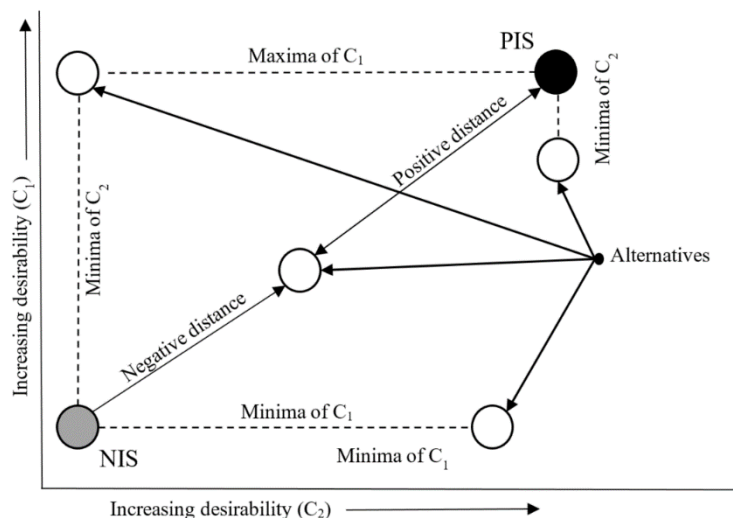
Tramarico et al. (2015) illustrates the principle of the TOPSIS technique using the above figure where each white ball represents one evaluated subject (municipality in our analysis). The gray ball represents a real or hypothetical alternative (subject/municipality) with the worst values of individual criteria - the Negative Ideal Solution (NIS). The black ball represents a real or hypothetical alternative (subject/municipality) with the best values of the individual criteria - the Positive Ideal Solution (PIS). The alternative that is farthest from the NIS alternative and closest to the PIS alternative is the best rated. More information on this method is offered by e. g. Noryani et al. (2018), Dutta et a. (2021) and others.

TOPSIS is often used method of multicriteria decision-making and its primary use is in solving different types of decision-making problems. According to Zavadskas et al. (2016), this method is one of the most widely used, with the AHP, ANP or PROMETHE as possible alternatives. An overview of its applications captures e.g. Tramarico et al. (2015), Ilbahar et al. (2019), who noted an annual increasing number of researches/articles in which the use of not only the TOPSIS technique could be found. Its applications can be found in environmental studies (Rozenthal, Blumberga, 2019; Siksnelyte et al. 2019), transport (Djordjević, Krmac 2019), local government (Vavrek, Bečica 2022; Vavrek, Papcunová, Tej, 2020), social area (Vaňková, Vavrek, 2021) and many other areas (see Chang et al. 2010, Behzadian et al. 2012, Luan et al., 2019; Ma et al., 2019; Wu et al., 2019).

The data was processed for the year 2012 and was obtained from the INEKO web portal (research sample no. 1) and the Monitor web portal (research sample no. 2). The obtained results are subsequently evaluated using a wide

range of mathematical and statistical methods including Kendall's rank correlation coefficient, Levene test and Mann-Whitney test. All analyzes are processed in MS Office Excel, Statistica and Statgraphics.

3 Results and Discussion

In the initial analyses, municipalities are evaluated in regions, resp. in the Slovak Republic and the Czech Republic separately. The comparison of the results obtained in this way with the results in the case of the unification of all statistical units into one file is discussed in this contribution.

Table 2 – Ranking of municipalities based on the results of the TOPSIS technique

E	M		Obec	c_i*	R1	R2	R3	R4	R5	R6	R7	R8
1	1	SR	Forbasy	0,743	366	2	534	4045	0	342	156	347
2	2	SR	Príkra	0,741	1071	0	978	3273	0	672	10	978
3	4	SR	Geraltov	0,736	561	6	528	2804	0	499	245	527
4	3	SR	Nová Kelča	0,714	1204	8	1266	3694	0	563	1397	954
5	5	SR	Sklené Teplice	0,712	1743	7	1662	2645	0	459	467	639
6	9	SR	Zlatníky	0,703	727	1	760	1730	0	727	45	759
7	7	SR	Parihuzovce	0,700	400	0	515	1957	0	400	1	515
8	6	ČR	Slatina	0,690	191	9	395	77	0	159	579	26
9	12	SR	Ratková	0,684	1034	3	1049	1250	0	1032	-79	1049
10	8	ČR	Pavlov	0,682	679	2	2282	1602	0	350	169	1588
...	...	...	...	...	...	...	...	...	...	...	...	...
3512	3514	ČR	Zbrašín	0,508	2959	3	791	-2168	0	696	314	150
3512	3510	SR	Veľké Revištia	0,499	425	0	456	-686	-1	419	29	446
3514	3513	ČR	Janská	0,499	966	154	401	-565	-0	944	3009	37
3515	3515	SR	Bratislava - Devín	0,395	506	407	529	-426	-0	506	8299	527
3516	3516	SR	Jelšovec	0,378	104	814	108	-4	-0	104	170	108

*c_i - relative distance to PIS alternative

note: E - equal weights defined based on the MW methods, M - modified weights defined based on the expert group

As can be seen in Table 2, the best rated is the municipality of Forbasy (SR). There is a minimal rotation of municipalities on the leading ranks with a predominance of Slovak municipalities in the TOP 10. At the other end of this table we can see the same situation, i.e. the majority group of Slovak municipalities. The results outlined in this way, with the equal weights, document a better average ranking of Czech municipalities (1500) compared to the average ranking of Slovak municipalities (1812). The change in weights results in a minimal change, as Slovak municipalities lost an average of 4 places.

Table 3 – Comparison of the rank correlations of the Slovak Republic, the Czech Republic, together

	R1	R2	R3	R4	R5	R6	R7	R8
equal weights - SR	-0,031	-0,365	0,029	0,611	0,646	-0,024	-0,302	0,007
p	0,014	0	0,022	0	0	0,053	0	0,600
equal weights - ČR	-0,275	-0,523	0,095	0,789	0,833	-0,237	-0,516	0,085
p	0	0	0,02	0	0	0	0	0,038
equal weights - together	-0,003	-0,342	-0,096	0,603	0,621	-0,014	0,264	0,021
p	0,827	0	0	0	0	0,226	0	0,068
modified weights - SR	-0,054	-0,386	0,019	0,594	0,610	-0,046	-0,317	-0,011
p	0	0	0,128	0	0	0	0	0,371
modified weights - ČR	-0,307	-0,513	0,068	0,8	0,833	-0,273	-0,504	0,066
p	0	0	0,095	0	0	0	0	0,103
modified weights - together	0,002	-0,357	-0,104	0,595	0,589	-0,009	0,268	0,016
p	0,849	0	0	0	0	0,442	0	0,155

Source: Own processing

Significant changes in rank correlations are recorded in Table 3. It is not possible to state strengthening, resp. weakening of the rank correlations found at the level of both countries. In their separate evaluation, criteria R2, R4, R5 and R7 are marked as important (associated with the result), i.e. criteria related to liabilities and the budget balance. By combining municipalities, the result of their assessment becomes independent of expenses (total and current) and current revenue.

Figure 2 – Comparison of the variation range of the results depending on the country (equal weights)
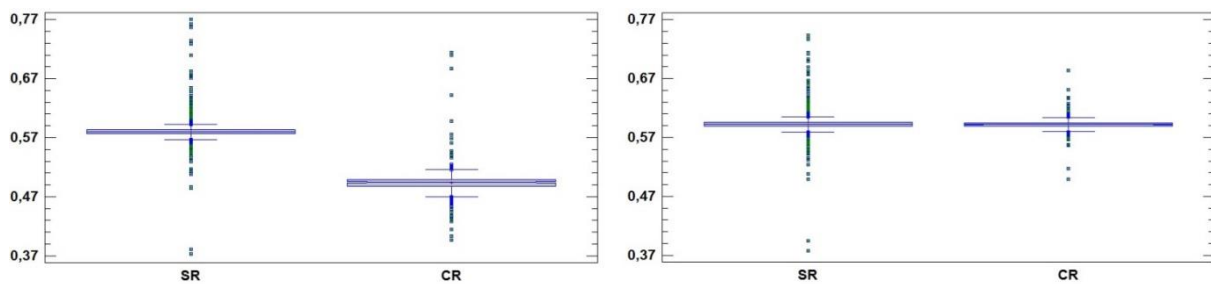
Source: Own processing

In the Slovak Republic, Figure 2 shows the average result achieved at the level of 0.580 ci compared to the result of 0.494 ci achieved by municipalities in the Czech Republic. The range of variation of the results in both countries is comparable (difference 2.69%). In the case of combining all municipalities into one set, the average result as well as the median is equalized (0.593, respectively 0.592). However, the range of variation has changed, which for Slovak municipalities is the effect of a pair of municipalities with a lower rating (Jelšavec, Bratislava - Devín).

Figure 4 – Comparison of the variation range of the results depending on the country (modified weights)
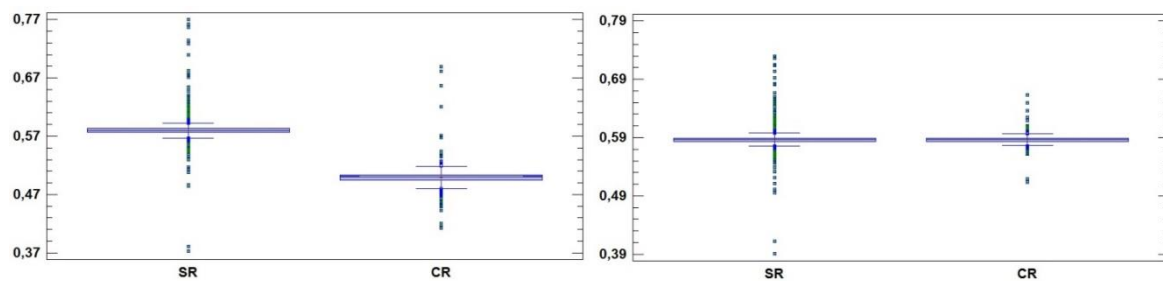
Source: Own processing

The change in weights confirmed the better average rating of municipalities in the Slovak Republic (in a separate evaluation). In both the Slovak Republic and the Czech Republic, the average and median did not change due to the merging of municipalities into one entity.

Table 4 – Comparison of selected characteristics of the Slovak Republic, the Czech Republic, and together

	separately		together	
	E	**M**	**E**	**M**
homoscedasticity	LE = 75,799; p = 0	LE = 85,447; p = 0	LE = 7,707; p = 0,005	LE = 19,804; p = 0
conformity of median	W = 19,47; p = 0	W = - 0,708; p = 0	W = 18,26; p = 0	W = 7,165; p = 0

note: E - equal weights defined based on the MW methods, M - modified weights defined based on the expert group

Levene's test did not confirm the homoscedasticity of the results when evaluated separately and together (Table 4). Despite the equalization of the mean and median of the results, the Mann-Whitney test did not confirm the agreement of the median even after merging the municipalities. When evaluating a municipality, the country in which the municipality is located has an impact.

4 Conclusion

Currently, under the conditions of the Slovak Republic, municipalities are evaluated by law only on the basis of a single criterion, which is indebtedness. The presented manuscript offers a summary of own research in the form of an alternative assessment of municipalities using the TOPSIS technique in combination with selected mathematical and statistical methods. Our basic results indicate a worse evaluation of municipalities in research sample no. 2, i.e., Czech municipalities. The subject of the research was not the identification of the causes of these differences, which we could find e.g., in different legislation.

Also, on the basis of the above TOPSIS application, we consider this technique to be a suitable tool for multi-criteria evaluation, for the application of which, however, it is necessary to have suitable criteria (which may limit

its use in some cases). Its use is also conditional on their appropriate selection and, above all, determining their importance, which significantly determine the overall results. At the same time, we consider the conducted research as a starting point that can serve for further qualitative research or as a basis for the management of municipalities. A similar system (MCDM analysis) can represent a replacement for SIMU indicators, or a completely new system for evaluating the efficiency of entities not only of local self-government. A suitable extension could be the analysis of a longer period of time, allowing to follow the development and trend of the obtained results or the application of other methods of multicriteria analysis, e.g. VIKOR, PROMETHE and others.

Acknowledgements

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The importance of digitalization for the development of the peripheries and small municipalities in the Czech Republic

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Abstract: The emphasis on the development of the use of ICT and digitization has on the territory of the European Union been linked from the very beginning with the effort to support economic development and the competitiveness of the European economy. The effort to enable the so-called fourth industrial revolution to take place, the introduction of the concept of Industry 4.0 and the adoption of A Digital Single Market Strategy for Europe clearly followed this goal. However, with the support of connectivity and the building of high-speed Internet connections even outside the main centers of economic activity, there was a shift in this regard. The concept of digital economy began to acquire a much broader meaning and, for example, in the strategic document Digital Economy and Society the concept of digital economy is grasped an umbrella category. It relates to effects of digitalization in the area of economic activity in the true sense but also in social life in a relatively broad sense. Digitization thus makes it possible also to solve traditional problems of peripheral areas, when it is true that thanks to the use of digital technologies it is possible to reach a state where a specific place where a specific service is provided will not negatively affect its quality, or at least this influence will be relatively smaller than it currently is. In our article, we tried to show how digitization in peripheral areas can also fulfill this role.

Keywords: Periphery, small municipalities, digitalization, Internet, development

JEL Classification: R220, K300, H830

1 Introduction

The concept of periphery and peripheral areas is not defined in legislation, and looking for the definition we can only turn to the professional literature, which understands peripheral areas as those ones in which social problems and disadvantages accumulate, the consequence of which are also limitations in the possibility of development of these areas. For example Gunnar Myrdal's (1957) classic theory of cumulative causes, which comes from the assumption of the centripetal action of economic, demographic and institutional factors influencing the potential of the development in favor of the centers at the expense of the peripheries, emphasises directly on these limitations. This uneven potential of the development also results in the widely accepted dichotomy of center versus periphery, in which peripheral areas are those ones that do not participate and do not benefit (or not to such a significant extent) from the development and prosperity of other places and areas (usually large agglomerations and economic centers). In the case of peripheral areas, it can be spoken thus about a certain degree of their exclusion from the mainstream of the development and prosperity of the society. However, certain shifts may occur over time, technological and social development. The above-mentioned definition of Gunnar Myrdal, for example, poses a great role to the spatial distance (remoteness) of the peripheral areas from the centers. However, this theory was conceived in a book published 66 years ago, i.e. under completely different conditions than today, and it can be considered that the importance of spatial distance and thus the extent of exclusion resulting from it has diminished significantly at least thanks to the development of transport infrastructure constructions and the high level of motoring in contemporary developed economies, which also includes the Czech Republic. The current strategy, when working with the concept of peripheral areas, states that it is a relatively diverse category. It comes from the analyzes and studies to which it refers in general (Bernard, Šimon, 2017). The mentioned authors state the diverse nature of the peripheral areas expressly based on the performed analysis. Therefore, the nature of the peripheral areas does not have to be only the areas at a great distance from the regional centers, in which the dominant role in terms of their peripherality is played primarily by their spatial remoteness. The Regional Development Strategy lists them as just one of the types of the peripheral areas, in addition to them they are also: "areas that lost a large number of job opportunities as a result of restructuring and failed to replace them with other activities, rural areas in the hinterland of large cities that have a positive migration balance, but are characterized by a high unemployment rate". Just in reaction to the difference between the individual types of the peripheral areas, it can be also encountered the questioning of whether it is appropriate to use the category of the peripheral areas at all (Bernard, Šimon, 2017). At least for the purposes of conceptual materials such as also the Regional

Development Strategy, however, the use of this category still appears to be meaningful in view of the fact that in these types of territories, we can talk about the existence of certain common problems that are typical for these areas. The Regional Development Strategy again comes from the analyzes and studies, when it states that these problems include, among others: poor accessibility of public services, which is seen especially in the inner peripheries, lower intensity of housing construction, the highest values of the age index as a consequence of the departure of younger groups of the population and a long-term negative increase, poor accessibility by public transport, especially at the weekend, but also, for example, worse availability of high-speed Internet.

It is the coverage of the territory by the Internet that has the fundamental importance for understanding the functioning of peripheral areas from the point of view of digitization. These issues are closely related to the development of the modern technologies, which enable subsequently remote communication and work from home, while it can be assumed that the gradual development of the Internet coverage of the territory will enable the development of the peripheral regions as well. The coverage of the territory by the Internet is therefore a very important data containing concentrated factors of the economic, administrative and socio-cultural natures, showing a strong regional differentiation with possible impacts on the identification of peripherality and the regionalization of the inner and outer peripheries. In the long term, we are witnesses of the strengthening of the coverage of the territory with high-speed Internet, depending on the economic and settlement importance of the individual municipalities, municipalities with extended scope and entire regions. The different coverage of high-speed Internet in the Czech Republic are among the essential findings presented in the publication Wokoun, Jeřábek et al. (2023), with the fact that there are significant variations and regional differentiations of this phenomenon, and also with the fact that some territories of rather rural, even peripheral nature are covered by high-speed Internet in an excellent way, and other peripheral areas have coverage significantly worse.

However, in connection with the onset of the so-called digital revolution (or digital transformation), a threat of another kind of exclusion or limitation of the possibilities for the development of certain groups of the population as well as areas arose. The concept of the so-called Industry 4.0 envisages the transition of production from separate automated units to fully integrated automated and continuously optimized production environments. "Smart factories" should be created as part of a new global network based on connecting production facilities to cyber-physical systems (Mařík et al.). As a consequence of this change, there should also be an increase in labor productivity and, under otherwise comparable conditions (including, for example, labor costs), the uncompetitiveness of production methods that are not based on this concept (according to the studies by the National Academy of Science and Engineering, this growth is estimated in the range of 32 % (Mařík et al., p. 33).

A fundamental issue, not only in connection with production and the concept of Industry 4.0, but also with functioning of society and public administration in general, was thus seen in the access to the Internet, respectively to the internet connection with sufficiently high performance as the condition for the possibility of involvement in production and social processes. The document Smart Cities Concept – Resilience through SMART solutions for the municipalities, cities and regions operates with the concept of digitally excluded localities, or so-called social exclusion, which are understood in it as "localities that are not covered in full extent and quality by the necessary ICT infrastructure or in in which there is an increased concentration of people who are digitally excluded or endangered by digital exclusion for other reasons". It is therefore not only about the real possibility of the access to the Internet, but also about the competence of specific people to use the existing infrastructure. At the same time, the digital lag of the specific area can also lead to the emergence of so-called digital divide or so-called social exclusion (digital gap), when there may be a risk that a specific area or a certain sector will have the problem in accessing information or even they will not be able to meet the requirements set by law. The effort to ensure access to the Internet, or a high-speed Internet connection, was motivated by the public administration mainly by the effort to eliminate existence of the areas that would be digitally excluded (from the essence of the matter, it would be probably mainly peripheral areas) and there would be a risk that they would not be competitive from the point of view of their economic performance or it would not be possible to fulfill the legal obligations of specific entities in them. In the conditions of the Czech Republic, for example, this represented a problem in connection with the introduction of the electronic records of sales in 2016, when internet access was not available throughout the whole country at that time (Veber et al.). However, ensuring access to high-speed Internet and building the relevant infrastructure could also be in the future a tool to alleviate at least some social problems and the disadvantage of the peripheral areas and their exclusion.

2 Material and Methods (The context of trends in removal of the digital divide between cities and in strategic documents)

2.1 Methods used in the article

The methods used in our article consist mainly in the analysis of conceptual documents of the European Union and the Czech Republic, which were adopted over time in connection with the process of digitization and building of a digital economy. The subject of the analysis were also documents describing real progress in the building of high-speed Internet infrastructure, even in those areas of the Czech Republic where this infrastructure would most likely not have been built without public support. For the most part, in these cases, we are dealing with peripheral areas, and the analysis of the real shift in the digitalization process can provide a basis for possible considerations about a development potential that digitization and the introduction of high-speed Internet represent for these areas.

2.2 Conceptual documents of the European Union and the Czech Republic relating to the use of ICT and digitization

The emphasis on the development of the use of ICT and digitization has been linked on the territory of the European Union from the very beginning with the effort to support economic development and the competitiveness of the European economy. Already in 2009, the strategic document A Green Knowledge Society: An ICT policy agenda to 2015 for Europe's future knowledge society (hereinafter Forge, 2009) was drawn up, in which the emphasis is placed on the role of ICT within the development of the knowledge economy (Wokoun, Ledvinová, 2022). The basic vision of the so-called Fourth industrial revolution and the concept of Industry 4.0 were presented in 2011 and A Digital Single Market Strategy for Europe was as a communication of European commission to other bodies of EU launched in 2015. According to this strategy "the global economy is rapidly becoming a digital one" in which ICT is "a foundation modern innovative economic system". Europe should have therefore became leader in the digital economy and improve Europe's competitiveness in a global context.

It must be listed from the important documents adopted at EU level the document Europe 2020 (Europe 2020, 2010) "Strategy for smart, sustainable and inclusive growth", which focused on three main priorities, which are further divided into seven flagship initiatives, of which the essential part for this contribution is: ""The 'Digital Agenda for Europe" - accelerating the development of high-speed internet and the use of the Digital Single Market by households and businesses.", where it is highlighted that Europe is lagging behind high-speed internet, which affects its ability to innovate (especially in rural areas), behind the dissemination of knowledge through the internet and the distribution of goods and services through the internet."

Following on The Digital Agenda for Europe strategy from year 2010, which aimed to promote and expand ICT and remove various economic barriers in Europe, the second Digital Agenda for Europe: 2020-2030 was adopted, which focused on the changes caused by digital technologies, on the essential role of digital services and markets, and on the EU's new technological and geopolitical ambitions. Based on two strategic communications, concretely "Shaping Europe's Digital Future" and "Europe´s Digital Decade", the Commission set out the specific measures to be taken to support the creation of secure digital services and markets. The priorities of the current decade are, further, the development of state-of-the-art computing, blockchain strategy and blockchain-based trade policy, human-centered artificial intelligence and trusted artificial intelligence, semiconductors, digital sovereignty, cybersecurity, gigabit connectivity, 5G and 6G, European data spaces and infrastructure, as well as setting global technology standards; 7.5 billion euros was earmarked for the implementation of this program (europa.eu).

In national operational programs, such as the "Integrated regional operational program for the period 2014-2020" updated on 2nd December 2022 managed by the Ministry for Regional Development, the question of the resilience of the peripheries and small municipalities appears rather sporadically. Although the mentioned program aims to strengthen regional competitiveness and the quality of life in the regions, it is rather broadly focused and does not focus too much on reducing the trend of increasing the digital gap between cities and the countryside, even though it is supposed to be in fact according to the law and as it is clearly the example of the so-called resortism, here in the form of insufficient coordination of legislation between individual resorts.

A conceptual material, clear and synthetic to a certain extent, is a set of concepts ensuring the prerequisites for long-term prosperity of the Czech Republic in the environment of the ongoing digital revolution "Digital Czechia" (Dzurila, Tax, Hrabě, Iľko, 2018a). It consists of three strategic concepts: the Information Concept of the Czech Republic (Digital Public Administration), the Czechia in Digital Europe, and Digital Economy and Society, while the individual pillars (concepts) are interconnected with the synergistic effects.

The strategic document Digital Economy and Society is to be continuously updated (its current wording is from June 2023) and its aim is to ensure the coordination of agendas falling into all areas of the digital economy and social life. It therefore includes all existing initiatives (Industry 4.0, Construction 4.0, Society 4.0, Work 4.0, Education 4.0, etc.) as well as those that may yet emerge. The goal of the conception is therefore a comprehensive understanding of the digital economy and its construction as a counterpoint to the previous sectoral approach. It defines eight goals, which include, among others, the support of connectivity and the infrastructure of the digital economy.

The current Regional Development Strategy, which was approved by in 2019, notes that peripheral areas have poorer Internet access, and this fact limits the availability of public services, including the Internet of Things. This problem especially relates to high-speed Internet. Therefore, the Regional Development Strategy identifies the improvement of the availability of high-speed Internet as one of the typical measures that should be implemented to eliminate existing problems. The strategy also defines the target state that should be reached by 2025. By this year, all households should have access to the Internet with a speed of at least 100 Mb/s, which could be increased to 1 Gb/s in the future. Schools, colleges, research organizations, transport hubs, hospitals, administrative bodies, libraries etc. should have Internet access with download and upload speeds of at least 1 Gb/s. All urban areas, highways and railways have been covered by 5G networks uninterruptedly by 2025. When defining these goals, the government had to reflect the objectives set by European Commission on connectivity for a European Gigabit Society, which merged into the objectives set in Regional Development Strategy.

In March 2021, the National Plan for the Development of Very High Capacity Networks was approved by the government. He works with the so-called infrastructure coverage map as one of his important tools. This map indicates so called white places, which are places where high-speed Internet connection is not available and for its introduction it seems necessary to use public support. In the past, the development of infrastructure enabling connection to high-speed Internet took place on the basis of the initiative of private entities in places with a high demand perspective. In white places, it cannot be assumed that high-speed Internet would be introduced without public support, as these places would be commercially unattractive for private investors. However, the construction of infrastructure even in these places can be supported from the National Recovery Plan, which is financed by the European Union. The first call for applications for support was issued by the Ministry of Industry and Trade in 2017 and was followed by other calls. The volume of funds for the introduction of high-speed Internet even in peripheral areas appears to be sufficient (lupa.cz).

The need for building high-speed Internet using fiber optic cable technology is also emphasized by the aforementioned document Smart Cities Concept – Resilience through SMART solutions for the municipalities, cities and regions. The concept emphasizes the need to prevent the existence of so-called digitally excluded localities, which, among other things, are not sufficiently covered by the necessary ICT infrastructure. The concept understands the building and use of digital infrastructure as one of the tools to achieve carbon neutrality and enable the achievement of SMART solutions. The concept mentions the possibility of using integrated projects where you can connect to centrally built specific applications, but this again assumes the building of connectivity, even at the level of small municipalities, and possibly even in peripheral areas.

3 Results and Discussion

3.1 Progress of digitalization in peripheral areas

As the data of the Czech Statistical Office shows, the differences between peripheral and other municipalities are gradually disappearing, respectively they do not tend to deepen. For example, the number of outputs from the contact points of Czech Point, which also includes the municipal authorities, has a constantly rising tendency, as well as the establishment of the data boxes on the application and the conversion of the documents from the basic registers, however the Czech Republic lags behind the more developed EU states by up to 50 % (europa.eu).

There are eliminated gradually the differences in the availability of high-speed Internet between the city and the countryside, respectively the peripheries by it, because when it is judged only from that point of view, there are no differentiations there, e.g. all municipalities must have the data box and must ensure the access to it.

The Czech Telecommunications Authority does not specify directly what technology for high-speed Internet should be implemented, however, the conditions of a speed higher than 256 kb/s must be met, but according to the following EU conditions it should be even higher. Above mentioned objectives set on connectivity for a European Gigabit Society are binding for the Czech republic. These objectives were applied where infrastructure was built in so called white areas using money from the National Renewal Plan. If in the past high-speed Internet networks

were built by private entities without public support, these goals were not necessarily pursued. The most recently published survey by the Czech Statistical Office states that as of 31 December 2021, all regional authorities, 98 % of state organizational units and 88 % of municipal authorities had high-speed internet connections, while almost 100 % were connected to the "slower" internet; nowadays, in view of the dynamics of the process, resulting also from the legal regulation, it should be apparently 100 %. (CSU (1)).

AThe necessity to equip all municipalities with high-speed internet also follows from their obligations set by law, respectively based on it. Municipalities are among the entities that provide Czech Point services constantly to the widest extent, and their number increases almost every year / Act on Public Administration Information Systems, Act No. 365/2000 Coll. and Decree No. 553/2020 Coll., on the list of municipal offices and offices of city districts or city areas that are contact points of public administration/. At the same time, it can be expected that their number will increase in the future, taking into account the fact that Czech Post branches are being closed. This opens up not only to the citizens of these municipalities, but also to other entities the possibility of obtaining statements and other data provided by Czech Point.

3.2 Digitization as a tool to bridge the gap between peripheries and metropolitan areas on the example of schools

The shift that has occurred in recent years in relation to digitization and the possibilities of using ICT can be demonstrated in the area of the educational system. For example, according to the investigation of the Czech School Inspection published as the study "Usage of digital technologies in kindergarten, elementary, secondary and higher vocational schools" (ČŠI, 2017), there were significant differences in computer technology equipment in 2017, especially between the so-called small elementary schools, which are almost exclusively located in the rural regions, and the schools in urban-type municipalities. However, according to the study, the overall situation was unsatisfactory. The schools did have classrooms equipped with computers, but in numbers that allowed their use only for teaching ICT subjects. Only 18% of small and 29% of large primary schools allowed pupils to use their own electronic devices in class. In peripheral areas, of course, this possibility was in reality even more limited by the lower purchasing power of the pupils' parents. Sufficient internet connection speed at most schools was only related to a low number of connected devices. The share of schools that, according to the criteria established at the time, met at least the minimum quality standards for conditions for the use of digital technologies was critically low, and in the case of small elementary schools it reached only 5%. Of course, this was also reflected in the lower computer literacy and overall level of education of their pupils.

However, the latest data from the Czech Statistical Office (CSU (2)) show that the significant changes occured in a relatively short period of time, specifically of four years, when the turning point was year 2019, which was related to the covid pandemic. In 2021, there were an average of 20.7 computers per 100 pupils in all types of schools. Basically, all schools were also connected to the Internet and the school agenda was processed from the most part in the electronic form. At the same time, the primary schools, especially second grade, recorded the biggest increase. In total, more than 320,000 computers were available to students at both levels of elementary schools, while at secondary schools, which are located in cities, there were around 125,000 computers. Another figure is interesting: neither Prague nor the Central Bohemian region is in the best position, but they are the regions described as structurally disabled. The Karlovy Vary Region is in the first place in terms of computer technology equipment in primary schools, and schools in the Ústí Region and the Moravian-Silesian Region have more than 40 computers per 100 pupils.

At present, more than 95 % of primary and secondary schools have a school WiFi network available, and what is important, there are no significant differences between individual regions, and the ninety percent limit was reached on average several years ago.

From the above mentioned, of course, it is not possible to draw conclusions about the overall level of education at individual schools, and there will be differences in each municipality undoubtedly. On the other hand, however, the tools offered by the digital technologies can be certainly very beneficial for overcoming the handicap of the peripheral or small villages at all. It is possible to imagine, for example, that streaming, or teams will be used for individual specialized teaching of gifted pupils, which cannot be provided in a small village, which is a matter of legal regulation.

Table 1 - Share of schools (in %) fulfilling the selected criteria, 2018

Region	Small elementary school	Large elementary school	Secondary schools	Average of elementary schools, secondary schools	Ranking of regions according to selected ICT criteria
South-Moravian Region	3,9	13,2	29,2	15,43	1.
Zlín Region	2,9	10	33,3	15,40	2.
Liberec Region	6,4	5,4	32	14,60	3.
Prague Region	7,9	12,3	22,1	14,10	4.
Hradec Králové Region	3,8	13,6	21,7	13,03	5
Hradec Králové Region (2023)	7,9	12,3	22,1	14,10	-
Vysočina Region	5,3	7,6	26,2	13,03	5.
Central Bohemian Region	5,4	12,4	18,7	12,17	7.
Pardubice Region	5,3	9,1	20	11,47	8.
South Bohemian Region	6,4	6,2	19,4	10,67	9.
Pilsen Region	5,3	5,6	21,1	10,67	9.
Ústí Region	4	11,5	16,5	10,67	9.
Moravian-Silesian Region	5,7	6,6	18,2	10,17	12.
Olomouc Region	3	7	16	8,67	13.
Karlovy Vary Region	4,5	1,6	10,5	5,53	14.

Source: data of The Czech Statistical Office, Czech School Inspection (2017), (Wokoun, Ledvinová, 2022), own processing (2023)

The table shows significant differentiation between the regions and a higher proportion of large primary schools meeting the selected criteria is clearly given in most regions. The regions with a lower proportion of small primary schools fulfilling the selected ICT criteria are Prague, Central Bohemian, Ústí, Hradec Králové, Pardubice, South Moravian and Zlín Regions. Thus, it can be concluded that in the mentioned regions, there is the digital divide between cities and the countryside, as it was documented on the example of elementary schools. In the ranking of the regions according to the selected ICT criteria (data from the Czech Statistical Office, Czech School Inspection criteria for primary and secondary schools, 2017), it is not Prague on the first place that has limited access to subsidies due to its maturity, but the South Moravian Region, followed by the Zlín and Liberec Regions.

When evaluating regional differentiation based on the selected criteria at the level of ICT at small and large elementary schools, the role of the core areas of large cities was manifested only partially, while the positive effect on the entire region is assumed generally. The peripheral areas with a prevailing rural residential structure suffering from the insufficient level of security are, from this point of view, typical only for some regions. The spatial distribution of regions with good ICT at elementary schools can be evaluated positively. Bohemia and Moravia have strong and weaker regions, neither east nor west dominates. This can be used during the introduction of technologies and gradual expansion into the surroundings.

3.3 Digitization as a tool for solving problems typical of peripheral areas

Building of high-speed Internet infrastructure even in peripheral areas can probably be primarily understood as a manifestation of an effort to prevent the worsening of the situation in them and their lagging behind in the traditional dichotomy of center versus periphery. If, for example, the concept of Industry 4.0 envisaged a transition from separate automated units to fully integrated production environments, it is obvious that without a high-speed Internet connection, involvement in these processes would not be possible. If the basic problem of peripheral areas can be exclusion from the mainstream of development and prosperity of the society, preventing it in the era of the digital economy means, among other things, ensuring a high-speed Internet connection in the given area. In addition to preventing the threat of this exclusion, however, the existence of a high-speed Internet network in peripheral areas can fulfill another function. It can also represent a tool through which some problems can be solved that can be considered typical for peripheral areas or can be assumed to be difficult to cope without connection to this network.

An example of a problem that can be expected to increase in the future is the provision of medical care in peripheral areas (Novinky.cz (1)). The difference between its availability in peripheral peripheral areas and in large cities is

therefore likely to increase. A possible improvement could be the use of so-called telemedicine (Denik.cz), which would eliminate the need to personally travel to a medical facility but also, for example, the possibility of continuous monitoring of the health status of chronically ill patients through electronic devices that can be permanently carried with them and inform about the current state the patient. Centralized applications could continuously evaluate this and alert the doctor to any anomalies that could indicate a deterioration in the patient's health.

The Regional Development Strategy states that places with limited access to information infrastructure and high-speed internet, coupled with limited access to transport infrastructure, may struggle to retain a population with higher education and skilled professionals. At present, in relation to rural municipalities, and perhaps this may also apply to peripheral areas, considerable hopes are placed on the remote work (typically from home) in those fields that allow this. One of the prerequisites for the attractiveness of certain areas for housing is ensuring their transport accessibility. This does not only apply to qualified professionals. The transport policy of the Czech Republic states that part of the population cannot use individual car transport and is thus dependent on the possibility of using public mass transport. But it will necessarily be limited in the number of connections in peripheral areas. The advantage of the digital economy can be seen in the fact that, in the future, it should enable the introduction of technologies that are currently only being developed or the possibility of their use may yet appear as science fiction. It can be, for example, shared vehicles that would be able to drive to the desired location autonomously without the presence of a driver. They could also be used for transport by people who cannot drive a car themselves. Digital technology, or Internet applications could be considered an optimal platform, also for example, for arranging carpooling.

Especially in rural (often peripheral) areas, a problem often arises with the possibility of developing the talent of highly gifted children within the framework of school education. (novinky.cz (2)) In relation to a specific municipality, there may be, for example, a single school, for attendance of which public transport services are provided. It is thus only a matter of chance to what extent it is possible to develop the talent of a given child here, and there is a big difference in the possibility of developing it in peripheral areas and in cities. This could be compensated, for example, by the fact that part of the teaching or those subjects in which the child's talent would need to be developed would take place in an online environment and would be a supplement to traditional face-to-face teaching. In the future, for example, the use of virtual reality in teaching, in which the specific place where the school is located will not play a role. After all, in all cases where it is a question of solving the problems of peripheral areas that could be solved through digital technologies, the point would be that, thanks to them, the specific place where a specific service is provided will not negatively affect its quality, or at least this influence will be relatively smaller than it is currently.

5 Conclusion

All Czech documents and EU strategies generally focus on high-speed Internet and network development, and it is obvious that considerable attention is paid to rural regions and, in this regard, to small regions and peripheries. In connection with our topic, it is important to note that the priority of ICT as an important means for fulfilling priority goals, including rural regions, is evident in the essential EU documents. Although the development of digitization is more pronounced in the urban regions, it is precisely digitization that helps to overcome many handicaps resulting from the peripheral nature of the municipalities.

In the new Regional Development Strategy 2021+ (SRR 2021+, 2019), more attention is already paid to the instruments reducing the digital divide between the cities and rural areas than in the previous strategy. In many economically and socially threatened territories and rural regions and localities, the unavailability of the high-speed Internet can be identified as a partial problem, which can be the negative factor in the development of the local companies, and which reduces generally the quality of life in the given locality.

Nowadays, there are a number of parallel strategies, plans and declarations of the need to improve the availability of the high-speed Internet - for example, the Strategic Framework of the Czech Republic 2030, the Government Digitalization Program of the Czech Republic 2018+ Digital Czech Republic or the National Plan for the Development of New Generation Networks. When formulating and implementing the specific measures, it will be necessary to ensure that there are no duplications (Wokoun, Kubinčiaková, 2022). However, many of these documents state the development of digitization in the countryside as well, but with the understanding that the realization of the proposed measures and sufficient financial coverage will be decisive for the eventual reduction of the digital divide between the cities and countryside's.

In connection with the knowledge-based economy and the emphasis on education, the conditions of the use of the digital technologies in schools were evaluated, based on the survey "The use of the digital technologies in kindergartens, primary, secondary and higher vocational schools", published by the Czech School Inspection. On the basis of a comprehensive evaluation of the group of the indicators, the proportion of schools meeting the selected criteria was determined, and it can be stated that there are no major differences, although, for example, the Karlovy Vary Region achieves very low values on average. According to the data of the Czech Telecommunication Office, there are relatively large differences in the coverage of the high-speed Internet above 30 Mbit/s in the individual regions of the Czech Republic. In the territory with a fragmented settlement structure with the large number of the small municipalities, the coverage is not sufficient, which indicates the digital divide between the cities and countryside's.

Within the recommendation of appropriate regional policy instruments to support ICT development, it can be mentioned especially the support for the creation of clusters and similar associations for cooperation at the regional and local level. The development of the digital society needs the population's access to the Internet. In the regions with lower equipment of PCs or Internet, it is advisable to compensate for the lack from the public sector, for example, by creating the computer rooms in the local libraries and schools.

The migration of the residents from the rural regions to urban areas and depopulation of non-prosperous regions is becoming a very frequent topic in the sphere of the regional policy at the level of the EU, member states, the Czech Republic and individual regions, thereby it occurs the increase of the disparities within the regions. In connection with the development of the modern technologies that enable remote communication and work from home, it can be assumed that just gradual development of ICT will enable the development of the countryside and the eventual reduction of the digital divide between the cities and countryside's. There may also be changes in the migration behaviour of population, in connection with, among other things, the possible reduction of the digital divide between the cities and countryside's. The impact of modern ICT technologies on migration of population between the regions could be fundamental or at least significant. However, it is obvious that it would be appropriate to support the development of the communication technologies in the countryside in the form of the local instruments or operational programs and to reduce gradually in this way the digital divide between the cities and countryside's.

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Comparison of trends in the prevalence of psychiatric diagnoses

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Abstract: The aim of this paper is to compare the dynamics of the prevalence of psychiatric diagnoses in the Czech Republic and the Slovak Republic between 2010 and 2021. The paper is divided into four parts. The development of dynamics is evaluated by means of growth coefficients. The objects of investigation are two segments (outpatient and inpatient) of psychiatric care in the Czech Republic and the Slovak Republic. Comparable dynamics between the Czech and Slovak Republics have been shown for mental and behavioural disorders caused by the use of other psychoactive substances in outpatient and inpatient care and for schizophrenia in inpatient care. In 2020, a year-on-year decline was observed for all diagnoses, which was more pronounced for most diagnoses in inpatient care, a logical explanation being the reduction in psychiatric care due to the Covid-19 pandemic.

Keywords: Dynamics, growth coefficient, prevalence, psychiatric diagnoses

JEL Classification: H75, H41

1 Introduction

Mental health is an important component of public health, as reflected in the definition of health in the World Health Organization's Constitution: "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." (WHO 1946).

Mental disorders are a major public health problem in the European population, affecting around one third of the population each year. Mental disorders account for almost 40 % of the total number of chronic diseases affecting the population of the European region (WHO 2015).

Factors determining the prevalence, onset and course of mental disorders can be divided into biological, psychological and social. These include, for example, nature, gender, age, family and social background, serious physical illness or conflict and disaster (WHO 2001).

The relevance of this topic can also be supported by the results of the Health at a Glance: Europe 2018 report, which states that around 84 million people in the European Union suffer from mental disorders. The Health at a Glance: Europe 2022 report shows that this situation continues to worsen. It also highlights in particular the problems of mental illness in relation to the younger generation, stating that almost every second person living in European Union countries feel that their mental health is not well cared for. Low-income people are also among the population at risk (European Commission 2023).

The effects of mental disorders can affect people for life. Children and young people with mental disorders have worse educational outcomes and consequently fewer job opportunities. Adults with mental disorders are less productive and more likely to become unemployed (OECD/European Union 2018).

From a medical perspective, mental illness is divided into 11 diagnosis blocks according to the International Statistical Classification of Diseases and Related Health Problems (ICD-10). The prevalence and frequency of these diagnoses in a population allows us to predict not only the need for and cost of care, but also the mental health prospects of that population. In this respect, the progressive diagnoses of mental illness in the Czech Republic in terms of number of patients include neurotic, stress and somatoform disorders; affective disorders; organic and symptomatic mental disorders and schizophrenia. Schizophrenia is among the most economically costly psychiatric illnesses, with an average cost per patient of CZK 56 861 in 2021. Other economically costly diagnoses include mental and behavioural disorders caused by the use of psychoactive substances (CZK 28 760), mental retardation (CZK 26 739) and organic and symptomatic mental disorders, which include, for example, dementia in Alzheimer's disease (CZK 23 575) (IHIS CR 2021; VZP 2021).

The cost burden of psychiatric care, as in other medical fields, lies in personnel costs. Similarly, the success of reforms is built on a quality staff base, as shown by Sunberg et al. (2022), who address the issue of psychiatric patient care in Sweden in their research.

A significant factor that has had a negative impact on the mental health of the global population in recent years has been the Covid-19 pandemic (OECD/European Union 2022; WHO 2020). The negative effects of the pandemic on the mental health of individuals in Germany are documented, for example, by the study of Bäuerle et al. (2020) or the study of Kaparounaki et al. (2020), which describes the negative effects of quarantine and lockdown due to the pandemic on the mental health of university students in Greece.

The negative impacts of the Covid-19 pandemic have led to a significant increase in demand for mental health services, but at the same time the pandemic has limited health care for people with mental illness. The problem of access to mental health care existed before the outbreak of Covid-19, but the pandemic has exacerbated this situation (OECD/European Union 2022 ; WHO 2020).

The aim of the paper is to compare the dynamics of the prevalence of psychiatric diagnoses in the Czech Republic and the Slovak Republic between 2010 and 2021 . To support the stated aim, two research questions were defined.

The paper is divided into four parts. The first is an introduction, which describes the motivation for the research and the relevance of the topic. The second part deals with the research methodology. It includes the research objective, research questions and a description of the indicators of time series dynamics used. The third part contains the findings and discussion. The fourth and final part summarizes obtained results.

2 Material and Methods

The methodology of this paper was chosen due to the stated aim in the introduction, and two research questions (RQ1 and RQ2) were set at the same time:

RQ1: "What are the dynamics of the incidence of neurotic, stress and somatoform disorders; affective disorders; organic and symptomatic mental disorders and schizophrenia in the Czech Republic and the Slovak Republic in the period 2010-2021?"

RQ2: "Are the dynamics of psychiatric diagnoses with the highest economic costs comparable in the Czech Republic and the Slovak Republic?"

The objects of study are two segments (outpatient and inpatient) of psychiatric care in the Czech Republic and the Slovak Republic. In the past, the Czech Republic and the Slovak Republic were one state, but nowadays they are separate states that have developed differently over the last 30 years and thus differ in various aspects of the established health care system. The differences are not only in their different populations but also, for example, in their approach to single policies and reforms, as illustrated by Vrabkova et al. (2023) but also in the robustness of their health systems (see Table 1).

Table 1 - Comparison of selected indicators in the Czech Republic and Slovakia, 2010 and 2021

	Czech Republic		Slovak Republic	
	2010	2021	2010	2021
Population	10 462 088	10 701 717	5 390 410	5 459 781
Psychiatric care beds	10 432	8 961	4 316	4 346
Psychiatric outpatient clinics	1 054	1 009	379	391

Source: Institute of Health Information and Statistics of the Czech Republic; National Health Information Centre of Slovakia; Eurostat

2.1 Data

Data were obtained from special statistical yearbooks published by the Institute of Health Information and Statistics of the Czech Republic and the National Health Information Centre of Slovakia. The data concerning the economic cost of psychiatric care were taken from the yearbook of the VZP of the Czech Republic for the year 2021.

The evaluation set is divided into 48 observations. In each country assessed, a distinction is made between outpatient care (OC) and inpatient care (IC). For each form of care are distinguished 12 variants (12 observation years, Y_1 , Y_2 , ...Y_n). Each variant contains 10 categories (CD_1 , CD_2 , ...CD_n). These individual categories are based on the diagnosis groups in chapter V. Mental and behavioural disorders (F00-F99) according to the

International Statistical Classification of Diseases and Related Health Problems (ICD). The logic of the construction of the evaluation set is shown in the two matrices below.

$$
\begin{array}{l|llll}
AC & Y_1 & Y_2 & ... & Y_n \\
EN & CD_1 & CD_2 & ... & CD_n \\
SR & CD_1 & CD_2 & ... & CD_n
\end{array}
$$

$$
\begin{array}{l|llll}
IC & Y_1 & Y_2 & ... & Y_n \\
EN & CD_1 & CD_2 & ... & CD_n \\
SR & CD_1 & CD_2 & ... & CD_n
\end{array}
$$

According to the ICD, the F0 category comprises the diagnosis block F00-F09, i.e. Organic, including symptomatic, mental disorders. These are disorders manifested by disease, injury or damage to the brain resulting in brain dysfunction. These include, for example, dementia in Alzheimer's disease, vascular dementia or a state of delirium not caused by psychoactive substances.

Block F10-F19 Mental and behavioural disorders due to psychoactive substance use, according to the ICD covers a wide range of mental disorders. These vary in severity or clinical form, but their common feature is the use of psychoactive substances. For the purposes of the analysis, category F10: disorders due to use of alcohol, has been separated within this block. Disorders caused by other psychoactive substances fall into category F11-19.

Category F2 includes mainly schizophrenia, but also schizotypal disorders, delusional disorders, psychotic disorders and schizoaffective disorders. Schizophrenia is characterised by distortions of perception and thought and by disproportionate or blunted affects.

The ICD category F3 consists of block F30-F39 Affective disorders (mood disorders). The main feature of these disorders is a disorder of affectivity or mood with a tendency to depression or, conversely, to euphoria.

Category F4 (block F40-F48) consists of neurotic, stress and somatoform disorders. Examples include multiple phobias, panic disorder and other anxiety disorders or somatoform phobias.

Category F5, according to ICD block F50-F59 Behavioural disorder syndromes associated with physiological disorders and somatic factors, includes eating disorders, non-organic sleep disorders, sexual disorders, non-addictive substance abuse, etc.

Category F6 includes personality and behavioural disorders in adults (block F60-F69). These are various conditions and patterns of behaviour that are often the result of the individual's characteristic lifestyle and relationship to self and environment.

Category F7 (block F70-F79) represents mental retardation, which is a condition of arrested or incomplete mental development, manifested during the developmental stage of an individual, affecting their intelligence and cognitive, language, motor and social skills. Several degrees of mental retardation are distinguished.

Category F8-F9 were created by merging blocks F80-F89: Disorders of psychological development; F90-F98: Behavioural and emotional disorders with onset usually occurring in childhood and adolescence and block F99: Unspecified mental disorder into one category.

Basic descriptive statistics of the data set for outpatient psychiatric care in the period 2010-2021 are shown in Table 2. Table 3 then shows the basic descriptive characteristics of inpatient psychiatric care from 2010-2021. For each category (group of diagnoses) the table shows the mean, standard deviation (SD) and maximum and minimum, including the years in which they were recorded.

Table 2 - Descriptive Statistics of the Categories, Outpatient care, 2010-2021

	Mean	SD	Maximum	Year (max)	Minimum	Year (min)
F0(CZ)	82 274.17	9 690.58	94 139	2019	65 086	2010
F0(SR)	73 423.25	3 274.77	79 416	2012	68 731	2017
F10(CZ)	20 329.42	503.83	21 135	2010	19 407	2021
F10(SR)	30 704.00	2 065.91	34 335	2012	27 198	2021
F11-19(CZ)	9 805.08	802.91	11 511	2021	8 521	2010
F11-19(SR)	9 259.17	730.98	10 259	2021	7 987	2010
F2(CZ)	45 409.42	1 404.98	47 041	2019	42 850	2010
F2(SR)	58 328.00	5 603.91	67 511	2010	48 928	2020
F3(CZ)	100 243.00	3 356.91	104 649	2021	93 104	2010
F3(SR)	122 016.50	4 371.96	132 620	2012	114 816	2017
F4(CZ)	220 138.83	19 645.50	250 254	2021	184 752	2010
F4(SR)	97 711.17	2 359.34	101 952	2021	93 843	2020
F5(CZ)	18 360.50	1 585.69	21 771	2021	16 448	2010
F5(SR)	6 947.25	1 303.97	9 800	2021	5 101	2010
F6(CZ)	20 735.33	1 010.36	22 930	2021	19 276	2010
F6(SR)	10 391.33	806.53	11 996	2012	9 377	2021
F7(CZ)	20 988.92	980.44	22 498	2019	19 387	2010
F7(SR)	18 622.67	788.30	20 245	2012	17 024	2017
F8-F9(CZ)	34 362.75	5 101.93	40 592	2019	25 211	2010
F8-F9(SR)	22 443.75	1 833.60	25 351	2011	19 238	2020

Source: Institute of Health Information and Statistics of the Czech Republic; National Health Information Centre of Slovakia

Table 3 - Descriptive Statistics of the Categories, Inpatient care, 2010-2021

	Mean	SD	Maximum	Year (max)	Minimum	Year (min)
F0(CZ)	6 867.58	334.24	7 283	2012	6 115	2020
F0(SR)	6 108.83	392.53	6 624	2019	5 251	2021
F10(CZ)	8 607.92	314.35	9 099	2010	8 024	2020
F10(SR)	10 998.17	746.16	11 691	2019	9 209	2020
F11-19(CZ)	5 410.83	410.90	6 111	2021	4 606	2010
F11-19(SR)	2 682.75	327.83	3 104	2019	2 083	2010
F2(CZ)	9 767.92	375.17	10 361	2010	9 220	2020
F2(SR)	8 400.08	397.95	8 962	2013	7 631	2020
F3(CZ)	4 836.75	216.22	5 272	2010	4 588	2016
F3(SR)	5 925.00	365.82	6 309	2018	5 266	2020
F4(CZ)	8 390.92	457.24	8 864	2014	7 067	2020
F4(SR)	3 402.33	336.94	3 776	2018	2 875	2020
F5(CZ)	616.67	113.30	792	2021	451	2012
F5(SR)	176.00	16.92	202	2016	146	2011
F6(CZ)	3 374.33	132.05	3 604	2014	3 066	2020
F6(SR)	1 446.75	225.02	1 676	2014	987	2021
F7(CZ)	1 621.83	101.43	1 756	2011	1 334	2020
F7(SR)	1 741.17	152.93	1 947	2019	1 416	2021
F8-F9(CZ)	2 465.33	243.53	2 858	2011	1 971	2020
F8-F9(SR)	1 191.75	251.96	1 553	2011	729	2021

Source: Institute of Health Information and Statistics of the Czech Republic; National Health Information Centre of Slovakia

2.2 Growth factor

Time series analysis was used to test the research questions in relation to the objective of this paper. The indicators of time series dynamics allow to observe the characteristic features of their development, but beyond that they are also used as one of the criteria to find a suitable trend function (Arlt et al. 2002).

Due to the existence of differences between the assessed countries, a relative indicator, namely the growth coefficient, sometimes also referred to as the growth rate, was chosen to assess the degree of dynamics (Arlt et al. 2002):

$$k_t = \frac{y_t}{y_{t-1}}, \qquad t = 2, \ldots, T. \tag{1}$$

The average growth coefficient is then given as the geometric mean of the individual growth coefficients

$$\bar{k} = \sqrt[T-1]{k_2 \cdot k_3 \cdot \ldots k_T} = \sqrt[T-1]{\frac{y_T}{y_1}}. \tag{2}$$

Dynamics is increasing if $\bar{k} > 1$, the dynamics is stagnating if $\bar{k} = 1$, the dynamics is decreasing if $\bar{k} < 1$.

3 Results and Discussion

The results of the analysis of the dynamics of the prevalence of diagnoses are presented in the context and sequence of the research questions.

First, the results for the Czech Republic are presented, then the results for the Slovak Republic and then the comparison of both countries in the dynamics of outpatient and inpatient care.

3.1 Growth rates of outpatient and inpatient care by diagnosis categories in the Czech Republic

The sub-graphs (10 categories of diagnoses) shown in Fig. 1 present the growth rates in the Czech Republic. For each category, the growth rates in outpatient care (OC) and inpatient care (IC) are shown. The dynamics of outpatient psychiatric care in the Czech Republic is rather stable. On the contrary, in inpatient care, there are significant year-to-year fluctuations, e.g. for categories F5, F7, or F8-F9. For all categories, there is a larger or smaller year-on-year decline in 2020, which could be mainly due to the reduction in psychiatric care as a result of the Covid-19 pandemic. Within inpatient care, category F7 showed the largest decline in 2020, down 19.3 % year-on-year, and within outpatient care, category F8-F9 showed the largest decline, down 6.3 % year-on-year.

Figure 1 - Growth coefficients of individual categories, Czech Republic for the period 2010-2021
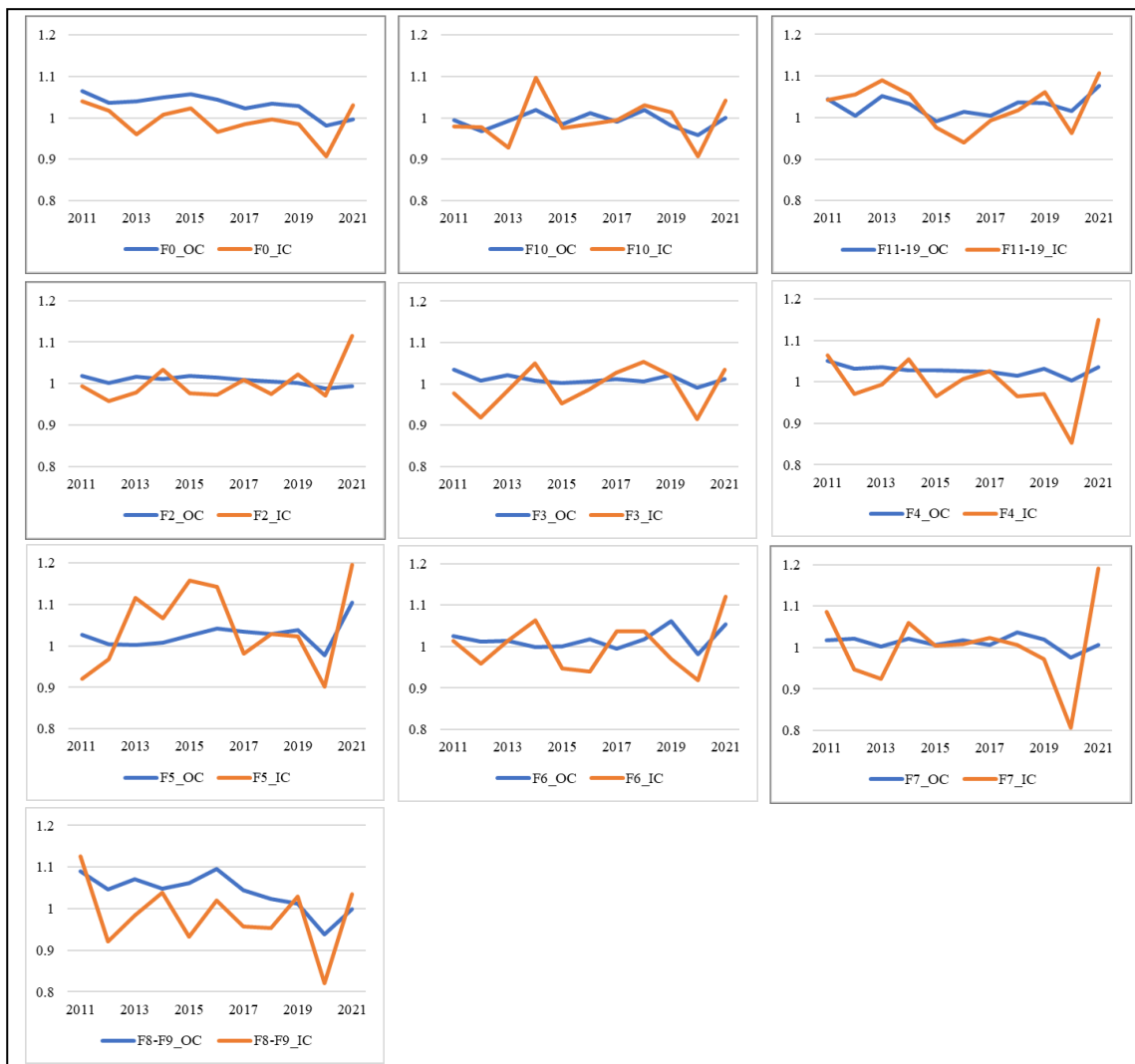
3.2 Growth rates of outpatient and inpatient care by diagnosis categories in the Slovak Republic

The sub-graphs shown in Fig. 2 present the growth coefficients in the Slovak Republic. For each category, the growth coefficients within outpatient care (OC) and the growth coefficients within inpatient care (IC) are shown. Within the Slovak Republic, the development of dynamics for all diagnoses is not clearly comparable as in the case of the Czech Republic. Rather stable development of dynamics can be observed for most categories in inpatient psychiatric care. An exception is e.g. category F5, which shows significant year-to-year fluctuations in both outpatient and inpatient care. As in the Czech Republic we will see in Slovakia year-on-year decline in outpatient and inpatient care in all categories in 2020. With the exception of category F2, the remaining categories assessed saw more significant declines in inpatient care. This can be explained by the same logic as in the case of the Czech Republic – the reduction in psychiatric care due to the Covid-19 pandemic. The largest decline were observed in inpatient care for category F8-F9 , down 30.4 % year-on-year, and within outpatient care for category F2, down 16.4 % year-on-year.

Figure 2 - Growth coefficients of individual categories, Slovak Republic for the period 2010-2021
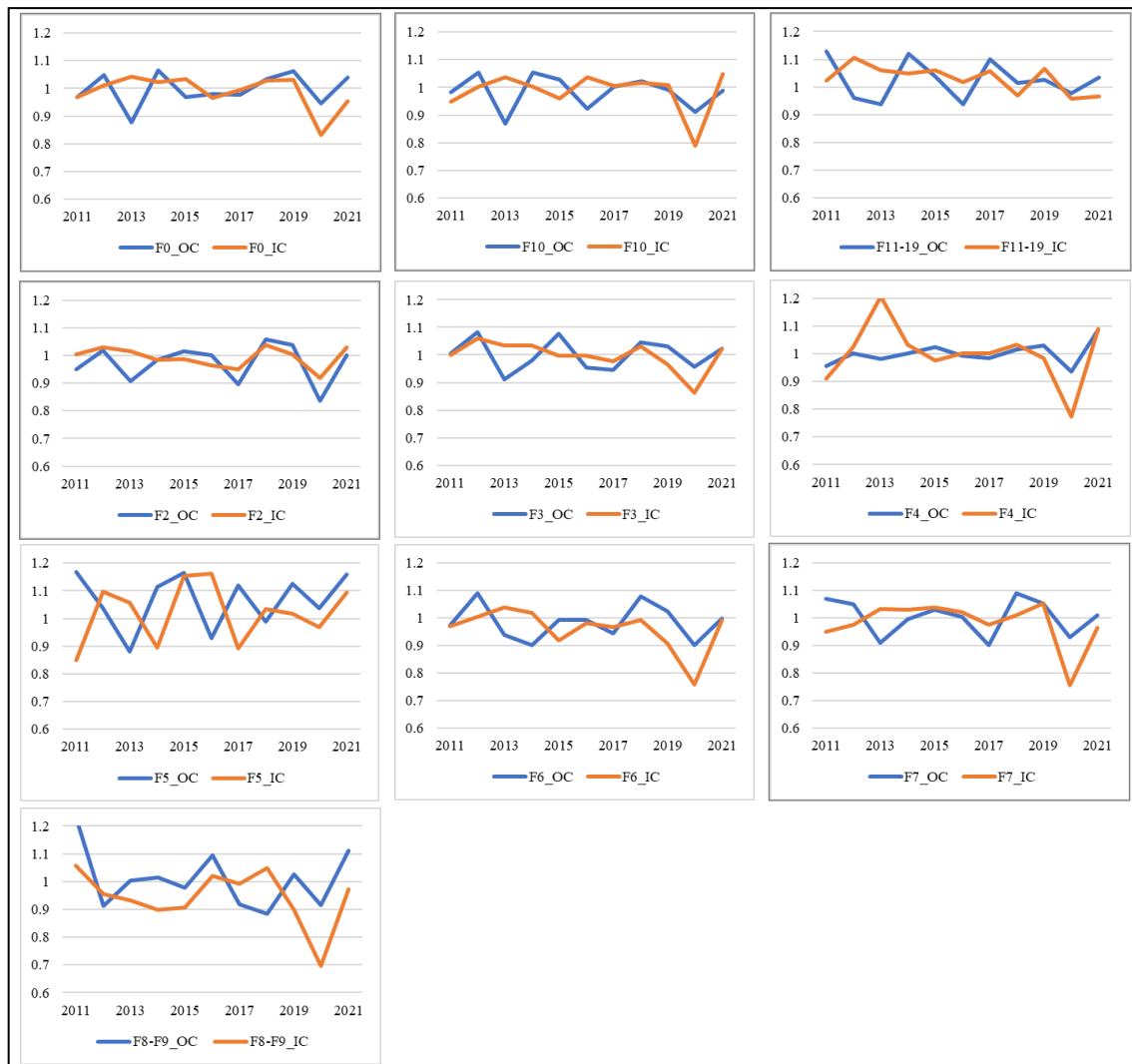
3.3 Comparison of growth rates of diagnosis categories in outpatient and inpatient care

The graph in Fig. 3 shows that the dynamics within outpatient care in the compared countries are not always identical. For category F0, the dynamics in the Czech Republic is increasing ($\bar{k}$ = 1.031) while in the Slovak Republic it is slightly decreasing ($\bar{k}$ = 0.995). For category F10, the direction of dynamics is the same in both countries - decreasing (CZ $\bar{k}$ = 0.992; SR $\bar{k}$ = 0.982). For category F11-19, the dynamics in the Czech Republic is increasing ($\bar{k}$ = 1.028), while in the Slovak Republic it is slightly lower ($\bar{k}$ = 1.023). For the F2 category, the dynamics in the Czech Republic is slightly increasing ($\bar{k}$ = 1.007), while in the Slovak Republic it is decreasing ($\bar{k}$ = 0.971). For category F3, the dynamics in the Czech Republic is slightly increasing ($\bar{k}$ = 1.011), while in the Slovak Republic it is very slightly decreasing almost to stagnating ($\bar{k}$ = 0.999). For category F4, the dynamics in the Czech Republic is increasing ($\bar{k}$ = 1.028), in the case of the Slovak Republic it is stagnant ($\bar{k}$ = 1.000). For category F5, the dynamics is increasing in both countries compared, however, in the Slovak Republic it is increasing more significantly (CZ $\bar{k}$ = 1.026; SR $\bar{k}$ = 1.061). For category F6, the dynamics is slightly increasing in the Czech Republic ($\bar{k}$ = 1.016) and slightly decreasing in the Slovak Republic ($\bar{k}$ = 0.983). For category F7, the dynamics in the Czech Republic is slightly increasing ($\bar{k}$ = 1.012) and almost stagnant in the Slovak Republic ($\bar{k}$ = 1.001). For category F8-F9, the dynamics in the Czech Republic is increasing ($\bar{k}$ = 1.038) and in the Slovak Republic very slightly increasing ($\bar{k}$ = 1.004).

Figure 3 - Average growth rates by category, outpatient care, 2010-2021
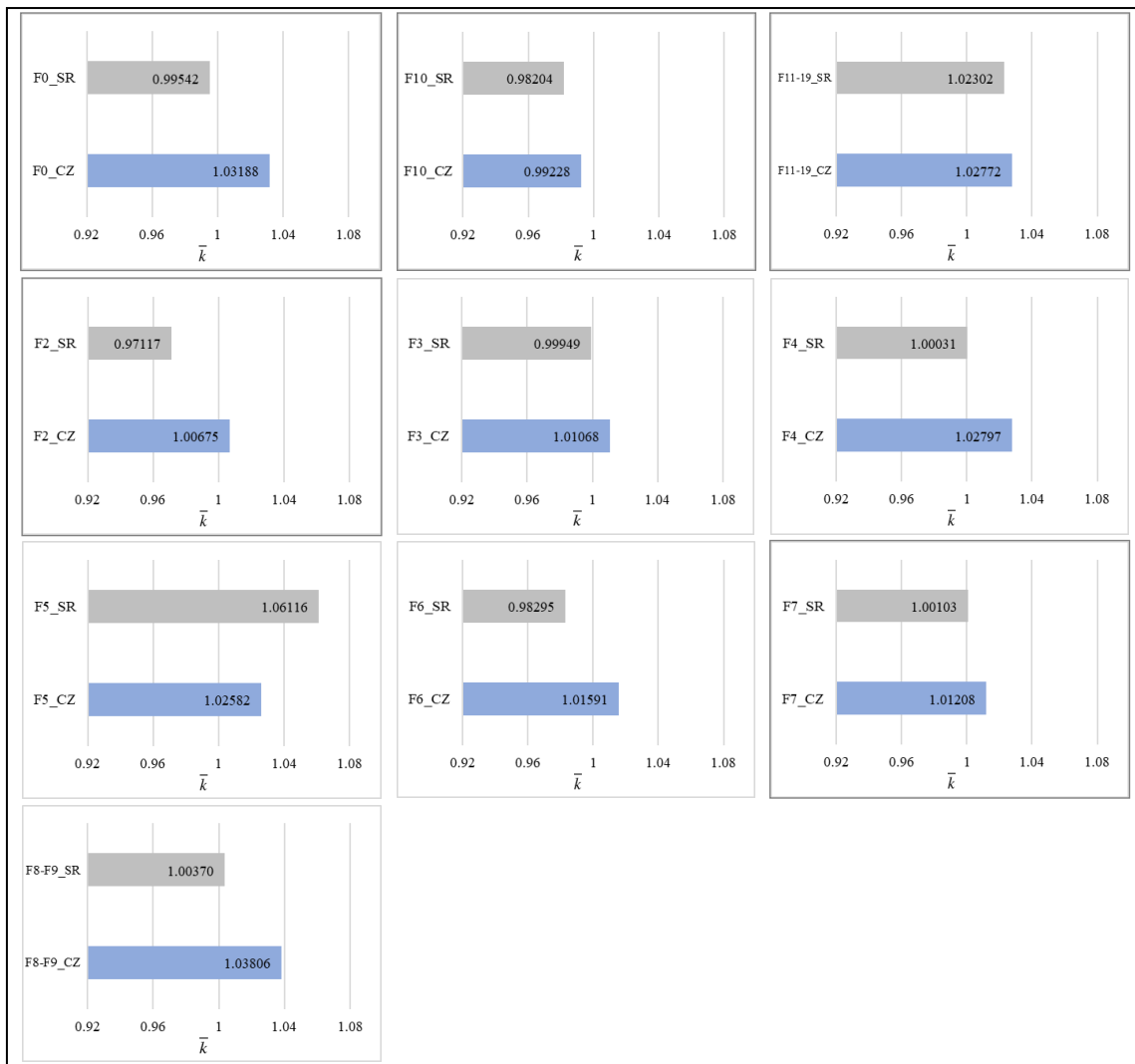
The graph in Fig. 4 presents the indicators of the dynamics of each category within inpatient care in the countries assessed. For the category F0, the dynamics is decreasing in both the Czech Republic and Slovakia (CZ $\overline{k} = 0.992$; SR $\overline{k} = 0.987$). In the case of the category F10, the dynamics in both countries has the same direction, decreasing in the CZ ($\overline{k} = 0.992$) and SR ($\overline{k} = 0.983$). For category F11-19, the dynamics are increasing in the Czech Republic ($\overline{k} = 1.026$) and also increasing in the Slovak Republic ($\overline{k} = 1.029$). For the F2 category, the dynamics in the Czech Republic are very slightly decreasing or almost stagnant ($\overline{k} = 0.999$) and in the Slovak Republic slightly decreasing ($\overline{k} = 0.992$). For category F3, the direction of dynamics is decreasing in both countries (CZ $\overline{k} = 0.991$; SR $\overline{k} = 0.997$). For category F4, the dynamics are almost identical and have a very slightly decreasing slope (CR $\overline{k} = 0.999$; SR $\overline{k} = 0.998$). For category F5, the dynamics in the Czech Republic is increasing ($\overline{k} = 1.042$), while in Slovak Republic it is also increasing ($\overline{k} = 1.030$). For category F6, the dynamics in the Czech Republic is stagnant ($\overline{k} = 1.000$) and in Slovak Republic it is decreasing ($\overline{k} = 0.955$). Also in the case of category F7, the direction of the dynamics is decreasing in both countries (CZ $\overline{k} = 0.998$; SR $\overline{k} = 0.978$). For category F8-F9, the dynamics in the CR is also decreasing ($\overline{k} = 0.980$) and in the SR it is decreasing more significantly ($\overline{k} = 0.938$).

Figure 4 - Average growth rates by category, inpatient care, 2010-2021
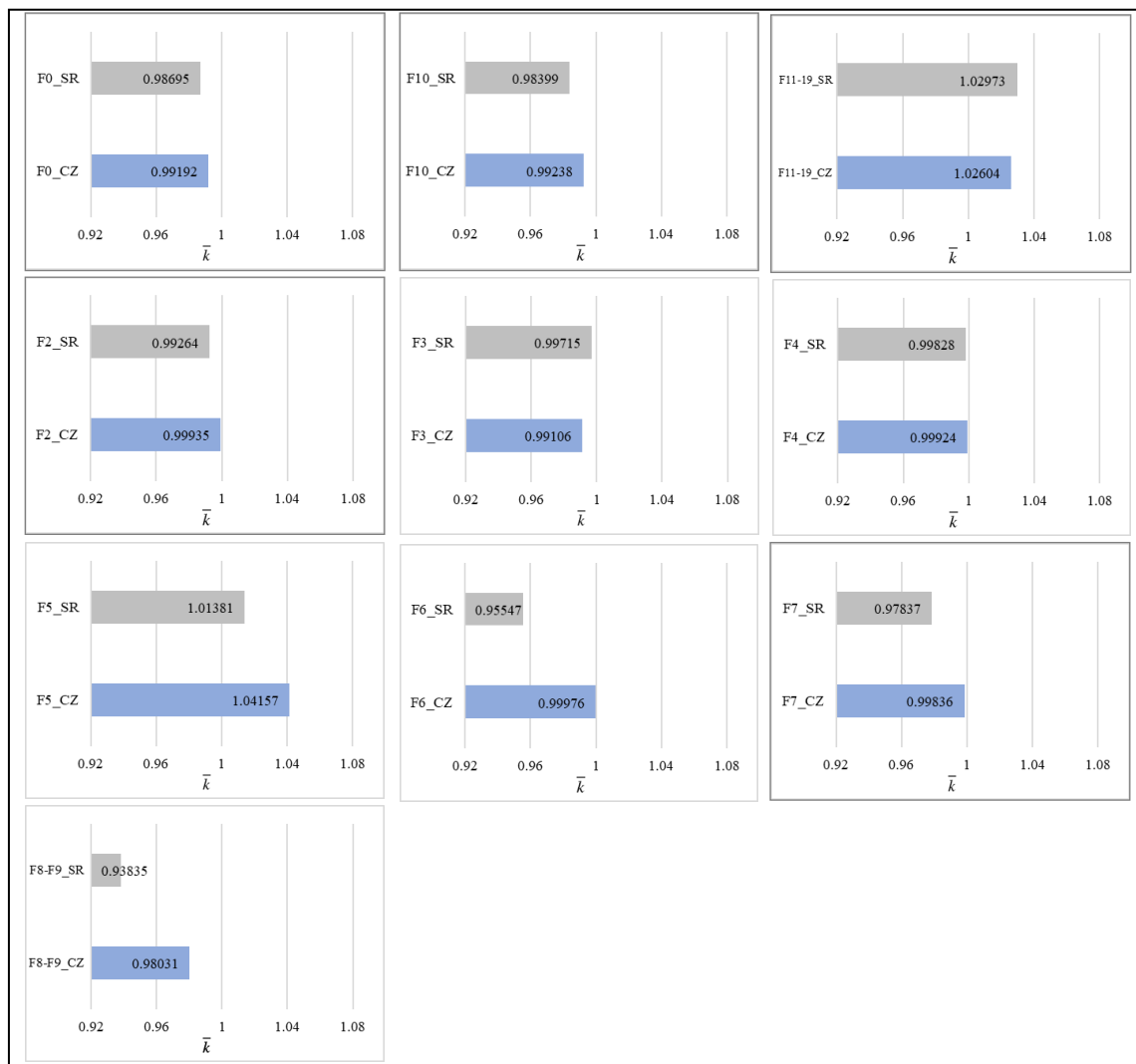
The achieved results and their predictive power are limited by the period and the chosen method of evaluation, but also by the different health care systems in the Czech Republic and the Slovak Republic. This is also evidenced by the different approach of these countries to the reform of psychiatric care. While in Slovakia the reform of psychiatric care formally started in 2002, in the Czech Republic it was 12 years later (Vrabková et al. 2023).

The absence of a government mental health care programme may result in, for example, a spatially uneven distribution of outpatient care, the unsystematic establishment of psychiatric institutions, outdated inpatient capacity, or lack of capacity for community-based care (Raboch, Wenigová 2012).

The results show that the dynamics of most psychiatric diagnoses is increasing in outpatient care and decreasing in inpatient care. This confirms the current trend within psychiatric care, which is a move away from institutionalised care (Green Book 2005).

Currently, the majority of psychiatric care takes place in psychiatric outpatient clinics (MH CR 2013), and based on the results achieved, this situation can be expected to continue. In the future, this may lead to the problem of insufficient capacity in psychiatric outpatient clinics, thus stimulating the quantity of care at the expense of its quality (Raboch, Wenigová 2012). In the future, therefore, psychiatric outpatient clinics should be strengthened in terms of staff. The expansion of psychiatric outpatient clinics to include non-medical staff, such as psychiatric nurses or social workers, could also be a solution.

Governments should also focus on support for investment in community mental health care platforms, which are at their beginning in both countries assessed. The involvement of social services could lead to improved and individualised care for patients with psychiatric illnesses. Available studies, e.g. Thornicroft et al. (2016), also

show that community psychiatric care leads to destigmatization and reduction of discrimination against patients with psychiatric disorders.

Another recommendation may be to improve the cooperation between outpatient and inpatient psychiatric care, but also to improve the cooperation between general practitioners and outpatient psychiatrists. Since Raboch and Wenigová (2012) report that only about 1/3 of patients are referred to inpatient psychiatric care by a psychiatrist. Thus, a large proportion of patients are initially treated in inpatient care, even when their diagnosis does not require hospitalization. This leads to a high economic cost of psychiatric care.

Socially desirable is balanced approach to the architecture of the psychiatric care system, which should include inpatient care, outpatient care and community care (Thornicroft, Tansella 2004).

Among the diagnoses with the highest growth rates in the Czech Republic and Slovak Republic are mental and behavioural disorders caused by the use of psychoactive substances (categories F11-19). It follows that the relevant authorities should focus on the development of outpatient addiction treatment clinics and improving the availability of addiction services. At the same time, these diagnoses are among the most economically costly, and for this reason, future pressure on public budgets or public health insurance systems in the countries assessed can be expected.

However, economic costliness is not only made up of direct costs, but also a significant part of indirect costs, such as lost productivity, higher unemployment rates or dependence on the welfare system (OECD/European Union 2022; WHO 2001).

The possibility of using telemedicine in the field of psychiatric care, which can help to extend mental health care services to people who do not have access to such care today for whatever reason, has a considerably high potential for the future. However, research shows that this technology is in at the beginning and currently serves more as a complement to face-to-face psychiatric care (Mehrotra et al. 2017; Uscher-Pines et al. 2020).

4 Conclusion

This paper compared trends in the prevalence of psychiatric diagnoses in the Czech Republic and Slovakia. The evaluation of the dynamics of the prevalence of psychiatric diagnoses in the Czech Republic and the Slovak Republic between 2010 and 2021 was carried out using time series analysis.

The growth coefficient was used to analyse how the most progressive diagnoses changed their incidence dynamics over the period (see RQ1). For neurotic, stress and somatoform disorders, the largest decline in the Czech Republic and Slovakia was found for inpatient care in 2020. The largest year-on-year increase in both the Czech Republic and the Slovak Republic was also recorded for inpatient care (CZ 2021; SR 2013). For affective disorders, the largest year-on-year decrease was also recorded for inpatient care in both countries in 2020. The largest increase was found in the Czech Republic for inpatient care in 2018, and in the Slovak Republic for outpatient care in 2012. For organic and symptomatic mental disorders, the largest decline was recorded in both the Czech Republic and Slovakia in 2020 for inpatient care. The largest increase has been shown in outpatient care (CR 2011; SR 2014). For schizophrenia, the largest year-on-year decline was recorded in the CZ in 2012 for inpatient care and in SR in 2020 for outpatient care. The largest increase was recorded in the Czech Republic for inpatient care in 2020 and in SR for outpatient care in 2018.

Using the average growth rate, it was analysed whether the more economically demanding diagnoses developed comparably in the Czech Republic and Slovakia (see RQ2). It was found that within outpatient and inpatient care, only mental and behavioural disorders caused by the use of other psychoactive substances showed comparable dynamics in the Czech Republic and Slovakia. In addition, comparable dynamics of incidence of schizophrenia were found in inpatient care. The other diagnoses did not show the same dynamics of incidence.

At the same time, it was found that the dynamics of prevalence within outpatient psychiatric care in the Czech Republic is increasing for most diagnoses, with the exception of mental disorders and behavioural disorders caused by alcohol use. On the contrary, in the Slovak Republic, the trend within outpatient care is the opposite, the dynamics of most diagnoses is rather stagnant or decreasing.

In the case of inpatient care in the Czech Republic, a slightly decreasing to decreasing direction of dynamics prevails for most diagnoses. In the Slovak Republic, a decreasing direction of dynamics also prevails, but it is higher than in the Czech Republic. Diagnoses with an increasing direction of dynamics in both the Czech Republic

and Slovakia include behavioural disorder syndromes associated with physiological disorders and somatic factors and mental and behavioural disorders caused by the use of psychoactive substances with the exception of alcohol.

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