Determinants of Regional Entrepreneurial Activity in the Czech Republic

Determinanty podnikatelské aktivity napříč regiony České republiky

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Abstract

The following study is focused on analysis of registered businesses in the 14 regions of the Czech Republic during the period of years 1995-2013. The aim of the study was to quantify factors that affect entrepreneurial activity expressed as rate of registered businesses per capita. Based on the previous empirical studies, the determinants were selected and hypothesis stated. Formed hypothesis investigated positive impact of GDP per capita, unemployment rate and R&D institutions on rate of registered business activity. To evaluate them, data were obtained from the Czech Statistical Office and formed into dataset. Firstly, panel regressions estimated with fixed effects method were employed and secondly, Granger causality tests to evaluate the relationship between entrepreneurial activity and GDP per capita were used. Regression estimates proved positive relationship between entrepreneurial activity in Czech regions and GDP per capita, unemployment rate and support activities of R&D institutions. Positive impact was also confirmed for population density, average age, share of tertiary educated population and real R&D expenditures. Testing Granger causality proved dual causality between entrepreneurial activity and GDP per capita confirming that GDP per capita as good predictor of economic development of Czech regions. Finally, economic growth motivates Czech individuals to enter entrepreneurial activity.

Keywords

determinants of entrepreneurship, regional entrepreneurial activity, registered business activity, GDP per capita, unemployment, R&D institutions, the Czech Republic

Abstrakt

Článek je věnován analýze registrované podnikatelské aktivity ve 14 regionech České republiky za období let 1995-2013. Cílem studie je kvantifikovat faktory, které ovlivňují podnikatelskou aktivitu, vyjádřenou jako počet registrovaných subjektů na obyvatele. Na základě předchozích studií byly vybrány determinanty a zformulovány testované hypotézy. Formulované hypotézy očekávaly pozitivní vliv HDP na obyvatele, míry nezaměstnanosti a institucí vědy a výzkumu na registrovanou míru podnikatelské aktivity. K jejich otestování byl použit datový soubor vytvořený z proměnných získaných z databáze Českého statistického úřadu. Nejprve byly odhadnuty modely panelové regrese s fixními efekty, a následně byla testována Grangerova kauzalita pro vztah mezi mírou podnikatelské aktivity v českých krajích a HDP na obyvatele. Regresní odhady potvrdily pozitivní vztah mezi mírou podnikatelské aktivity v českých krajích a HDP na obyvatele, mírou nezaměstnanosti a podpůrnými aktivitami institucí vědy a výzkumu. Pozitivní vliv byl prokázán také pro hustotu obyvatel, průměrný věk, podíl terciárně vzdělané

populace a výdaje na vědu a výzkum. Test Grangerovy kauzality prokázal oboustrannou kauzalitu mezi mírou podnikatelské aktivity a HDP na hlavu, což potvrzuje, že HDP na obyvatele dobře předpovídá budoucí ekonomický vývoj českých regionů. Závěrečným zjištěním bylo, že ekonomický růst motivuje Čechy k zapojení do podnikatelské aktivity.

Klíčová slova
determinanty podnikání, regionální podnikatelská aktivita, registrovaná podnikatelská aktivita, HDP na obyvatele, nezaměstnanost, instituce vědy a výzkumu (R&D), Česká republika

JEL Codes
M2, M1, L260

Introduction

Entrepreneurship was identified as important part of the economy contributing to economic growth measured by country´s GDP (Carree and Thurik, 2010). Positive relationship between entrepreneurial activity and economic growth was also confirmed by Thurik (1995); Berkowitz and DeJong (2005); Van Praag et al. (2007) or Klapper et al. (2015). However there are still authors who argue that those positive effects on GDP and employment vary over time and across countries (Blanchflower, 2000). Carree and Thurik (2010) point out, that there exists dual causality between the entrepreneurial activity and economic growth and encourage scholars to investigate these phenomena on different levels of analysis. Statistical offices and Global Entrepreneurship Monitor reporting entrepreneurial activity allow us to study these kind of relationships in various contexts. Importance of studying entrepreneurship increased with the need to regain competitive advantages after structural changes in modern economies in 21st century.

What are the determining factors having impact on entrepreneurship and how can we increase entrepreneurial activity? Entrepreneurship is cross-disciplinary area, with determinants from psychological, sociological and economical disciplines. Psychology is focused on traits of entrepreneurs and potential entrepreneurs, Sociology on collective background and Economics on impact of economic climate, technological development and demographic trends (Giannetti and Simonov, 2004). The determinants also differ with the level of analysis, which may be conducted on individual (micro), meso (industry or region) or macro (country or group of countries) level (Grilo and Thurik, 2004). Not many studies are focused on regional entrepreneurial activity and therefore research gap on this level exists. On regional level entrepreneurs are perceived as engine of regional development and this level of analysis allows researchers to take into account also geographical and cultural differences (Leitao et al., 2011).

Based on Global Entrepreneurship Monitor, in 2013 on average 5.3% of Czech adult population was engaged into established entrepreneurial activity (Lukeš et al., 2014). We have investigated previous empirical studies and conclude that there are not many studies dedicated to determinants of entrepreneurship in relation to all regions of the Czech Republic, and that none of the scholars tested the relationship between the entrepreneurial activity and economic growth in both directions using more robust econometric approach. Our analysis is conducted from economic perspective and serves as complement to already

published research studies focused on the Czech entrepreneurial activity which are also in this paper presented.

In the first (theoretical) part we introduce previous studies devoted to determinants of entrepreneurial activity and develop tested hypothesis. Second part describes collected variables for the analysed period of years 1995 - 2013 and third section employs econometric models to fulfil our research aim, identification of the main factors having impact on entrepreneurial activity in the regions of the Czech Republic. Finally, Granger Causality test deals up with the dual causality between the entrepreneurial activity and GDP per capita. Main findings, limitations of our approach and suggestions for future research are summarized in conclusions

1 Theoretical Background

Coleman (1988) explains that every entrepreneur needs to be equipped with resources, which include physical, financial, human and socio-cultural capital. It has been stated by Gartner (1985) that venture creation is a multi-dimensional phenomenon and should be looked upon with all the complexities. Sandberg and Hofer (1988) mention that performance of a newly established venture is influenced by the structure of the industry, where the business operates, its organisational structure and strategy. Stuart and Sorenson (2003) perceive the geographical location of newly established venture as a key determinant of success as some areas have better infrastructure and access to resources. Besides all forms capital, entrepreneur needs to have certain level of self-confidence, willpower and ability to build networks.

Entrepreneurs typically build networks in the region where they are involved in their activity, and hence their ability to succeed in networking may be affected by regional characteristics. As remarks Karlsson et al. (1993), business environment consists of all relevant socio, economic and cultural variables. Differences in regional entrepreneurial activity may be described by four models (market model, resource model, milieu model and career model). Karlsson et al. (1993) proved positive relationship between newly established entrepreneurial activity per thousands of households and GDP per capita, population with tertiary education, public expenses for regional development and share of economically active population.

Grilo and Thurik (2004) divide determinants of entrepreneurship into supply and demand side. The supply side is determined by population characteristics, such as size, growth, age structure, population density and share of immigrants. Economic development, globalization and stage of technological development are considered as demand side of entrepreneurship. They also explain that once the overall economic performance is declining, the wages and salaries are declining and the entrepreneurial activity decreases. On the other hand, the increase in unemployment rate force individuals to create jobs for themselves by engaging into entrepreneurial activity, so there are two effects acting against each other and it is important to analyse, which exceeds. This varies among countries and time period. The main finding of Grilo and Thurik (2004) was that lack of financial resources does not have impact on entrepreneurial activity. Secondly, they find that administrative barriers negatively influence entrepreneurial engagement. They also stress that for the most of the included variables we can observe ambiguous impact on entrepreneurial activity.

Wennekers et al. (2005) worked with Global Entrepreneurship Monitor and used as explanatory variables GDP per capita for economic variables and education (tertiary and secondary) as demographic. They present positive effect of income and education on entrepreneurial activity. Freytag and Thurik (2007) analysed the role of cultural variables on entrepreneurial aspirations. As cultural variables they used proxy variables social spending, regulations (barriers), political and other organizations, economic freedom index and life expectancy index. Life expectancy, social and health expenditures confirmed negative impact on preferences towards entrepreneurship. Index of economic freedom had positive impact on entrepreneurial aspirations.

Roig-Tierno et al. (2015) stress the importance of supportive infrastructure, such as business incubators, technology centres and universities. Regarding to their research, supportive infrastructure have the highest impact on innovative entrepreneurship. The aim of these institutions is to boost innovative activity and commercialize it as a product or service. Business sector has therefore interest to establish networks with these R&D institutions, which act with each other complementarily. Roig-Tierno et al. (2015) found positive effects on employment creation. Also investments into R&D create scientific knowledge and therefore new entrepreneurial opportunities. These opportunities are exploited by entrepreneurs who commercialize them and therefore the entrepreneurial activity increases (Sanders, 2007). Grilo and Thurik, (2004) also support this argument stating that R&D investments support technological advancements and stimulate entrepreneurial activity.

Currently, scholars in determinants go back to investigation of relationship between entrepreneurial activity, unemployment and GDP per capita, since there are more counter effects at the same time. When unemployment is high, unemployed individuals may choose to become entrepreneurs and enter the market introducing a new technological innovation since they need to make income for living. (Llopis et al., 2015). Positive relationship between entrepreneurship, quantified as rate of new business registrations, and unemployment rate confirmed by Fritsch et al. (2015). However, Cueto et al. (2015) argue that positive relationship between unemployment rate and entrepreneurship occurs only when unemployment increases substantially. Koellinger and Thurik (2012) conclude that increase in entrepreneurial activity was associated with the increase of GDP and decrease of unemployment. They also found that future trends in entrepreneurship help to predict economic fluctuations using Granger tests of causality, VAR models and fixed effects regression estimations. On the other hand economic growth stimulates creation of new opportunities and leads to increase in entrepreneurial activity. Authors conclude, that it is important to use lags, some effects may take several years to occur. In their models, they use two years lag. Klapper et al. (2015) also proved positive, pro-cyclical relationship between GDP per capita and entrepreneurial activity. However those relationships vary over time and need to be analysed over time and across countries (Llopis et al., 2015).

Entrepreneurial activity in the Czech Republic is most frequently investigated by researchers from micro and meso level perspective, mostly surveying individual entrepreneurs and managers of companies. Lukeš et al. (2014) conducted Global Entrepreneurship Monitor in 2013 for the Czech Republic and conclude that on average 7.3% of adult population aged 18-64 years was actively involved in setting up business and on average 5.3% of adult popula-

tion was running established business.[1] According to interviewed entrepreneurs, the biggest problems in business activity are lack of contracts, administrative barriers, bureaucracy, frequent changes in laws and chaotic system of taxation. Strýčková (2015) conducted research focused on determinants of capital structure of Czech enterprises and concludes that key external factors of capital structure were economic and political development, market environment and levels of taxes and interest rates. Small business enterprises (SMEs) in selected regions of the Czech Republic and Slovakia were investigated by Belás et al. (2015). According to their findings the most important motive for starting a business in the Czech Republic was to have a job. In Slovakia, the most important motive for starting a business was money. Belás et al. (2015) confirmed that Czech business environment is affected by relatively high level of corruption and also that Czech entrepreneurs are perceived on public still negatively. Role of state was by surveyed entrepreneurs perceived negatively, highlighting creation of meaningless barriers and obstacles. These results of entrepreneurial perceptions are also described by World Economic Forum (2016) reporting the most problematic factors for doing business in the Czech Republic. The most problematic factors are inefficient government bureaucracy, corruption, policy instability, complexity of tax regulations and restrictive labour regulations (World Economic Forum, 2016).

Despite increasing research interest in the Czech entrepreneurship, studies focused on determinants of population of active enterprises, using previously introduced methodology, conducted on macro (country) level, are still very limited. One of the recent attempts to study registered business activity on country level was conducted by Menčlová (2014) for period of years 1992 - 2011 using only bivariate correlation analysis to investigate relationship between entrepreneurial activity, unemployment rate and GDP growth. Menčlová (2014) was unable to prove statistically significant relationship with GDP on level base. Some relationship was proved for the GDP growth lagged by one year for newly registered companies with more than 20 employees. For the unemployment rate, negative correlation coefficient was statistically proved for joint-stock companies and companies with limited liabilities. Menčlová (2014) did not find any empirical support for impact of economic recession in 2009 on entrepreneurial activity. However study using more robust econometric approach investigating whole population of the Czech active enterprises applied by Koellinger and Thurik (2012) is still missing and allowing us to fill in this research gap by its implementation in the Czech environment. The next session informs reader about our methodological approach and tested hypothesis.

Method and Tested Hypothesis

Based on the theoretical background and methodology applied by previous authors (Koellinger and Thurik, 2012) we developed following hypothesis that are tested:

H_1: There is a positive relationship between entrepreneurial activity and GDP per capita.
H_2: There is a positive relationship between entrepreneurial activity and unemployment rate.
H_3: There is a positive relationship between entrepreneurial activity and R&D institutions.
H_4: Entrepreneurial activity predicts the economic development.

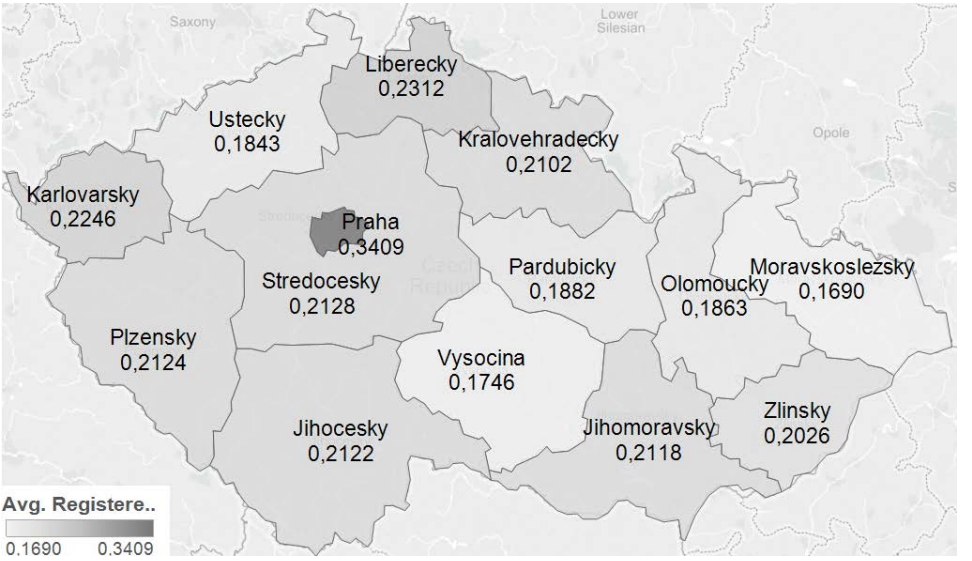
1 *Running business for more than 42 months and paying salaries or wages to its owners (Lukeš et al., 2014).*

To confirm/reject the hypothesis we use econometric approach based on collected data. For the first three hypotheses **(H_1-H_3)** we construct regression models with lagged variables (with impact up to two years lag) and for the fourth hypothesis **(H_4)** we employ Granger causality test. The next part is dedicated to introduction of the dataset.

2 Data

Data were obtained from different parts of Czech Statistical Office database (ČSÚ, 2015) and formed into a panel of 14 regions of the Czech Republic for period of years 1995-2013. Unfortunately not all variables mentioned in previous studies were available for our analysis so we tried to obtain as many relevant variables as possible and for the longest available period. The dependent variable was set up as amount of registered businesses per capita *(REG_BUSINESSES_CAP)*, representing entrepreneurial activity. It would be most appropriate to have entrepreneurial activity obtained from population survey like Global Entrepreneurship Monitor, however such a data are still not available for longer time period. There are two limitations following this approach, firstly as mention Koellinger and Thurik (2012) we do not have covered early stages of entrepreneurial activity and secondly, there are businesses which are officially registered but not in reality active. Taking this limitation we are allowed to compare regions of the Czech Republic in panel regression.

Figure 1: Average registered business activity in Czech regions[2] during years 1995-2013

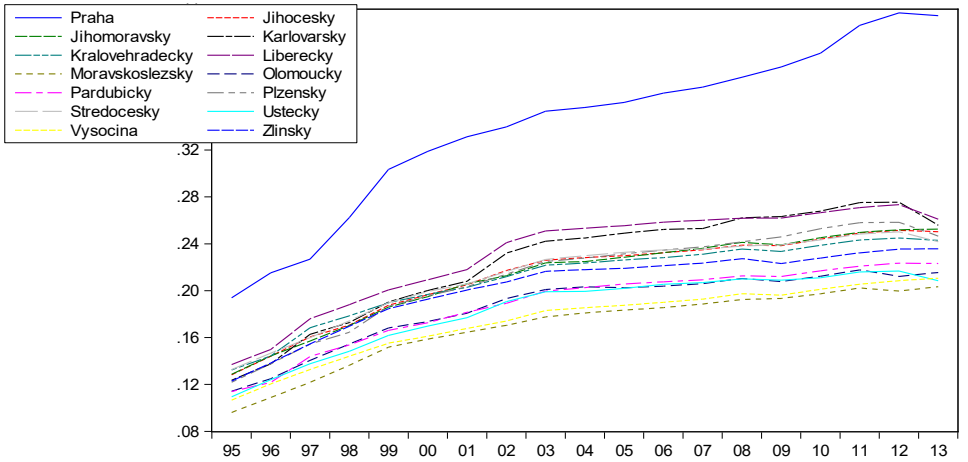


Source: Tableau, own elaboration.

2 *English equivalent names of the Czech regions: Praha - Prague, Stredocesky - Central Bohemia, Jihocesky - South Bohemia, Plzensky - Plzen, Karlovarsky - Karlovy Vary, Ustecky - Usti nad Labem, Liberecky - Liberec, Kralovehradecky - Hradec Kralove, Pardubicky - Pardubice, Olomoucky - Olomouc, Moravskoslezsky - Moravia-Silesian, Jihomoravsky - South Moravia, Zlinsky - Zlin, Vysocina - Vysocina.*

On Figure 1 we have plotted average entrepreneurial activity based upon our calculations during years 1995-2013. As expected the highest rate of registered businesses is in the Capital Praha which may affect results of regression analysis as outlier, so we notice that for validity of regression models. The lowest level of entrepreneurial activity was found in Moravskoslezsky region. The difference between registered business activity in 1995 and 2013 are depicted on Figure 3 in Appendix. Over the analysed period, in all regions total entrepreneurial activity significantly increased as can be seen on Figure 2.

Figure 2: Rate of Registered Businesses per Capita over years in Czech regions



Source: EViews, own elaboration.

Among explanatory variables we were able to collect for all regions average age of population (AVERAGE_AGE), where we assume positive sign, since entrepreneurial activity requires collecting resources. For unemployment rate *(UNEMPLOYMENT_RATE)* we expect positive sign since during higher levels of unemployment people switch from unemployment into self-employment. Business enterprise R&D expenditures in mil. CZK is calculated per capita *(REAL_EXP_RD_CAPITA)* and we assume that support of R&D will stimulate technological and innovation driven businesses. For GDP per capita in CZK *(REAL_GDP_PER_CAPITA)* we expected also positive sign as indicator of increasing economic performance of economy motivating individuals to engage into entrepreneurship (pro-cyclical relationship). Number of Business enterprise workplaces (subjects mainly focused on R&D) in responding units per thousands of inhabitants *(WORKPLACES_RD_THINH)* as variable representing of supportive infrastructure (positive sign). Share of economically active population between 15 and 64 years (*SHARE_PUPULATION_1564)* as factor for supply side of entrepreneurship together with population density *(POPULATION_DENSITY)* positively affecting entrepreneurship. Share of population obtaining tertiary education for demographic variable and resource model *(TERTIARY_EDUCATION)* positively affecting registered businesses per capita. GDP per capita and business enterprise R&D expenditures had to be converted into real variables using Consumer Price Index (CPI) with base year 2005. Unfortunately data for variables representing R&D workplaces and real R&D expenditures of business enterprises were available only for period of years 2005-2013. Descriptive statistics for all variables are presented in Table 1.

Table 1: Descriptive Statistics

Variable	Mean	Median	Maximum	Minimum	Std. Dev.	Observations
AVERAGE_AGE	39.49	39.67	42.03	36.00	1.50	266
REG_BUSINESSES_CAP	0.21	0.21	0.44	0.10	0.06	266
UNEMPLOYMENT_RATE	6.71	6.32	15.97	1.90	2.87	266
REAL_EXP_RD_CAPITA	0.002	0.002	0.008	0.0002	0.001	126
REAL_GDP_PER_CAPITA	276369.2	249999.7	766349.1	194983.4	100161.7	266
WORKPLACES_RD_THINH	0.21	0.18	0.55	0.05	0.11	126
SHARE_POPULATION_1564	0.70	0.70	0.72	0.67	0.01	266
POPULATION_DENSITY	287.74	118.23	2533.92	62.11	597.60	265
TERTIARY_EDUCATION	10.55	10.39	21.72	4.81	2.79	266

Source: EViews, own elaboration.

2.1 Stationarity

We are working with panel data which are combination of time series and cross sections. From 1980s econometricians wrote articles about estimation of econometric models on non-stationary data that led into so called spurious regression giving misleading results. Stationarity is tested using joint Dickey-Fuller test for all regions of the Czech Republic. The null hypothesis states non-stationarity of the variable (existence of unit root). By rejecting the null hypothesis, we are able to accept alternative hypothesis of stationarity of the variable (Verbeek, 2012). All variables were tested for stationarity and for all of them we were able to reject the null hypothesis of non-stationarity on 5% level of statistical significance and conclude that we are working with stationary data (results are presented in Table 2).

Table 2: Stationarity Testing Results

Variable	Stat. Significance	P-Value	Result
AVERAGE_AGE	5%	0.00	Stationary
POPULATION_DENSITY	5%	0.049	Stationary
REAL_EXP_RD_CAPITA	5%	0.05	Stationary
REAL_GDP_PER_CAPITA	5%	0.001	Stationary
REG_BUSINESSES_CAP	5%	0.00	Stationary
SHARE_POPULATION_1564	5%	0.00	Stationary
UNEMPLOYMENT_RATE	5%	0.00	Stationary
TERTIARY_EDUCATION	5%	0.00	Stationary
WORKPLACES_RD_THINH	5%	0.03	Stationary

Source: EViews, own elaboration.

3 Regression Analysis

For quantification of the relationships among variables, regression analysis is employed. All econometric models were estimated using software EViews 8. As we mentioned before, the aim of regression analysis is to investigate, which factors affect rate of registered businesses in the Czech Republic and evaluate stated hypothesis from section Method and Tested Hypothesis.

3.1 Estimation of Econometric Models

Firstly we had to choose suitable estimation technique. Usually for legal entities, fixed effects estimation is used, because those entities remain the very same over the time. To support our expectations, we used Hausman test which helps us to decide between estimation with fixed and random effects. Hausman test confirmed for our data estimation with fixed effects that helps us to control unobserved heterogeneity in our models (Verbeek, 2012). Then the econometric models were estimated with fixed effects and White cross-section standard errors & covariance (d.f. corrected) which helps us to avoid consequences of heteroscedasticity and autocorrelation. In all regression estimates we controlled the level of multicollinearity and also checked the normality of residuals. Unfortunately, some of our models violate assumption of normality of residuals which restrict our options to generalize results on other states and regions. Estimated models are depicted in Table 3.

Models 1 and 2 covered whole period, however, for the variables R&D workplaces and real R&D expenditures we did not have observations for the whole period so they were estimated separately (Models 3 and 4 in Table 3). R&D variables highly correlated with real GDP per capita, so in those models, the variable representing real GDP per capita had to be excluded to satisfy assumption of acceptable level of collinearity tested using Variance Inflation Factors test. Collinearity problems also occurred between unemployment rate and share of tertiary educated population. Therefore we estimated two models with unemployment rate and two models with tertiary education, to satisfy acceptable level of collinearity in regression models. To make sure that region Praha does not bias the results of the regressions the presented models were estimated without this region, however results of estimated reduced regressions brought us the same results so finally region Praha was kept in the final models. The following section interprets results of regression analysis.

3.2 Results and Discussion

Before interpreting individual explanatory variables, we conclude that our constructed models have high explanatory power of the dependent variable represented by the rate of registered business activity in the Czech regions. The most contributing variables explaining variety in business activity were share of tertiary education, GDP per capita and unemployment rate explaining majority of the variability of the dependent variable. In the first model (Model 1) we found empirical support for positive impact of GDP per capita ceteris paribus, mirroring economic situation of the Czech regions. All variables in the first model were found to be statistically significant at least on 10% level of statistical significance. These results are not in agreement with sign obtained by Menčlová (2014), however are in consistency with previous researchers using similar methodology, such as Koellinger and Thurik (2012) or Klapper et al. (2015). We support obtained positive signs of coefficients by explanation that

new opportunities reveal, once the economy grows and therefore people are motivated to create ventures (entrepreneurship driven by opportunities).

Positive sign was obtained also for the variables representing population density, average age and share of tertiary educated population offering explanation that Czech entrepreneurs engage more into business creation once they obtain relevant amount of experience, networks and education, resource based view on entrepreneurship, which was described by Wennekers et al. (2005). Increase in population density leads to higher volume of interactions among economic agents and increase in networking which is according to previous research (Stuart and Sorenson, 2003) positively associated with entrepreneurial activity. The positive sign of average age may be interpreted as proxy variable for increase in experience of population which could be used for engagement into business activity. More educated individuals are able to implement and commercialize outputs of scientific research. Unfortunately, estimated econometric models did not agree on the impact of share of economically active population providing contradictory signs, therefore this question is still open for future research.

Variable representing economic crisis during years 2008-2010 revealed that in comparison with other periods, entrepreneurial activity was during years 2008-2010 higher. Positive response of entrepreneurial activity towards significant increase in unemployment rate during economic recessions was described by Cueto et al. (2015). Second model (Model 2) was focused on the impact of unemployment rate. The variable representing unemployment rate was included in level form, first lag and second lag. Despite the fact, that first lag was not found to be statistically significant, all coefficients were positive, again contrary to the findings obtained by Menčlová (2014), but in accordance with positive sign reported by Fritsch et al. (2015) or Belás et al. (2015) who argue that the most frequent motivation of the Czech entrepreneurs for entering business activity was to have a job. Therefore increase in unemployment rate was associated with higher engagement of Czech economic agents into entrepreneurship (becoming self employed or setting up a new enterprises) covered by theory of necessity entrepreneurship.

Third and fourth model (Model 3 and Model 4) were estimated only for period years 2005 - 2013 because of lack of the data depicting R&D sector. The models supported previously introduced positive signs of coefficients for population density, average age, tertiary education and unemployment rate. Model 3 tested the impact of R&D workplaces on registered business activity. The results confirmed positive impact of research institutions on business activity through improving socio-cultural networks and supportive activities mentioned by Roig-Tierno et al. (2015). The last econometric model (Model 4) tested the impact of real R&D expenditures on entrepreneurial activity and both estimated coefficients were positive. However, only coefficient of R&D expenditures lagged by one year was found to be statistically significant. This result may be explained by delays caused by distribution of new scientific knowledge towards entrepreneurs and potential entrepreneurs and by time required for transferring knowledge into product or service. Positive impact of R&D expenditures was also obtained by (Sanders, 2007).

Summing up results of regression estimates we are able to accept first three hypotheses stating that there exists positive relationship between entrepreneurial activity in the Czech regions and GDP per capita, unemployment rate and support activities of R&D institutions. Hypothesis $\mathbf{H_1}$, $\mathbf{H_2}$ and $\mathbf{H_3}$ are accepted.

Table 3: Model Table

Variable / Model	Model 1	Model 2	Model 3	Model 4
Dependent Variable:	*REGISTERED_BUSINESSES_PER_CAPITA*			
CONSTANT	**0.002249***	**-1.174835*****	**-0.017757*****	**-0.169627**
	0.001207	0.118169	0.000995	0.207964
REAL_GDP_PER_CAPITA	**3.02E-09*****			
	3.64E-10			
POPULATION_DENSITY	**3.94E-06*****	**0.000525*****	**4.56E-06*****	
	5.22E-07	9.78E-05	8.74E-07	
AVERAGE_AGE	**0.000174*****	**0.020583*****	**0.000341*****	**0.008861***
	1.88E-05	0.000807	2.33E-05	0.005175
SHARE_POPULATION _1564	**-0.017400*****	**0.582044*****		
	0.001157	0.127560		
UNEMPLOYMENT_RATE		**0.001276*****		**0.000398**
		0.000491		0.001612
UNEMPLOYMENT_RATE (-1)		**0.000453**		
		0.000626		
UNEMPLOYMENT_RATE (-2)		**0.001045***		
		0.000592		
TERTIARY_EDUCATION	**0.020021*****		**0.020272*****	
	4.75E-05		2.13E-05	
TERTIARY_EDUCATION (-1)	**0.000131*****			
	3.41E-05			
ECONOMIC_CRISIS	**0.000144*****			
	2.36E-05			
WORKPLACES_RD_THINH			**0.000668****	
			0.000319	
WORKPLACES_RD_THINH (-1)			**0.001126*****	
			0.000356	
REAL_EXP_RD_CAPITA				**7.730759**
				7.360853
REAL_EXP_RD_CAPITA (-1)				**16.96424****
				7.661041
R-squared	0.999998	0.952742	0.999998	0.582432
Adj. R-squared	0.999997	0.948604	0.999998	0.566822
F-statistic	4687862.	230.2530	3143024.	37.31144
Observations	251	237	111	112

Note: Standard Errors are in parenthesis, *** stat. significance on 1 %,
** stat. significance on 5 %, * stat. significance on 10 %.

Source: EViews, own elaboration.

4 Entrepreneurship and Economic Growth – Dual Causality

This part tests the relationship between entrepreneurial activity and GDP per capita in the sense of Granger causality evaluation, testing to what extend are variables able to predict future values based on their previous values. The null hypothesis states that there is no Granger-Causality between tested variables, by rejecting it we are allowed to accept alternative hypothesis of existence of such relationship (Granger, 1969). Results of the tests are reported in Table 4. On 5% level of statistical significance we are able to reject the null hypothesis and accept the alternative. This result was controlled also using lags 2 and 5 obtaining the same result. GDP per capita Granger causes entrepreneurial activity and also, entrepreneurial activity Granger causes GDP per capita which is in agreement with results obtained by Koellinger and Thurik (2012). We verify $\mathbf{H_4}$ that entrepreneurial activity predicts the economic development of the Czech regions. Arguing that firstly, economic growth motivates additional individuals to engage into entrepreneurial activity, however also, entrepreneurial activity is good predictor of economic development of the Czech regions.

Table 4: Granger Causality between Entrepreneurship and Economic Growth

Tested Relationship	P-value	Lags	H0 Reject
REAL_GDP_PER_CAPITA ➔ *REGISTERED_BUSINESSES_PER_CAPITA*	0.00	10	Rejected
REGISTERED_BUSINESSES_PER_CAPITA ➔ *REAL_GDP_PER_CAPITA*	0.00	10	Rejected

Source: EViews, own elaboration.

Conclusions

This paper aimed to investigate relationship between the rates of registered businesses in the fourteen regions of the Czech Republic during period of years 1995-2013. Following previous studies, existing models explaining differences in regional business activity were discussed. We also introduced empirical findings of previous scholars and variables they suggest to take into account when determining factors having impact on entrepreneurial activity. Based on the previous research studies we developed four hypotheses which were tested in the empirical part of the article. Dataset was created based on variables collected from the Czech Statistical Office. Firstly we estimated econometric models using fixed effects method approach with lags to determine variables having impact on entrepreneurial activity. We were able to accept the hypothesis assuming positive relationship between entrepreneurial activity in the Czech regions and GDP per capita, unemployment rate and support activities of R&D institutions. This leads to main conclusion that during times of higher unemployment rate Czech people become self employed or set up their own business to earn income. Positive impact was also confirmed for population density, average age, and share of tertiary educated population supporting resource based view when explaining diversity among regional entrepreneurial engagement. Increase in real R&D expenditures suggested positive impact on entrepreneurial activity. The second part

of empirical analysis tested the relationship between GDP per capita and entrepreneurial activity using Granger causality test. Dual causality was statistically confirmed, so entrepreneurial activity is a good predictor of economic development of the Czech regions and on the other hand, economic growth motivates additional individuals to engage into entrepreneurial activity by bringing new business opportunities.

However, presented results have also several limitations that must be taken into account. First of them is related to operationalization of entrepreneurial activity expressed as rate of registered businesses in the Czech regions. The number of registered business may be in reality higher in comparison with real active enterprises for two reasons. Firstly, in the economy, there are businesses that are officially registered, however they are not active anymore, and secondly, some of registered entrepreneurs are in reality employees working under schwarz system conditions. On the other hand, in the registered business activity are not covered early stages of entrepreneurial activity, such as nascent entrepreneurship. Therefore it will be beneficial to operationalize entrepreneurial activity in a different way, such as based on population surveys (Global Entrepreneurship Monitor) to check our results. Unfortunately, data from population surveys so far do not cover even national entrepreneurial activity in sufficiently long time series nor on regional level. Also, more frequent data than annual, such as quarterly or monthly will be necessary to provide deeper insight into determinants of the Czech entrepreneurship. Since we were able to collect only data for period of years 1993-2013, we need to wait until updated data will be published to be able to increase our research sample. More frequent data and larger data set allow to implement more sophisticated econometric techniques, such as Vector Autoregressive models (VAR) and construction of impulse response functions.

As for policy recommendation, we suggest entrepreneurial policy makers to be prepared to organize entrepreneurial education, such as trainings and workshops, and allocate more resources towards entrepreneurial infrastructure, such as science parks and business incubators, to support current, potential and new entrepreneurs during times of higher unemployment rate that was already mentioned for example by Lukeš et al. (2014). We further encourage any initiatives trying to monitor entrepreneurial activity and recommend allocation of resources towards more detailed monitoring of the Czech entrepreneurship. Finally in our research we made no difference between various types of entrepreneurial activity. Business companies and self-employed individuals have its specific characteristics and therefore their determinants may differ. Studies investigating them separately should become a challenge for future researchers. More determinants of the Czech regional entrepreneurial activity should also be tested, we suggest to investigate the impact of share of immigrant population, share of economically active population, regional corruption perceptions or regional entrepreneurial subsidies.

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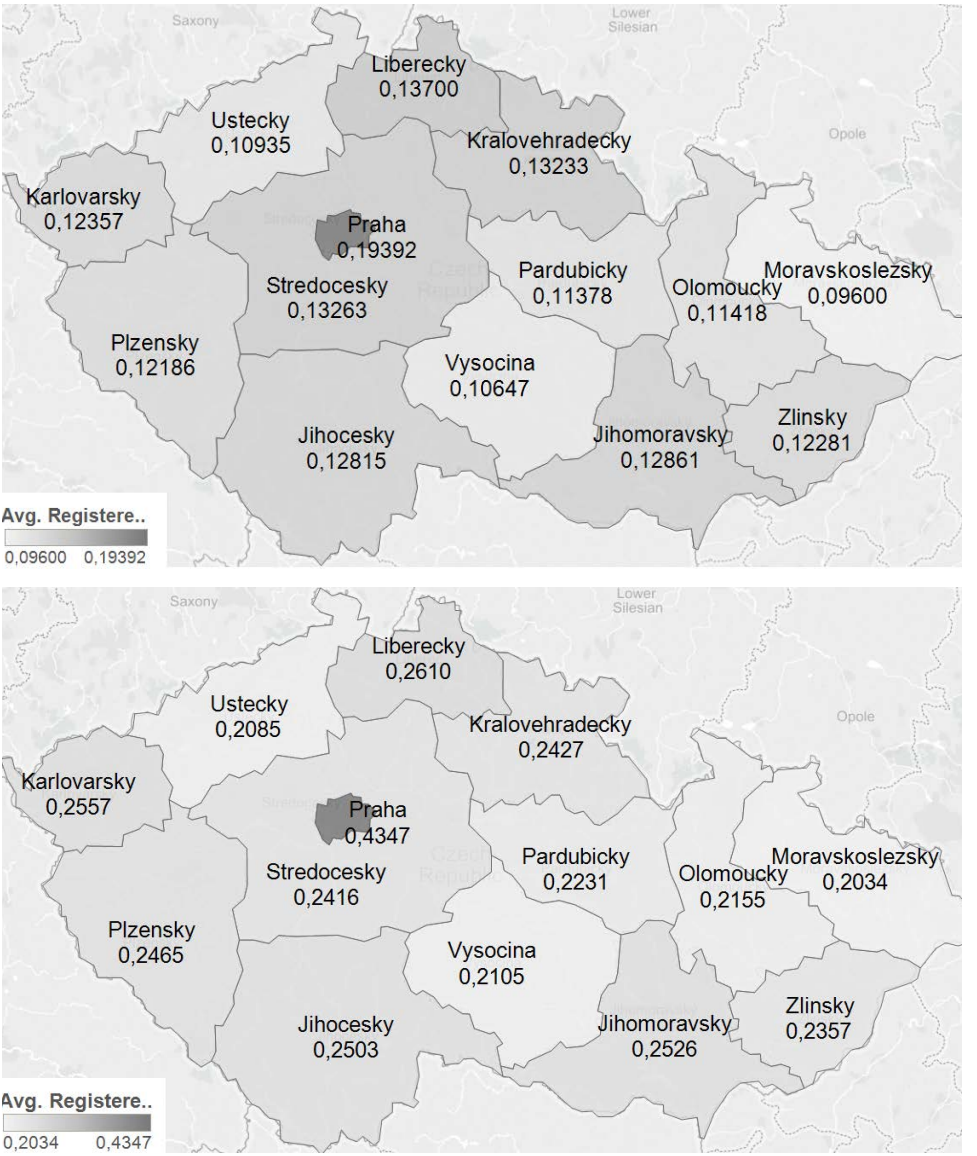
Appendix

Figure 3: Registered business activity in the Czech regions in 1995 (top) and 2013 (bottom)



Source: Tableau, own elaboration.