

# *Impact of Selected Types of Public Spending on Economic Growth*

## *Vliv vybraných typů veřejných výdajů na ekonomický růst*

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### **Abstract**

At present as the financial crisis impacts most countries and sectors – the question of the effect of fiscal policy is arguably of paramount importance. Public finance influences on growth could be assessed via relations between public expenditures, taxation and growth; via the effectiveness of the institutional framework; or via their contribution to macro economic stability.

We were specialized on analysis of influence of selected types of public expenditures on economic growth. We have used Czech Republic, Ireland, Sweden and Finland data for the comparison. This selection was made according to specific results in the area of the economic growth, support of research and development, structure and amount of public expenditure.

Data comparison of selected countries could show the presence or absence of impacts of these types of public expenditures. The other types of public expenditures, as for example government investments, will be involved in the next phase of the research.

In the contribution, the causality between the development of public spending (with the use of COFOG classification) and the development of GDP with various time delays was being determined. The performed analysis points to certain trends in the given area and to certain macro-economic links. It seems the GDP per capita is positively related to the per capita expenditures on Education and Defense. Number of population has also positive impact on GDP. The only positive effect of relative public expenditure variables have relative share of economics affairs, social protection and health variable. The effect of explanatory variables on GDP annual growth is in most cases negative. Only the per capita expenditures on Recreation, culture and religion and Health have positive effect on GDP growth.

Similar objectives could be also found by public expenditures.

### **Keywords**

public spending, economic growth, Granger causality, GFS methodology

### **JEL classification**

H5, E6

## Abstrakt

V současné době, kdy finanční krize ovlivňuje většinu zemí a odvětví – má pravděpodobně zásadní význam otázka vlivu fiskální politiky. Dopady veřejných výdajů na růst by mohly být hodnoceny prostřednictvím vztahů mezi veřejnými výdaji, zdaněním a růstem, prostřednictvím efektivnosti institucionálního rámce nebo prostřednictvím jejich přínosu k makroekonomické stabilitě.

Zaměřili jsme se na analýzu vlivu vybraných typů veřejných výdajů na hospodářský růst. Pro porovnání jsme použili údaje za Českou republiku, Irsko, Švédsko a Finsko. Tento výběr byl proveden podle specifických výsledků v oblasti hospodářského růstu, podpory výzkumu a vývoje, struktury a výše veřejných výdajů.

Porovnání údajů vybraných zemí by mohlo prokázat přítomnost nebo nepřítomnost vlivů těchto typů veřejných výdajů. Ostatní typy veřejných výdajů, jako například vládní investice, budou zahrnuty do další fáze výzkumu.

V příspěvku byla zjišťována příčinná souvislost mezi vývojem veřejných výdajů (s použitím klasifikace COFOG) a vývojem HDP s různými časovými prodlevami. Provedená analýza poukazuje na některé trendy v dané oblasti a na určité makroekonomické vazby. Zdá se, že HDP na hlavu pozitivně souvisí s výdaji na hlavu v oblasti vzdělání a obrany. Na HDP má rovněž pozitivní vliv množství obyvatelstva. Jediný pozitivní vliv relativních proměnných veřejných výdajů mají relativní proměnné podíly hospodářských záležitostí, sociální ochrany a zdraví. Vliv vysvětlujících proměnných na roční růst HDP je ve většině případů negativní. Pouze výdaje na hlavu v oblasti rekreace, kultury a náboženství a v oblasti zdravotnictví mají pozitivní vliv na růst HDP.

Obdobné cíle mohly být zajištěny rovněž veřejnými výdaji.

## Klíčová slova

veřejné výdaje, ekonomický růst, Grangerova příčinnost, metodologie GFS

## Introduction

At present as the financial crisis impacts most countries and sectors – the question of the effect of fiscal policy is arguably of paramount importance. Practical problems of economic policy and the strategic intentions of the EU amplify the importance of the economic analysis of the potential and actual effects of fiscal policy on the economy and especially on growth.

Although a high degree of coordination and harmonization across the EU has been achieved in many areas, fiscal policy is still in the sphere of action of national governments. Therefore the issue of the influence of fiscal instruments on growth, employment, and competitiveness involves a question of relations among European integrative goals and national fiscal strategies.

Fiscal politics influences could be denoted as direct (influences on employment rate, savings, investments and innovations) and indirect, via institutional framework. Public finance influences on growth could be assessed via relations between public expendi-

tures, taxation and growth; via the effectiveness of the institutional framework; or via their contribution to macro economic stability.

Similar objectives could be also found by public expenditures. Authors emphasize the significance of public investment spending, public consumption spending and social welfare or redistributive spending. Some of this literature has also considered public spending that increases human capital and spending that contributes to innovation, such as that for research and development, as core spending, as it enhances the human capital base and so technological progress.

In our research, that is the part of project: New approaches to an optimization of budgetary and fiscal policy with emphasis on the fiscal discipline (supported by Czech Science Foundation), we were specialized on analysis of influence of selected types of public expenditures on economic growth. We have used Czech Republic, Ireland, Sweden and Finland data for the comparison. This selection was made according to specific results in the area of the economic growth, support of research and development, structure and amount of public expenditure. We supposed that results of this comparison could be contributing also in the Czech Republic.

The aim of this paper is the analysis of selected types of public expenditures (final consumption of the government) on economic growth. Data comparison of selected countries could show the presence or absence of impacts of these types of public expenditures. The other types of public expenditures and government investments will be involved in the next phase of the research.

For a more detailed analysis of the relationship between public spending (by COFOG) and the development of GDP, the so called Granger causality and multiple regression with controls for time and country characteristics was applied in our study.

## **1 Progress of the state-of-the-art**

An interesting contribution to the analysis of the relationship between the composition of the expenditure and revenue and economic growth is a paper by Afonso and Alegre (2008). They analyzed these links for a sample of 27 EU members from 1971 to 2006, and concluded that:

- There was a negative influence of public consumption and social security contributions on growth,
- There was a positive impact from public investment.

Regression results show an existence of differences between EU members (in comparison to new and older member states). Conclusions about the channels through which the composition of the public budget affects growth are really suggestive.

How are public expenditures related to economic growth? In the 19th century A. Wagner formulated a "law" on the expansion of government. Based on empirical evidence he argued that government size increases with wealth. Public expenditures are endogenous,

in contrast to the short-run Keynesian approach that treats public expenditure as an exogenous (Afonso and Furceri, 2008).

Lucas (1998) pointed out the role of public investment in education in human capital growth and eventually in long-run economic growth. Similarly Barro (1990) and Romer (1990) referred to the role of government expenditure in public infrastructure and expenditures on research and development in achieving growth.

Public expenditures play a significant role in economic growth. In an analysis of government size and fiscal volatility on growth for a sample OECD and EU member states from 1970 to 2004, Afonso and Furceri (2008) conclude that both factors tend to hamper growth for both samples of countries.<sup>1</sup>

Understanding the effects of government expenditures on the growth mechanism is very important. Mo (2007) follows the view that public expenditures affect growth through three channels – total factor productivity, investment and aggregate demand. The results show that public expenditures have negative marginal effects on productivity and GDP growth. When relocation of government investment occurs, it influences productivity growth and GDP growth. Mo (2007) emphasizes that all government expenditures have positive aggregate demand effects.

Ghosh and Gregoriou (2008) analyzed panel data for 15 developing countries for 28 years and using GMM techniques they showed that current (capital) spending has positive (negative) effects on growth.

Endogenous growth models analyzing the growth effects of public spending divide public spending into productive and consumption. The proportion of productive public spending differs across countries. Using IMF data and CEPD (2001) Chen (2006) shows a higher proportion in Eastern Asia while in North America and Europe it is lower. For Latin America it is much lower. For example in the 1980s and early 1990s the share was above 15 % in Korea and above 20 % in Taiwan, a little more than 5 % in the US and nearly 5 % in the UK and France. Brazil was less than 5 % (Chen, 2006).

The following questions naturally arise:

- Why do governments select particular ranges?
- How can optimal composition be determined?
- What relationships exist between public expenditure structure and growth?

Researchers into these questions explore various factors that influence the division between public expenditures and the determinants of growth. See Lee (1992) Baier and Glomm (2001), Cazzavillan (1996), Raurich (2003), and Park and Philippopoulos (2004).

Chen (2006) offers a one-sector endogenous growth model to study these questions, and he confirms the significance of the structure of public expenditure on growth.

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<sup>1</sup> António Afonso & Davide Furceri, 2008. "Government size, composition, volatility and economic growth," Working Paper Series 849, European Central Bank, January.

There are interesting links between public expenditure, growth and the source of funds. Palivos and Yip (1993) believe that income tax financing is more detrimental to growth than seigniorage financing. But De Gregorio (1993) holds the opposite view, while Pecorino (1997) prefers a mixture of both ways. Bose, Holman and Neanidis (2007) use a sample of 40 developing and 21 developed countries to assess the influence of both ways. They conclude that for the high-income economies, an expansion in government expenditures financed through taxes retards growth more than if it were financed through seigniorage. For low-income countries the opposite conclusion is valid.

Carboni and Medda (2007) build a model, with empirical applications, that determines optimal government size, the optimal mix of government expenditures, maximizes the rate of growth and the level of per capita income.

Devarajan et al. (1996) emphasize the significance of the composition of government expenditure for economic growth, and in the theoretical model they consider two productive services. They try to determine which type of public expenditure is more productive. In developing countries this is current expenditure.

Monteiro et al. (2008) has introduced two types of public investment (in infrastructure and in education) into a two sector endogenous growth model. The authors find that "the welfare-maximizing rate of expenditure is less than the growth-maximizing rate, with the opposite being the case with regard to their allocation".<sup>2</sup>

Analysis of public finance influence on growth also comprises the problem of the relationship between government (or fiscal) size and economic growth. See Afonso et al. (2005, 2006), Greene (2005), Angelopoulos, and Philippopoulos and Tsionas (2008).

Afonso et al. (2005, 2006) concentrate on the analysis of public sector effectiveness using help of indicators of public sector performance (PSP) and efficiency (PSE) respectively for OECD member states and for new EU member states and emerging markets. Angelopoulos et al. (2008) begin from Afonso et al. methodology, but finally they incorporate PSE into the economic model. They conclude that "when fiscal size is measured by the government consumption share in GDP, the size-efficiency mix is significant in explaining the size-growth relationship."

A high number of scientific papers about the relationship between government size and economic growth can be found, but there are few examples of the significance of public finance influence on lower than central level administrative units. Schaltegger and Torgler (2006) have performed that analysis for Switzerland from 1981 to 2001. Their results show the negative relationship between government size and economic growth. They also find that an increase in current expenditure reduces economic growth but a significant influence on capital expenditure was not confirmed.

Based on an analysis of seven fast-growing economies from 1970 to 2006 Moreno-Dodson (2008) tries to find an answer to the question of under what conditions public expendi-

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<sup>2</sup> Monteiro et al. 2008, pp. 77.

tures positively influence growth, and what kinds of expenditures cause that. The public expenditures are for analysis needs divided into the following three criteria:

- by functional criterion GFS classification with resolution on economic and social criteria,<sup>3</sup>
- by their degree of productivity,<sup>4</sup>
- by sectoral classification.

The results of the analysis confirm the influence of public expenditures on GDP per capita growth, especially by selected types of expenditures.

Afonso, Nickel, and Rother (2005) performed a consolidation process analysis in Central and Eastern Europe countries (8 EU members from CEE and two candidate countries: Bulgaria and Romania) from 1991 to 2003 in comparison to 15 EU countries. The results of the study indicate that the higher the share of expenditure reduction relative to the change (improvement) in the budget balance, the higher is the probability of a fiscal consolidation being successful (Afonso, Nickel and Rother 2005).

Gray et al. (2007) analyze in their wide-ranging study of public finance policies in so-called ECA countries 15 years after the start of transition.<sup>5</sup> The authors also used seven non-ECA countries – Chile, Ireland, the Republic of Korea, Spain, Thailand, Uganda and Vietnam, because they think that their public finance policies hold useful lessons for ECA because these seven countries have had higher than average growth rates for the past decade. The study facilitates the understanding of not just basic trends and specific problems of public finance in ECA countries, but also how these trends and problems affect economic growth. The comparison with seven non-ECA rapidly-growing emerging market countries produces many interesting findings and themes.

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3 *Economic public spending includes: fuel and energy; agriculture, forestry, fishing, and hunting; mining, mineral resources, manufacturing, and construction; transportation and communication etc. (for central government).*

*Social public spending includes: education; health; social security and welfare; housing and community amenities; and recreational, cultural, and religious affairs (for the central government).*

4 *This categorization, based on an a priori judgment regarding their expected impact on Growth was introduced by Bleaney, Gammel and Kneller in 2001.*

5 *Central and Eastern Europe and Asia (ECA) countries (group of countries created just for this analysis needs) comprising:*

- *a subset of 10 ECA: Albania, Armenia, Croatia, Georgia, the Kyrgyz Republic, Poland, Romania, the Slovak Republic, Turkey, and Ukraine (these countries vary markedly in size, per capita income etc.),*
- *EU-5, comprising the Czech Republic, Hungary, Poland, the Slovak Republic, and Slovenia,*
- *EU-8, comprising EU-5 and the Baltics; Southeast Europe (SEE), comprising Albania, Bosnia and Herzegovina, Bulgaria, Croatia, the former Yugoslav Republic of Macedonia, Romania, and Serbia and Montenegro,*
- *low-income members of the Commonwealth of Independent States (CIS), comprising Armenia, Azerbaijan, Georgia, the Kyrgyz Republic, Moldova, Tajikistan, and Uzbekistan;*
- *and middle-income CIS, comprising Belarus, Kazakhstan, the Russian Federation, and Ukraine.*

Under planning CEECs had similar histories due to their shared ideologies, economic management and development strategies. Their present situation is different, and Schadler et al. (2006) argue that there is a possibility of a two-speed catch-up: growth in the three Baltic countries having pulled substantially ahead of that in the five Central European countries (CE-5) – the Czech Republic, Slovak Republic, Hungary, Poland and Slovenia.

Comparisons of CEECs with emerging market countries are also very interesting, even if the CEECs' growth experience during the past decade was unusual by emerging market country standards (Schadler et al., 2006).

## 2 Analyze of impact of selected types of public spending on economic growth

Together with public income (especially taxes), public spending forms the "front and back of the same coin". The conflict between pressure on the growth of public spending on one hand, and the pressure on the decreasing of the tax burden on the other is a constant problem of budget policy. An analysis of the development of public spending (in total, as well as according to individual components and factors of their dynamics) can be considered as key from the perspective of fiscal discipline.

An analysis of the development of public spending and factors of their dynamics is a current problem of a number of countries. The main reason are these trends: growth of the volume of public spending, growing weight of public spending of GDP, increasing share of transfers on total public spending and, last but not least, also the growth of the share of the so called debt servicing.

For a more detailed analysis of the relationship between public spending and the development of GDP, the so called Granger causality was applied in this text. It concerns the monitoring of the relationship between the development of individual services of public spending and GDP (or possibly in reverse), where one variable is monitored in a different time period. The stated procedure makes it possible to search for answers to the following questions:

- [1] Does the development of individual components of public spending in year  $t$  depend on the development of GDP in year  $t-j$ ?
- [2] Does the development of GDP in year  $t$  depend on the development of individual components of public spending in year  $t-j$ ?

Statistical data do not make it possible to monitor a different causality than time causality. This means that the determination of causes and effects can only be deduced from the perspective of time succession. Granger's approach to causality (resolution of the dependence relationship) is as follows:

$$VV_t = f(HDP_{t-j}), \text{ where} \tag{1}$$

$VV_t$  – are public spending in period  $t$

$HDP_{t-j}$  – is GDP in period  $t-j$

If this relationship is of a higher quality (more stable in time, measured via a coefficient of variation) than reverse causality

$$\text{HDP}_t = f(VV_{t-j}), \text{ where} \quad (2)$$

j – is delay

t – is time

Then according to Granger's approach to causality we say that public spending is the consequence of the development of GDP in the previous period. The causality was monitored:

1) in period t-1,

2) in period t-2.

We have used Czech Republic, Ireland, Sweden and Finland data for the comparison. This selection was made according to specific results in the area of the economic growth, support of research and development, structure and amount of public expenditure. We supposed that results of this comparison could be contributing also in the Czech Republic.

Our aim is the analysis of selected types of public expenditures (final consumption of the government) on economic growth. Data comparison of selected countries could show the presence or absence of impacts of these types of public expenditures. The other types of public expenditures, as for example government investments, will be involved in the next phase of the research:

**Table 1:** Granger's causality in terms of coefficient of variation (dependence of selected parts of public expenditures by COFOG in period t on GDP development in period t-j)

| Ireland  | t-1       | t-2       |
|--|-----------|-----------|
| General public services                                  | 0,703283  | 0,4603217 |
| Defence  | 0,6121548 | 0,6870159 |
| Public order and safety                                  | 0,3201892 | 0,450811  |
| Economic affairs   | 0,7593352 | 0,8042787 |
| Housing and community amenities                          | 1,129558  | 1,2205796 |
| Health   | 0,3459577 | 0,1888437 |
| Recreation, culture and religion                         | 0,7555267 | 0,7023723 |
| Education  | 0,3911302 | 0,3037478 |
| Social protection  | 0,3673047 | 0,3523094 |
| Equals: General government final consumption expenditure | 0,3173756 | 0,2435935 |



| <b>Finland</b>   |            |           |
|--|------------|-----------|
| General public services                                  | 1,0706049  | 0,8107405 |
| Defence  | 1,435768   | 4,9901914 |
| Public order and safety                                  | 0,5918182  | 1,5871056 |
| Economic affairs   | 1,3154085  | 2,9576458 |
| Environment protection                                   | 1,8081732  | 6,8391749 |
| Housing and community amenities                          | 48,356827  | 3,1698962 |
| Health   | 0,5197588  | 1,7440781 |
| Recreation, culture and religion                         | 0,4116329  | 1,276059  |
| Education  | 0,7152615  | 1,6836157 |
| Social protection  | 0,5402746  | 2,0486315 |
| Equals: General government final consumption expenditure | 0,4735734  | 1,8313146 |
| <b>Sweden</b>  |            |           |
| General public services                                  | 1,3550239  | 3,5043502 |
| Defence  | 8,3401975  | 4,5274221 |
| Public order and safety                                  | 1,7735198  | 4,5173576 |
| Economic affairs   | 1,537436   | 2,7578469 |
| Environment protection                                   | 14,506988  | 1,8640763 |
| Housing and community amenities                          | 2,9659982  | 1,3874314 |
| Health   | 1,7217375  | 1,3050575 |
| Recreation, culture and religion                         | -4,6517078 | 23,122268 |
| Education  | 1,7242459  | 1,4746454 |
| Social protection  | 1,614947   | 1,4644981 |
| Equals: General government final consumption expenditure | 1,7309822  | 1,4057589 |
| <b>Czech Republic</b>                                    |            |           |
| General public services                                  | 1,5246294  | 1,7398518 |
| Defence  | 4,0664121  | 4,9765867 |
| Public order and safety                                  | 1,2405365  | 1,2076971 |
| Economic affairs   | 1,256914   | 1,384364  |
| Environment protection                                   | 0,8157651  | 0,848537  |
| Housing and community amenities                          | 1,611553   | 2,0043142 |
| Health   | 0,5123059  | 0,543175  |
| Recreation, culture and religion                         | 1,0320391  | 1,0062217 |
| Education  | 0,8602209  | 0,6522281 |
| Social protection  | 1,0427968  | 1,1680369 |
| Equals: General government final consumption expenditure | 0,632579   | 0,421095  |

**Table 2:** Granger's causality in terms of coefficient of variation (dependence of GDP development in period t on development of selected parts of expenditures by COFOG in period t-j)

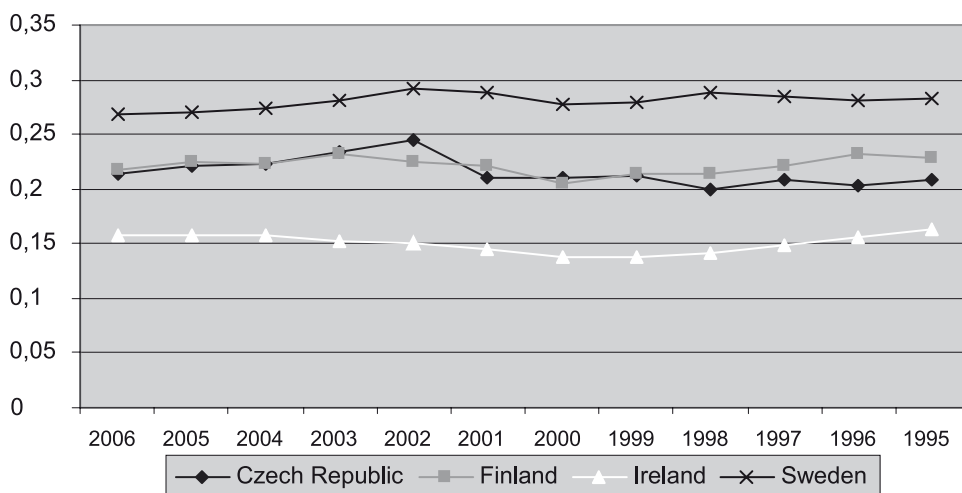
| <b>Ireland</b>   | <b>t-1</b> | <b>t-2</b> |
|--|------------|------------|
| General public services                                  | 1,714832   | 2,118593   |
| Defence  | 0,361793   | 1,045821   |
| Public order and safety                                  | 18,41486   | 0,870923   |
| Economic affairs   | 0,562991   | 2,804791   |
| Housing and community amenities                          | 4,228136   | 0,962571   |
| Health   | 1,02438    | 0,818066   |
| Recreation, culture and religion                         | -0,76391   | -6,90903   |
| Education  | 0,837358   | 0,813358   |
| Social protection  | 9,130909   | 0,487092   |
| Equals: General government final consumption expenditure | 1,180578   | 0,597483   |
| <b>Finland</b>   |            |            |
| General public services                                  | 3,786624   | -5,85332   |
| Defence  | 4,842333   | 4,825793   |
| Public order and safety                                  | 14,81544   | -6,349     |
| Economic affairs   | -2,63966   | -2,83093   |
| Environment protection                                   | -4,42023   | -6,08475   |
| Housing and community amenities                          | 14,00671   | 19,52785   |
| Health   | 1,000505   | 0,46127    |
| Recreation, culture and religion                         | 0,714718   | 0,773259   |
| Education  | -3,82887   | -5,25862   |
| Social protection  | 1,111048   | 1,886205   |
| Equals: General government final consumption expenditure | 0,591426   | 0,418614   |
| <b>Sweden</b>  |            |            |
| General public services                                  | 3,633548   | 3,368015   |
| Defence  | 3,571368   | -4,36401   |
| Public order and safety                                  | -2,99533   | -2,11259   |
| Economic affairs   | 27,11867   | -3,27198   |
| Environment protection                                   | 3,059549   | -6,20223   |
| Housing and community amenities                          | 8,171914   | 1,771996   |
| Health   | 1,796575   | 2,524053   |
| Recreation, culture and religion                         | -8,14197   | 3,70288    |
| Education  | 1,919153   | 2,722457   |
| Social protection  | -7,81119   | 3,687949   |
| Equals: General government final consumption expenditure | 1,769487   | 2,60583    |

| Czech Republic   |          |          |
|--|----------|----------|
| General public services                                  | 3,180377 | 1,669693 |
| Defence  | -2,80558 | -2,57081 |
| Public order and safety                                  | 3,468877 | 3,47467  |
| Economic affairs   | 1,165106 | 1,177177 |
| Environment protection                                   | 0,502627 | 0,60588  |
| Housing and community amenities                          | 2,640099 | 2,504908 |
| Health   | 0,452192 | 0,383848 |
| Recreation, culture and religion                         | 1,293215 | 1,159881 |
| Education  | -23,5957 | 0,624115 |
| Social protection  | -5,19951 | -7,65218 |
| Equals: General government final consumption expenditure | 0,476967 | 0,736078 |

From the previous tables it follows, that the relationship

a)  $VV_t = f(HDP_{t-j})$  and b)  $HDP_t = f(VV_{t-j})$  is not really significant in selected countries and in the evaluating period. (measured with the use of the coefficient of variation) According to Granger's approach to causality it thus holds that public spending classified according to COFOG methodology is not a consequence of the development of GDP in the previous period and GDP is not consequence of the development of public spending classified according to COFOG.

**Graph 1:** Government final consumption expenditure by function at current prices/GDP



We also employed multiple regression approach (for final models see Appendix) to test the relationship between GDP (in two forms, 1) GDP per capita and 2) GDP annual growth) and a set of variables containing structure of public expenditure (relative and per capita form of

variable). We also tried to control for country specific characteristics (dummy variables for 4 (3) countries), time trends and population. For a full set of variables see Appendix.

To avoid problem of multi co-linearity of explanatory variables (including all variables leads inevitably to a linear combination of variables.), we have selected from variables that express the ratio of specific public expenditures parts on total expenditures (variables beginning with r) only those that have the highest variability between countries (DEF, POS, EA, HEA, EDU and SOC).

It seems the effect of explanatory variables on GDP annual growth is in most cases negative. Only the per capita expenditures on Recreation, culture and religion and Health have positive statistically significant effect on GDP growth. So unfortunately we were not able in this time derived some clear recommendation for policymakers concerning the pro-growth effects of selected public expenditures.

On the other hand the GDP per capita is positively related to the per capita expenditures on Education and Defense. Number of population has also positive impact on GDP. The only positive effect of relative public expenditure variables have relative share of economics affairs, social protection and health variable. These findings indicate that country economic power is correlated with composition of public expenditure but the link to economic growth is not significant. There is possible the opposite direction of influence – from the economic power to the composition of expenditure. Again we were not able to derive any suitable policy recommendation.

The testing of dependence direction is planned for future because from upper mentioned results is not really clear that for example GDP is a result of higher expenditures into education or at the opposite wealthy countries (countries with higher GDP) are able to spend more money into education.

## **Conclusion**

The contribution being presented comes out of the first period of the work on the project within the scope of GA ČR no. 402/08/1134 *“New approaches to the optimization of budget and fiscal policy on the strengthening of fiscal discipline”* and especially from the analysis of the impact of public spending on fiscal discipline.

In the contribution, the causality between the development of public spending (with the use of COFOG classification) and the development of GDP with various time delays was being determined. The performed analysis points to certain trends in the given area and to certain macro-economic links.

It seems the effect of explanatory variables on GDP annual growth is in most cases negative. Only the per capita expenditures on Recreation, culture and religion and Health have positive statistically significant effect on GDP growth.

On the other hand the GDP per capita is positively related to the per capita expenditures on Education and Defense. Number of population has also positive impact on GDP. The

only positive effect of relative public expenditure variables have relative share of economic affairs, social protection and health variable.

In the next part of the research, the testing of the statistical significance of selected linkages on a file of OECD countries data will be performed. The testing of dependence direction is planned for future because from upper mentioned results is not really clear that for example GDP is a result of higher expenditures into education or at the opposite wealthy countries (countries with higher GDP) are able to spend more money into education. The objective will be to verify whether the discovered linkages have a more general validity.

## Annex

Variables:

| Description of variable          | Variable per capita | Variable as a share on all public expenditure |
|----------------------------------|---------------------|---|
| General public services          | GPS                 | rGPS  |
| Defence                          | DEF                 | rDEF  |
| Public order and safety          | POS                 | rPOS  |
| Economic affairs                 | EA                  | rEA   |
| Environment protection           | ENV                 | rENV  |
| Housing and community amenities  | HOU                 | rHOU  |
| Health                           | HEA                 | rHEA  |
| Recreation, culture and religion | CUL                 | rCUL  |
| Education                        | EDU                 | rEDU  |
| Social protection                | SOC                 | rSOC  |
| 1996 – 2006                      | Year                | -   |
| Dummy for Ireland                | Ireland             | -   |
| Dummy for Sweden                 | Sweden              | -   |
| Dummy for Finland                | Finland             | -   |
| Dummy for Czech Republic         | CR                  | -   |
| Population                       | -                   | -   |

*Note: Data retrieved from United Nations Statistics, Government final consumption expenditure by function (<http://data.un.org>).*

Final regression model for variable GDPperCAP  
Multiple Regression Analysis

Dependent variable: GDPperCAP

| Parameter | Estimate       | Standard Error | T Statistic | P-Value |
|-----------|----------------|----------------|-------------|---------|
| CONSTANT  | -56,7032       | 14,1414        | -4,00974    | 0,0004  |
| DEF       | 0,00000509743  | 4,8063E-7      | 10,6057     | 0,0000  |
| ENV       | -0,00000460702 | 0,00000180055  | -2,55868    | 0,0160  |
| HEA       | -0,00000320498 | 5,074E-7       | -6,31647    | 0,0000  |
| EDU       | 0,00000319621  | 5,35297E-7     | 5,9709      | 0,0000  |
| popul     | 0,0255649      | 0,00166657     | 15,3398     | 0,0000  |
| Sweden    | -141,262       | 9,90107        | -14,2674    | 0,0000  |
| Finland   | -30,6384       | 4,12626        | -7,42523    | 0,0000  |
| CR        | -166,329       | 11,966         | -13,9001    | 0,0000  |
| rDEF      | -254,318       | 24,543         | -10,3621    | 0,0000  |
| rPOS      | -121,14        | 31,8195        | -3,80712    | 0,0007  |
| rEA       | 45,0327        | 14,6869        | 3,06618     | 0,0047  |
| rHEA      | 60,03          | 18,5411        | 3,23768     | 0,0030  |
| rEDU      | -120,78        | 21,9649        | -5,49876    | 0,0000  |
| rSOC      | 51,8611        | 19,71          | 2,6312      | 0,0135  |

R-squared = 99,862 percent

R-squared (adjusted for d.f.) = 99,7953 percent

Standard Error of Est. = 0,477705

Mean absolute error = 0,303965

Durbin-Watson statistic = 2,38652

Final regression model for variable annual change of GDP (dGDP)  
Multiple Regression Analysis

Dependent variable: dGDP

| Parameter | Estimate     | Standard Error | T Statistic | P-Value |
|-----------|--------------|----------------|-------------|---------|
| CONSTANT  | 6,19117      | 1,09112        | 5,67416     | 0,0000  |
| SFS       | -1,23219E-7  | 2,65476E-8     | -4,64143    | 0,0001  |
| ENV       | -6,21758E-7  | 1,57022E-7     | -3,9597     | 0,0004  |
| FOU       | -7,19885E-7  | 2,07707E-7     | -3,46587    | 0,0017  |
| HEA       | 1,3727E-7    | 3,37872E-8     | 4,06279     | 0,0003  |
| CUL       | 5,9898E-8    | 2,91813E-8     | 2,05261     | 0,0492  |
| SOC       | -7,01058E-8  | 3,25509E-8     | -2,15373    | 0,0397  |
| popul     | -0,000287467 | 0,0000499522   | -5,75484    | 0,0000  |
| Finland   | -0,704782    | 0,139775       | -5,04227    | 0,0000  |
| CR        | 1,81732      | 0,417825       | 4,34946     | 0,0002  |
| rDEF      | -3,72977     | 1,2535         | -2,97549    | 0,0058  |
| rPOS      | -11,3336     | 2,65285        | -4,27225    | 0,0002  |
| rEA       | -4,51348     | 1,19786        | -3,76795    | 0,0007  |
| rHEA      | -6,936       | 1,27769        | -5,42857    | 0,0000  |
| rEDU      | -4,43481     | 1,2964         | -3,42088    | 0,0019  |

R-squared = 80,4636 percent

R-squared (adjusted for d.f.) = 71,0322 percent

Standard Error of Est. = 0,0290428

Mean absolute error = 0,0183756

Durbin-Watson statistic = 2,19552

Note:

Since the DW values are greater than 1.4, there is probably not any serious autocorrelation in the residuals.

Since the P-value is less than 0,05, the terms are statistically significant at the 95% confidence level.

The backward stepwise regression procedure was employed to eliminate those variables which are not statistically significant.

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