**CHARLES UNIVERSITY**
FACULTY OF SOCIAL SCIENCES
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# Elasticity of local governments' expenditures to gross domestic product

Bachelor's thesis

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## Declaration of Authorship

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Prague, July 27, 2021

Barbora Bajgarova

# Abstract

Public finance is an important topic in the work of modern economists. Local finance forms a significant part of the public finance affecting quality of life of all the citizens. The aim of this thesis is to explore the connection between economic development, represented by the gross domestic product, and Czech local governments' expenditures. Data from `https://monitor.statnipokladna.cz/` on expenditures and revenues of Czech municipalities are used to model the relationship. The model confirms there is a relationship between GDP and local expenditures. The effect is positive for current expenditures, meaning they tend to decrease when GDP drops, and negative for capital expenditures, meaning they tend to rise when GDP drops. However, different municipalities (in terms of population size and responsibilities carried out) respond considerably differently. Moreover, the evidence of political budget cycles is found for all the municipality types.



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# Abstrakt

Veřejné finance jsou nedílnou součástí prací ekonomů po celém světě. Obecní rozpočty tvoří výnamnou část těchto veřejných financí ovluvňujíc kvalitu života všech obyvatel. Cílem této práce je prozkoumat vztah mezi ekonomickým vývojem, zastoupeným hrubým domácím produktem, a obecními výdaji českých obcí. K modelování tohoto vztahu jsou využity data z `https://monitor.statnipokladna.cz/` obsahující údaje o příjmech a výdajích českých obcí. Výsledky potvrzují existenci souvislosti mezi lokálními výdaji a vývojem HDP. Pro běžné výdaje je tato korelace pozitivní, což znamená, že klesají, když HDP klesá. Pro kapitálové výdaje je korelace negativní, což znamená, že naopak rostou, pokud HDP klesá. Ovšem různé obce (ve smyslu velikosti a množství poskytovaných služeb) reagují výrazně odlišně. Dále byla potvrzena přítomnost politicko-hospodářských cyklů ve všech typech obcí.

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| **Klasifikace JEL** | F12, H72, C33, R50 |
| **Klíčová slova** | Česká Rebulika, obce, elasticita, obecní finance, HDP |
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# Chapter 1

# Introduction

Public finance is an important topic in the work of economists all around the world. However, most of them tend to focus on the state or district budgets as they are individually bigger and usually more in the 'social spotlight'. Nevertheless in 2019 Czech municipalities' spending reached to more then 338 billions CZK, which is more then 60% of spending of all locally govern organizations' spending (Ministerstvo financí (2020a)) and nearly 25% of all general government expenditures (OECD (2020)).

The objective of this thesis is to provide an empirical analysis of revenues and expenditures of more than 6200 Czech municipalities between years 2010 and 2020. Since there already exists some research on connection between political cycles and local finance in Czech Republic (Sedmihradská *et al.* (2011), Šťastná (2015), Bendžíková (2018)), this thesis focuses more on the impact of the economic cycle. The aim of this thesis is to explain how municipalities budgets behave during economic growth and how different types of municipalities react to economic crisis. Since measuring economic cycles is very complicated we will simply use GDP as a proxy, which should provide satisfying level of correlation to economic cycles for our thesis. Since municipalities' influence on their revenues is negligible, we will be focusing more on the expenditures.

The author hopes to help to increase understanding of structure and development of municipalities' budgets and therefore to increase efficiency in revenues redistribution between levels of government in Czech Republic and even more importantly to increase efficiency of the local spending.

The structure of this thesis is as follows: Chapter 2 provides a review of existing literature in this topic, Chapter 3 explains how municipality system in Czech Republic works and shows some of the main characteristics of our

data and the structure of municipalities revenues and spending, Chapter 4 explains the model used for the empirical research and choice of control variables. Chapter 5 presents the final results of the empirical research and provides a discussion on their meaning. Chapter 6 revises the whole thesis and provides an overall conclusions.

# Chapter 2

# Literature Review

This chapter provides an overview of existing literature about effects of economic cycle on local budgets and suggests its implications for our analysis.

## 2.1 Economic crisis and local budgets

During an economic crisis, municipalities suffer from so called 'scissors effect'. This means that expenditure rise (due to a need to provide more social assistance etc.) and at the same time tax revenues drop significantly (OECD (2020)). Due to drop in revenues, municipalities need to search for other means to finance the increased expenditures. This includes borrowing, however especially small municipalities can find it very difficult to borrow money on the finance market. Hence, the central government often needs to step up and increase transfers to local governments. Rodden & Wibbels (2010) observe several world's most decentralized federations and notes that they tend to be overwhelmingly pro-cylical, which result in a need for ad-hoc transfers from the state.

Blöchliger *et al.* (2010) suggests, that thanks to the central government transfers, the crisis tend to fall on local budgets with at least one to two years delay. However the length of delay differs significantly across the OECD countries and strongly depends on the revenue structure of the local governments. Countries with business taxes playing important role in their revenues, are hit by the crisis more. Moreover Blöchliger *et al.* (2010) argues that the expenditures of local government fluctuate less then central governments in the OECD countries.

## 2.2 The case of Czech Republic

Špaček & Dvořáková (2011) examines the history of local budgets of Czech municipalities and their reaction to 2009 financial crisis and points out that budgets of Czech municipalities have been rather anti-cyclical mainly thanks to two reasons. Firstly, the history of decentralized public administration has been short and marked with economic growth and low utilization of debt instruments, which enabled the municipalities to built sufficient reserves. Secondly, the 2009 state budget was built on a premise of economic growth and the transfers to municipalities were not adversely effected (in fact central government transferred additional 9 billions CZK to help municipalities cope with the crisis). However the author expect this to turn around in following years, when municipalities will not be able to rely on state subsidies, which is consistent with Blöchliger *et al.* (2010), who also points out that Czech municipalities are also negatively effected due to fact that tax revenues represents more then half of total municipalities' revenues.

Sedmihradská & Klazar (2011) explore the effect of the financial crisis in 2009. They observe the already mentioned 'scissors effect', i.e. tax revenues of Czech municipalities fell significantly in 2009 while the expenditures grew. The research also suggests that municipalities were not able to quickly adjust and needed to rely on accumulated surpluses as claimed by Špaček & Dvořáková (2011). According to Sedmihradská & Klazar (2011) capital spending in 2009 increase by more then 20% against the year 2008, whereas current spending only increased by approximately 5.2%. Moreover the authors point out the problem of high inaccuracy of approved budget, especially in municipalities with less then 10 000 inhabitants.

## 2.3 Political budget cycles

Another type of cycle that will be important in our analysis are the political budget cycles. This term refers to a manipulation of fiscal policies to improve chances of politicians' reelection. In many countries (including Czech Republic) local government have a very little influence on their revenues, thus most of the studies focus on development of capital and current expenditures before the elections. Baleiras & da Silva Costa (2004) and Veiga & Veiga (2007) analysed spending of Portuguese municipalities and proved existence of PBC there. Moreover, Veiga & Veiga (2007) claim that municipalities reorganize their ex-

penditures structure in the pre-election years favoring the capital expenditures over current expenditures. The evidence of PBC in Flemish municipalities has been found by Geys (2007), who additionally suggests that more fragmented governments are more prone to manipulate their expenditures as their reelection in more uncertain. Tellier (2006) explored the opportunistic behavior in Canadian provinces and found out that politicians tend increase expenditures more when they have a lower probability of being reelected.

In Czech environment, there are several studies supporting existence of political budget cycles. Bendžíková (2018) confirms existence of pre-election manipulation of expenses by district's governments. The author claims that both capital and current expenditures tend to increase in the year of elections and for capital expenditures even in the pre-electoral year. This increase can be seen especially in areas that are perceived by society as generally beneficial such as health care, culture or environment. Moving to a municipality level, Sedmihradská *et al.* (2011) explores 205 municipalities with extended powers in 2001-2007 confirming existence of PBC. According to Sedmihradská *et al.* (2011), due to very limited fiscal autonomy of Czech governments, incumbent cannot influence voters through manipulation of taxes and therefore they increase visible capital expenditures in the election year. To finance this increase, municipalities tend to decrease current expenditure. However, this opportunistic behavior that not serves its purpose as the empirical research suggest that it does not increase their chances for reelection. Following up, Šťastná (2015) examines the same municipalities with extended power over the period of 1997-2013 and confirms previous results. Moreover, the paper decomposes expenditures into more detailed categories showing that leisure, infrastructure, education and housing are targeted the most before elections. Bigger municipalities also tend to increase expenditures on environmental protections.

# Chapter 3

# Data

This chapter provides an overview of institutional context of municipalities in Czech Republic and describes their main responsibilities and powers. Moreover it decompose the structure of their revenues and provides descriptive statistics of their expenditures, divided both in term of expenditure's structure and allocation.

## 3.1 Municipality system in Czech Republic

The local government in Czech Republic is in international comparison extremely fragmented. Both the average number of inhabitants per municipality and the municipality area are the lowest in OECD countries (OECD (2020)). There are 6254 municipalities in total in Czech Republic with average number of residents approximately 1713 and mean size 443 inhabitants (in 2020). [1] According to OECD Economic Surveys from 2020, about 90% of municipalities have under 2000 inhabitants.

In terms of population structure, Czech Republic in not only the most fragmented country within the OECD, but also one of the least urbanised. Many of the smallest municipalities are remote and sparsely populated. Population tends to be older in the rural areas requiring more expensive public services and thus increasing costs. This trend will probably only worsen over time as bigger cities are more attractive to the young generation, therefore we can expect further depopulation and ageing in the rural areas. This, with many other factors such as mentioned high fragmentation, overlapping levels of gov-

[1] Please note that this is only an approximation due to some missing observations in our sample. As smaller municipalities are more prone to have a missing value, these numbers can be a little bit biased upwards.

ernment, difficulty of finding a sufficient management for small municipalities etc., contribute to low overall efficiency of public spending in Czech Republic.

There are several levels of local government in Czech Republic each carrying out different responsibilities. The current institutional structure was introduced in a reform in year 2000. Before the reform, there were three tiers of government - the central government, 76 district authorities and 6 242 municipalities. This reform firstly created 14 administrative regions, that acquired a wide range of responsibilities and powers from the national authority. Subsequently, in 2003 the original districts were dissolved and instead municipalities with extended scope were established. Those 205 municipalities acquired about 80% of responsibilities and powers of the initial district.(Šťastná & Gregor (2011)). Moreover, this reform introduced a new requirement of at least 1000 residents for creation of a new municipality, which stopped a steep rise in number of municipalities after the Velvet revolution. (OECD (2020)) Over the observed period we can see constant however very slow increase in number of citizens per municipality.

Currently, there are 6254 municipalities with basic delegated powers or so called type I municipalities. To their responsibilities belong for example dealing with offences (e.i. minor disorderly conduct, traffic), ensuring election, keeping population records and being a road authority. Type II municipalities are the municipalities with authorised office. In addition to the basic delegated powers, those 388 municipalities serve as a building authority and operate a registry office [2]. Moreover, they provide social and work assistance and manage selected agendas on environmental and agriculture. The type III municipalities, or the municipalities with extended powers, are besides all already mentioned also responsible for issuance of ID cards, driving licences, travel documents, trade licences and administration of motor vehicles and population register and water and waste management. Furthermore, the municipalities with extended scope coordinate the provision of social services (although they are only carrying out services financed by state budget). There are 205 municipalities with extended powers and each administers a district of on average 30 other municipalities. Besides the delegated competencies, each municipality also exercise independent competencies such as provision of elementary and art schools, kindergartens and primary health care, setting local fees and management of local police and fire brigade, territorial and regulatory planning, maintenance

[2]There are some exceptions to this as some of the building authorities and registry offices are also located in type I municipalities.

of local roads and garbage collection. Municipalities can form a voluntary association of municipalities or enhance any other type of cooperation to manage their duties. Last type of municipalities we will be using for our research are the statutory cities, which consist of 26 of some of the biggest cities in Czech Republic[3]. The statutory cities are part of municipalities with extended powers and do not bear any specific delegated powers, however they can divide themselves into smaller self-governing territories.

The capital city of Prague is an exception from the framework, having both status of a municipality and a district. Due to its specific nature and financial features (its expenditures per capita are two times bigger than the maximum of our sample and more than 2000 times bigger than the average of our sample over the observed period) we decided exclude Prague from our analysis.

For the purpose of our analysis, we have decided to divide Czech municipalities into three groups - the municipalities with extended powers, statutory cities and the rest of the municipalities (now on also called the basic municipalities).

## 3.2 Revenues

Generally, municipalities' revenues can be divided into four basic categories - tax revenues, non-tax revenues, capital revenues and transfers.

Tax revenues are the biggest resource reaching to 67.3% of total revenues (in 2019). They can be further divided to value added tax, which takes up about 40% of the tax revenues received by municipalities, then the person income tax and corporate income tax, property tax and other taxes and fees from selected activities. Non-tax revenues sum to 9.8% and capital revenues to not even 2%. Last but not least, the transfers are about 21.1% of total municipalities' revenues. Figure 3.1, shows development of each category of revenues over the observed period. We can observe that tax revenues approximately follow the GDP development as they constantly increase after the last financial crisis in 2009 and then drop in 2020 due to the COVID-19 crisis. We can also observe increased level of transfer in the beginning of the observed period, when state increased transfers to help municipalities to deal with the financial crisis, and in 2020 as a reaction to the pandemic crisis.

Municipalities in Czech Republic have a very little autonomy about their revenues. Large part of tax revenues (the VAT, personal and corporate income

[3]The 26th is Třinec, which is not among the 26 biggest and the capital city of Prague is not considered a statutory city.

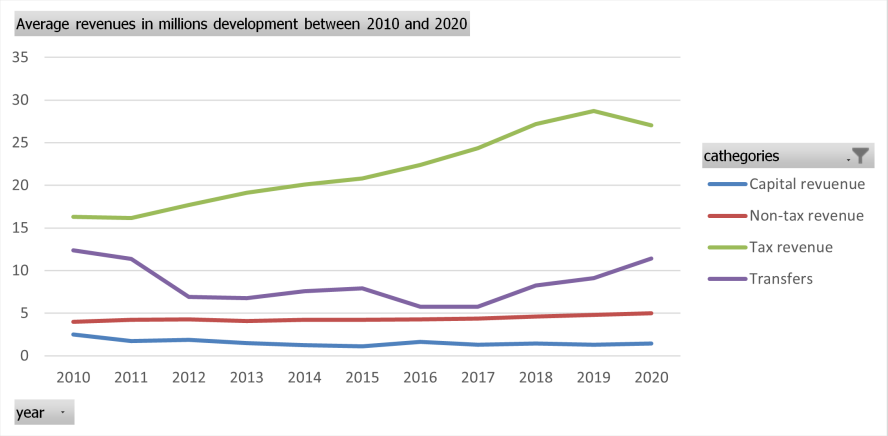



Figure 3.1: Development of revenues

Source: Own calculations. Data obtained from `https://monitor.statnipokladna.cz/`

tax) is collected by state and then formula-based redistributed among the state budget, regions and municipalities. Municipalities receive their tax revenues according to their population size (88% weight), number of children in nursery and elementary schools (9% weight) and size of cadastral area (3% weight).

Hence, Czech municipalities are due to their revenue structure very sensitive to economic cycle as a great part of their revenues collected in a form of taxes which is likely to drop during economic crisis. For example in 2020 during the COVID-19 pandemics, we can observe a significant drop (app. 6%) in tax revenues. It is generally accepted as a good practice to assign less cyclical tax resources (such as property taxes) to municipalities in order to prevent big cuts in investments and other pro-cyclical effects. More cyclical resources should be kept by the central budget, who is thanks to its stronger fiscal position and better ability to borrow money more capable to manage fluctuations. (Kim and Vammale 2012, OECD 2020). Although we do not see that happening in Czech Republic. The local budget still tend to be rather anti-cyclical thanks to their short history marked with economic growth and low utilization of debt instruments. (Špaček & Dvořáková (2011)). However with 2020 pandemic crisis some cities may be running out of accumulated financial reserves, which may pose a challenge in the future development of Czech local finance.

## 3.3 Expenditures

Similarly to revenues, expenditures can be formally divided into two categories - current and capital expenditures. Generally, current expenditures are rel-

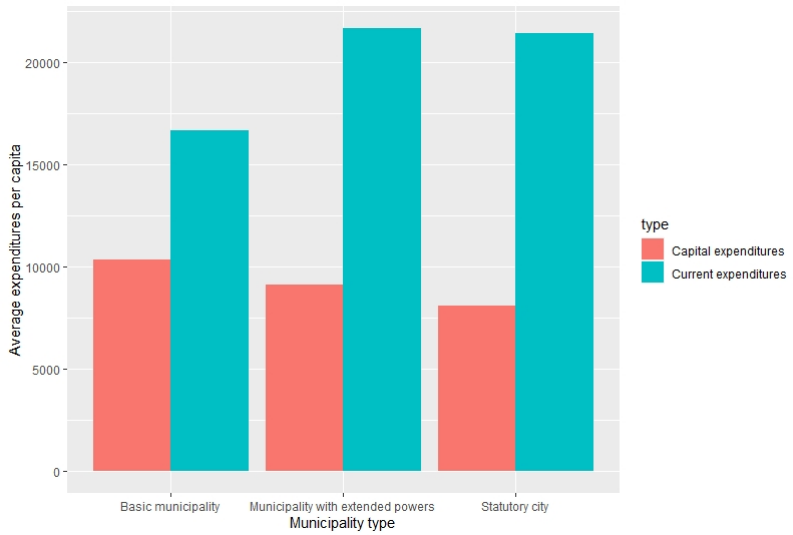



Figure 3.2: Current and capital expenditures per capita for different municipality types.

Source: Own computations. Data obtained from `https://monitor.statnipokladna.cz/`.

atively bigger budget item generating about 72% of total expenditures. To biggest components of current expenditures belong salaries and other payments for work performed, services purchases (e.g. postal, telecommunications and radio-communications services, rent, financial institutions' services, consulting and advisory services), expenditure on territorial transportation services and most importantly non-investment transfers to contributory and similar organizations, to which belong mostly organizations operating in the areas of education and school services, culture (theater, libraries, museums and galleries), physical education and leisure activities, housing and communal services and environmental protection and social care services. Capital expenditures are mostly investment purchases and related expenses, which are directed mainly to the transport, water, housing, education, communal services and territorial development sectors. They amount to approximately 28% of total expenditures.(Ministerstvo financí (2020b)) However, the proportion of current and capital spending differs significantly across different levels of local governments. Figure 3.2 shows average current and capital spending per capita over the observed period for different types of municipalities. We can observe that larger municipalities (i.e. municipalities with extended powers and statutory cities) have higher share of current expenditures, which might be caused by greater extend of responsibilities managed by these municipalities.

Another division of expenditure, and even more interesting, is according to their allocation. Figure 3.3 shows the per capita spending according to

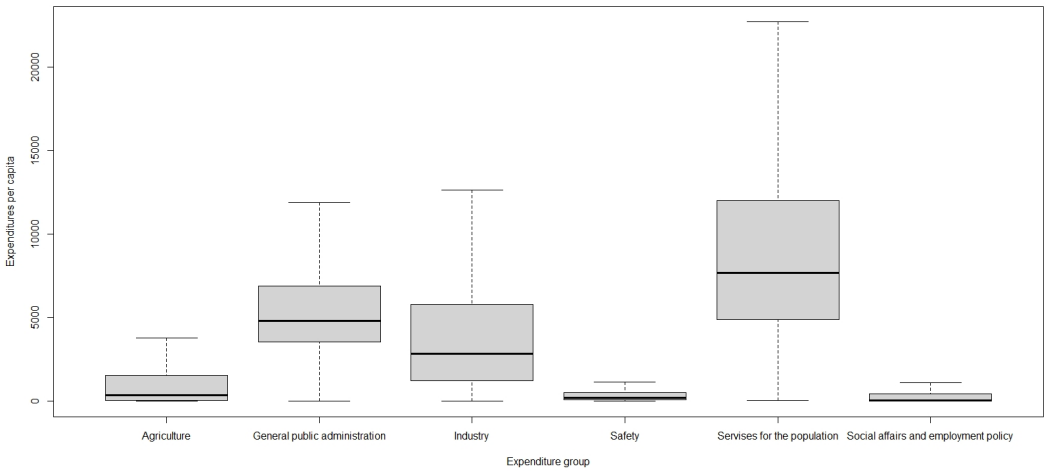



Figure 3.3: Expenditures per capita according to different allocation groups.

Source: Own computations. Data obtained from `https://monitor.statnipokladna.cz/`.

six main groups reported by Czech public administration, which are 'State security and legal protection', 'Industrial and other sectors of the economy', 'Services for the population', 'Social affairs and employment policies', 'General public administration and services' and 'Agriculture, forestry and fishery'. We can observed that most of the expenditures go to services for the population, followed by industry and general public administration.

Looking at the expenditures from the efficiency perspective, international evidence supports existence of U-shaped relationship between the costs of service provision and the size of municipalities. (Holzer *et al.* (2009), Douglas (2006), OECD (2020)) In Czech Republic local expenditure per capita shows a slight U-shaped patter, however making direct comparison is difficult as different municipalities provide different services. Mainly due to high fragmentation is Czech local governments' overall spending efficiency is under the OECD average, especially in area of general public expenditures. As a consequence of high fragmentation, extremely small municipalities often struggle to attract and pay sufficiently skilled staff to undertake more complex procurement and investment projects. Small municipalities also face a loss of economies of scale especially in capital-intensive services. (OECD (2020)). Efficiency of Czech local governments' was further explored by Šťastná & Gregor (2011), who examined factors decreasing efficiency of municipalities with extended scope. According to Šťastná & Gregor (2011) main factors that increase inefficiency are distance to regional center, share of university-educated citizens and popula-

tion size, which is in contrast with assumptions of OECD (2020). However, Šťastná & Gregor (2011) only considers three groups of municipalities - bellow 10000 inhabitants, between 10000 and 20000 and over 50000. Considering that mean population size of Czech municipalities 443, additional research done on all municipalities remains to be done. Concerning budgetary factors higher capital expenditures, subsidies per capita and share of self-generated revenues increase inefficiency, because they relax the budget constraint. From political factors increase in party concentration and voters' involvement increase efficiency. Following up on their research, Šťastná & Gregor (2015) confirms their previous results. Additionally, both studies asses the development of inefficiency of Czech municipalities and conclude that small municipalities have increased their efficiency significantly more then bigger municipalities.

# Chapter 4

# Methodology

This section provides a theoretical background of methodology used in the thesis. It briefly discuss the data used in regression and selection of explanatory variables. Then it provides necessary information about econometric models used for the empirical analysis and discussion whether they are suitable for our research.

## 4.1 Data specification

For the empirical analysis we will be using data on 6254 municipalities in Czech Republic observed over the period from year 2010 to year 2020. The data on expenditure and revenues of each municipality were collected from `https://monitor.statnipokladna.cz/`, with employment of R package *statnipokladna* developed by Petr Boukal. However, the data set is unbalanced as for some municipalities some observations are missing. From the review of the data set, we can reasonably say that to author's best knowledge the time dimension of mission observation is not showing any pattern and thus is randomly sampled. However, from the individual perspective, smaller or medium size municipalities are more prone to have missing values, hence we do not have random sampling and we will need to take this into consideration during our analysis. Although, thanks to the size of our sample and relatively small number of missing observations in each regression, we can expect this effect to be rather negligible.

Originally, all the data were obtained in absolute term (i.e. the sum for the given municipality), but for to interpretation simplicity and due to big differences between individual values, which might be difficult to analyse, we

decided to collect data on number of inhabitants and recompute the data to per capita. This might also help to decrease high heterogeneity of out sample.

The general form of the assessed model can be quantified as follows:

$$log(y_{it}) = \beta_0 + \sum_{p=1}^{P} \beta_p * log(y_{t-p}) + \sum_{l=0}^{L} \beta_l * log(GDP_{t-l}) + \sum_{j=1}^{J} \beta_j * x_{j,it}$$

Where $y_{it}$ is the level of expenditures per capita of given municipality $i$ at given time period $t$. $P$ is the number of lags of dependent variable included. Log(GDP) is the variable of interest, also included with several ($L$) lags as we expect that GDP in previous time periods can affect the current time period significantly. In other words, if there is an economic crisis we assume it takes several years for municipalities to recover or, as Blöchliger *et al.* (2010) suggests, the effect of economic crisis may even fall onto municipalities with several years delay due to state subsidies provided by central government in times of crisis. Lastly, $x_{j,it}$ stands for j-th explanatory variable used in regressions. List of explanatory variables with brief explanation of reasoning for their use can be found in the next subsection. Summary statistics are presented in Table 4.1. Summary statistics for relevant variables after division to different municipality types can be found in A.1 in the Appendix. The correlation matrix is presented in Table 4.2 followed by the visualization of correlation matrix in Figure 4.1.

### 4.1.1 Control variables

**exp_per_cap, curr_exp_cap and cap_exp_cap** Following Šťastná (2015), we include lags of expenditure per capita (i.e. our dependent variable) to control for persistence in the expenditures, and analogously for current and capital expenditures per capita. Due to interpretation and scale reasons this variable will also be used in logarithmic form.

**rev_per_cap** Revenues per capita have a major influence on the level of expenditures. To comply with law restrictions, municipalities can only spend the money they have or they are able to borrow. Due to very strict law regarding debt level of municipalities, their borrowing ability is limited. As past revenues also matters for current spending, we include lag of this variable. Due to interpretation and scale reasons this variable will be used in logarithmic form.

**elect_year and pre-elect_year** As explained in the Chapter 2, there is an evidence of political budget cycle in Czech municipalities. Therefore we decided to include dummies for election and pre-election years to out model. The elections to municipalities' governments took place in years 2010, 2014 and 2018. Hence, dummies for pre-electoral years are equal to 1 in years 2013 and 2017. This will also allow us to asses the hypothesis of presence of political budget cycles in the municipalities.

**prod_age_per and avg_old** The percentage of inhabitants in productive age, i.e. the ratio of inhabitants between 15 to 64 years to the number of total inhabitants, and average age for each municipality to control for the demographic structure of the municipality. These data were obtained from the Czech Statistical Office database.

**inflation** We use inflation to try to control for uncertainty in the economy. And even more importantly it should help us to capture unwanted trends in the model. Both expenditures and GDP have an increasing trend in general and the data are not adjusted for inflation, which might bias our elasticity estimates upwards. By engaging inflation in our models, we hope to at least partially eliminate this bias. The data were obtained from Czech Statistical Office as inter-year change in percentage.

**unempl** Unempl refers to level of unemployment at given time period. Originally we wanted to collect the data for each district to differentiate between different economic situation in different locations. However, this was not possible for the most recent year. Rather then giving up the last time observation from 2020, in which the pandemic crisis began, we decided to include *unempl* from the national level (the same holds for the GDP variable). The data were collected from the Czech Statistical Office as general unemployment rate in %.

## 4.2 Hypothesis

As previously said, we will try to estimate the effect of economic crisis, represented by the Gross Domestic Product, on expenditures of municipalities. We will be searching for elasticity of current and capital expenditures on GDP. In order to measure the elasticity, we will use both the dependent variable and the

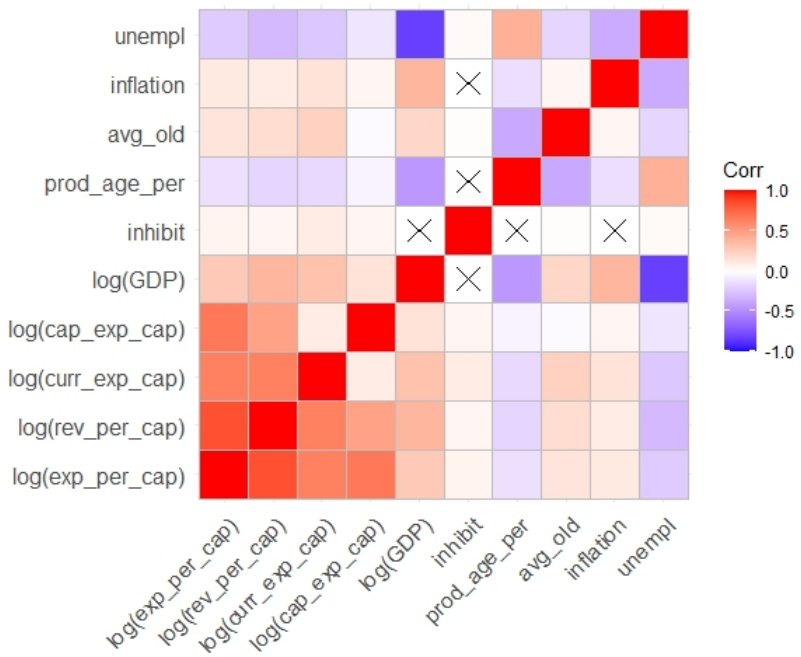
Table 4.1: Summary statistics of used variables

| Statistic | N | Mean | St. Dev. | Min | Pctl(25) | Pctl(75) | Max |
|---|---|---|---|---|---|---|---|
| exp_per_cap | 64,730 | 21,042.790 | 21,101.450 | 2,221.588 | 12,346.280 | 23,713.470 | 1,998,112.000 |
| rev_per_cap | 64,730 | 22,445.070 | 18,065.530 | 5,017.332 | 14,675.030 | 24,779.370 | 1,561,099.000 |
| curr_exp_cap | 64,730 | 13,310.140 | 8,234.331 | 39.526 | 8,966.110 | 15,370.220 | 502,040.200 |
| cap_exp_cap | 64,730 | 7,732.648 | 17,768.780 | 0.001 | 1,465.384 | 8,315.964 | 1,764,830.000 |
| GDP | 64,730 | 4,734,479.000 | 634,217.900 | 3,992,870 | 4,088,912 | 5,409,665 | 5,748,805 |
| inhibit | 64,730 | 1,569.121 | 8,275.330 | 15 | 231 | 978 | 382,405 |
| prod_age_per | 64,730 | 66.512 | 3.949 | 26.667 | 64.207 | 69.000 | 98.425 |
| avg_old | 64,730 | 41.602 | 2.624 | 26.443 | 40.028 | 43.004 | 65.167 |
| inflation | 64,730 | 1.833 | 1.022 | 0.300 | 0.700 | 2.800 | 3.300 |
| unempl | 64,730 | 5.568 | 2.216 | 2.120 | 3.480 | 7.160 | 11.470 |

Table 4.2: Correlation matrix

| | log(exp_per_cap) | log(rev_per_cap) | log(curr_exp_cap) | log(cap_exp_cap) | log(GDP) | inhibit | prod_age_per | avg_old | inflation | unempl |
|---|---|---|---|---|---|---|---|---|---|---|
| log(exp_per_cap) | 1 | 0.839 | 0.642 | 0.680 | 0.283 | 0.061 | -0.130 | 0.140 | 0.113 | -0.217 |
| log(rev_per_cap) | 0.839 | 1 | 0.639 | 0.485 | 0.379 | 0.045 | -0.184 | 0.177 | 0.102 | -0.303 |
| log(curr_exp_cap) | 0.642 | 0.639 | 1 | 0.101 | 0.316 | 0.096 | -0.157 | 0.237 | 0.146 | -0.238 |
| log(cap_exp_cap) | 0.680 | 0.485 | 0.101 | 1 | 0.153 | 0.047 | -0.053 | -0.021 | 0.046 | -0.114 |
| log(GDP) | 0.283 | 0.379 | 0.316 | 0.153 | 1 | -0.002 | -0.450 | 0.209 | 0.378 | -0.828 |
| inhibit | 0.061 | 0.045 | 0.096 | 0.047 | -0.002 | 1 | -0.005 | 0.014 | -0.0005 | 0.032 |
| prod_age_per | -0.130 | -0.184 | -0.157 | -0.053 | -0.450 | -0.005 | 1 | -0.367 | -0.136 | 0.408 |
| avg_old | 0.140 | 0.177 | 0.237 | -0.021 | 0.209 | 0.014 | -0.367 | 1 | 0.051 | -0.185 |
| inflation | 0.113 | 0.102 | 0.146 | 0.046 | 0.378 | -0.0005 | -0.136 | 0.051 | 1 | -0.358 |
| unempl | -0.217 | -0.303 | -0.238 | -0.114 | -0.828 | 0.032 | 0.408 | -0.185 | -0.358 | 1 |

Figure 4.1: Correlation map



GDP in logarithmic form. Intuitively, we expect current expenditure to increase when the GDP drops, because municipalities need to finance additional cost that appears during economic crisis such as unemployment subsidies' administration, increased provision of social services or during the COVID-19 pandemic also the increased health care expenditures. To finance those increased current expenditures, municipalities (especially the smaller ones with generally smaller financial reserves) are expected to cut the capital expenditures for some time.

Additionally, we will try to assess the hypothesis whether different municipalities react to the economic developement differently. We will try to evaluate the statement by Špaček & Dvořáková (2011) that bigger municipalities affected by the drop of GDP more then smaller municipalitie.

By adding dummy variable for election and pre-election year, we will also be able to asses the hypothesis of presence of the political budget cycles in the Czech municipalities suggested by the previous literature (Šťastná (2015), Sedmihradská *et al.* (2011)).

## 4.3 Proposed models

First panel data method we will be applying on our data is the pooling independent cross sections across time. This model was developed for analysing two or more independent cross sections across two or more time periods. This is not the case for our data set, where we observe the same individuals in each time period and thus this model might lead to severe biases. However, we have decided to construct this model as it is one of the most simple ones to give us a perspective for following more complicated models used.

As mentioned in previous paragraph, we observe the same individuals in each of the time periods and due to the nature of our data we can be almost sure there are unobserved individual's specifics, for example some location related characteristics such as distance to a bigger town or affiliation to the region. This implies that besides the idiosyncratic error term $\epsilon_{it}$, additional unobserved effect $a_i$, also called the fixed effect, is present.

First model used to deal with additional unobserved effect is the fixed effect model. This model takes the original model and time-demeans it, which means it subtracts mean form each respective variable. This transformation is also called the within transformation. Because the unobserved fixed effect $a_i$ is constant over time, it gets subtracted from the model and the originated model can then be estimated by using standard pooled OLS estimator. It is important

to note that as the intercept is also constant it gets subtracted from the model as well. The fixed effect transformation is as follows.

$$y_{it} - \overline{y_i} = \beta_0 - \beta_0 + \beta_1(x_{it} - \overline{x_i}) + a_i - a_i + u_{it} - \overline{u_i}$$

$$\ddot{y}_{it} = \beta_1 \ddot{x}_{it} + \ddot{u}_{it}$$

Using fixed effect model also solves the unbalanced data set problem. The unbalance data set causes problem of non-random sampling, because the pattern according to which are some observations missing from sample is often correlated with the unobserved effect $a_i$. Fixed effect allows for this correlation as the idea is that likeliness to drop from the sample is captured in the unobserved effect $a_i$, which is then subtracted from the equation. However, this only works under the assumption that the reason why the observations are missing is not systematically related to the idiosyncratic error. (Wooldridge (2015))

Another model used for dealing with unobserved effect $a_i$ is the random effect model. The random effect transformation is very similar to fixed effect transformation, however instead of deduction of the mean, it subtracts multiple (denoted by $\lambda$) of mean as shown below:

$$y_{it} - \lambda\overline{y_i} = \beta_0 - \lambda\beta_0 + \beta_1(x_{it} - \lambda\overline{x_i}) + a_i - \lambda a_i + u_{it} - \lambda\overline{u_i}$$

Where $\lambda$ is:

$$\lambda = 1 - \sqrt{\frac{\sigma_u^2}{\sigma_u^2 + T\sigma_a^2}}$$

Where $\sigma_u^2$ is the variance of error term and $\sigma_a^2$ is the variance of unobserved effect and $T$ is the number of time periods.

The main difference between fixed effect model and random effect model is that fixed effect assumes correlation between the unobserved effect $a_i$ and explanatory variable $x_i$. On the other hand, random effect assumes no correlation between $a_i$ and $x_i$. As we do not know whether there is or there is not a correlation at first, we will estimate both models and then use Hausman test to determine which model is more suitable for our regression. The test hypothesis is:

$$H_0 \ : \ There\ is\ no\ correlation\ between\ a_i\ and\ x_i.$$

$$H_1 \ : \ There\ is\ a\ correlation\ between\ a_i\ and\ x_i.$$

If null hypothesis is rejected, it means there is non-zero correlation between the unobserved effect and the explanatory variables and the random effect model is inconsistent under this assumption, therefore fixed effect model is more suitable. If we fail to reject the null hypothesis, there is no evidence of correlation between the unobserved effect and explanatory variables, thus both models are consistent, but random effect model is asymptotically more efficient and therefore more suitable.

First of all, we will run the proposed regressions for the overall expenditures of municipalities. Then we will decompose the expenditures to current and capital expenditures and run the same regressions.

# Chapter 5

# Results and Discussion

As presented in previous chapter, we have conducted pooling, fixed effect and random effect models and then run a Hausman test. All the result are state in the Appendix with robust standard errors in parenthesis. As a result of Hausman test, we rejected the null hypothesis, therefore fixed effect model is more suitable and we will be using it in the thesis.

## 5.1 Regression results

We tried several model specifications in order to estimate the elasticity the most precisely and meaningfully. Firstly, we regressed expenditure per capita only on its lag and $log(GDP)$ and its lag. Then we added variables representing some characteristics of the municipality - $log(rev\_per\_cap)$ and its lag, $inhibitants$, $prod\_obyt\_per$ and $avg\_old$ trying to mirror variables used by Šťastná (2015) and Bendžíková (2018). We also added dummies for election ($elect\_year$) and pre-election ($pre\_elect$) years to control for the effect of political budget cycles. Lastly, we tried to 'clean' the elasticity from other factors that may bias the results by adding $inflation$ and $unempl$ (unemployment) to our regression. Table A.4 in the Appendix shows the results of mentioned specifications for overall per capita expenditures with heteroskedasticity-robust standard errors in the brackets.

In Table A.4, we can observe that in the first regression, our variable of interest GDP has a positive effect on municipalities expenditures per capita, but if we control for other factors the effect becomes negative, which is in line with what we expected. Hence, that during an economic crisis overall expenditures tend to rise. Interestingly, municipalities' characteristics such as population

Table 5.1: Expenditures per capita final model

| | *Dependent variable:* |
|---|---|
| | log(exp_per_cap) |
| lag(log(exp_per_cap)) | $-0.113^{***}$ |
| | (0.007) |
| log(rev_per_cap) | $0.998^{***}$ |
| | (0.007) |
| lag(log(rev_per_cap)) | $0.184^{***}$ |
| | (0.009) |
| log(GDP) | $-0.150^{***}$ |
| | (0.047) |
| lag(log(GDP)) | $-0.213^{***}$ |
| | (0.053) |
| inhibit | $-0.00001^{**}$ |
| | (0.00001) |
| elect_year1 | $0.020^{***}$ |
| | (0.003) |
| pre_elect1 | $-0.024^{***}$ |
| | (0.003) |
| prod_age_per | 0.001 |
| | (0.001) |
| avg_old | 0.002 |
| | (0.002) |
| inflation | $0.034^{***}$ |
| | (0.001) |
| Observations | 62,463 |
| $R^2$ | 0.587 |
| Adjusted $R^2$ | 0.541 |
| F Statistic | $7{,}265.033^{***}$ (df = 11; 56205) |
| *Note:* | $^{*}$p<0.1; $^{**}$p<0.05; $^{***}$p<0.01 |

structure and number of inhabitants are not significant. This is most probably due to their relatively small variation in time. Nevertheless, we decided to keep them in the regression, because even though they are insignificant we believe this to still have an informative value. On the other hand, *unempl* turn out to be insignificant and unnecessary, therefore we removed it from the final model, which is shown by Table 5.1.

In the final model, we can observe negative effect of the gross domestic product as expected. The development in previous period seems to be even more important in terms of the magnitude. The overall effect for 1% decrease in GDP is 0.363% increase in expenditures per capita. The model also supports the previous evidence of political budget cycles presence in Czech municipalities. According to the model overall expenditures per capita rises by about 2% in a year of elections. To finance this, municipalities decrease their expenditures per capita by approximately 2.4% in the year before elections.

Then we proceed by decomposing the overall expenditures per capita into current and capital expenditures (measured as per capita as well). After the decomposition, we have encountered a problem with several negative observation. This may due to some accounting specifics or simply an error in our data set, nevertheless we decided to remove these observations. Moreover, in capital expenditures we have encountered several zero values, which does not seem reasonable and might also be given by error in our data set, thus we eliminated those observations as well. After further exploration of the data set, we noticed big deflection in capital expenditures in year 2016 as shown on Figure 5.1. According to Ministerstvo financí (2016), this is caused by transition to new period of drawing of EU funds. To control for this one-time shock, we added dummy variable for year 2016 to the capital expenditures regression. Table 5.2 shows the estimated results with heteroskedasticity-robust standard errors in the brackets.

The result goes against our intuitive assumptions and suggest that current expenditures tent to fall when GDP falls while capital expenditures tend to rise when GDP falls. For capital expenditure this is in line with what we can observe on the Figure 5.1, however for current expenditure we can observe their increased level at the begging of the observed period and in year 2020, which goes against our model. In order to examine this relationship more precisely, we would need to employ more time periods in our model to better understand the development of these variables during the last financial crisis. Additionally, the model suggests capital expenditures are influence more by economic devel-

Table 5.2: Current and capital expenditures per capita model

| | *Dependent variable:* | |
|---|---|---|
| | log(curr_exp_cap) | log(cap_exp_cap) |
| | Current expenditures | Capital expenditures |
| lag(log(curr_exp_cap)) | $0.093^{***}$ | |
| | (0.007) | |
| lag(log(cap_exp_cap)) | | $-0.031^{***}$ |
| | | (0.005) |
| log(rev_per_cap) | $0.188^{***}$ | $2.022^{***}$ |
| | (0.008) | (0.021) |
| lag(log(rev_per_cap)) | $0.019^{***}$ | $0.163^{***}$ |
| | (0.005) | (0.020) |
| log(GDP) | $0.676^{***}$ | $-0.700^{***}$ |
| | (0.023) | (0.091) |
| lag(log(GDP)) | $-0.031^{**}$ | $-0.384^{***}$ |
| | (0.014) | (0.063) |
| inhibit | −0.00000 | 0.00001 |
| | (0.00001) | (0.00002) |
| elect_year1 | $0.019^{***}$ | $0.032^{**}$ |
| | (0.002) | (0.013) |
| pre_elect1 | $-0.004^{*}$ | $-0.024^{*}$ |
| | (0.002) | (0.013) |
| prod_age_per | $0.001^{**}$ | −0.002 |
| | (0.001) | (0.004) |
| avg_old | $0.011^{***}$ | $-0.014^{*}$ |
| | (0.002) | (0.007) |
| inflation | $0.018^{***}$ | $0.019^{***}$ |
| | (0.001) | (0.006) |
| year2016 | | $-0.126^{***}$ |
| | | (0.018) |
| Observations | 68,613 | 64,825 |
| $R^2$ | 0.318 | 0.241 |
| Adjusted $R^2$ | 0.250 | 0.160 |
| F Statistic | $2{,}648.767^{***}$ (df = 11; 62355) | $1{,}550.323^{***}$ (df = 12; 58567) |
| *Note:* | | $^{*}$p<0.1; $^{**}$p<0.05; $^{***}$p<0.01 |

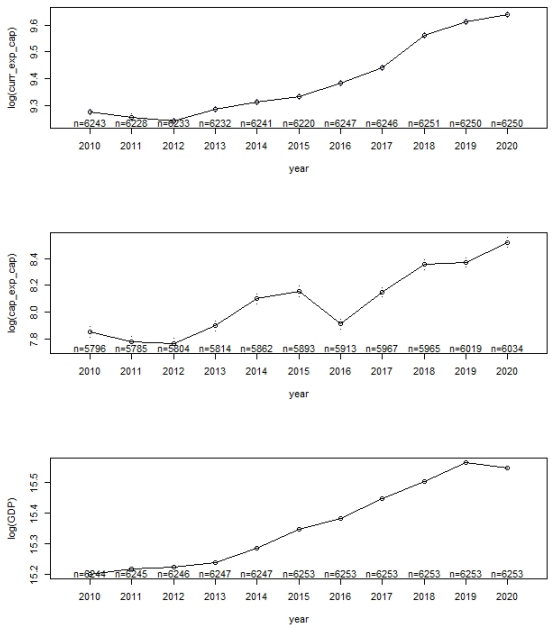



Figure 5.1: Development of current and capital expenditures and GDP in time

Source: Own calculations. Data obtained from `https://monitor.statnipokladna.cz/` and Czech Statistical Office

opment in previous periods then current expenditures, which corresponds with our expectations. Another thing to notice for capital expenditures is very high coefficient of revenues per capita. This is given by the inclusion of grants in revenue variable and the biggest investments usually heavily rely on grants. On the other hand, current expenditure are, unlike the capital expenditures, significantly influenced by the demographic structure of given municipality. The model also supports existence of political budget cycles as both kinds of expenditures increase significantly in the year of elections. However, all the result need to be considered very carefully due to very low $R^2$, which only 0.318 for the current expenditures model and even worse, 0.24, for the capital expenditures model. Therefore additional variables explaining the variation would need to be found to estimate the model more precisely.

Fixed effect model due to its nature does not allow for characteristics constant over time. Therefore three sub-samples were create from our original sample to enable us to observe whether different types of municipalities show different patterns. We created a sub-sample for statutory cities, municipalities with extended powers and for 'basic' municipalities. By municipalities with extended powers we will now on understand municipalities with extended power minus municipalities that are also a statutory city. This division may also help

to reduce high heterogeneity of our sample and therefore provide more relevant results. Table 5.3 shows the regression results for the overall per capita expenditures for the three types of municipalities.

Table 5.3: Overall model for diffrent municipality types

| | *Dependent variable:* | | |
|---|---|---|---|
| | log(exp_per_cap) | | |
| | Basic municipalities | With extended powers | Statutory cities |
| lag(log(exp_per_cap)) | −0.100*** | −0.034 | 0.017 |
| | (0.007) | (0.029) | (0.055) |
| log(rev_per_cap) | 0.967*** | 1.004*** | 0.746*** |
| | (0.007) | (0.021) | (0.085) |
| lag(log(rev_per_cap)) | 0.168*** | 0.115*** | 0.145** |
| | (0.008) | (0.033) | (0.060) |
| log(GDP) | −0.164*** | 0.475*** | 1.299*** |
| | (0.022) | (0.095) | (0.290) |
| lag(log(GDP)) | −0.146*** | −0.186*** | −0.178* |
| | (0.017) | (0.034) | (0.095) |
| inhibit | −0.0001*** | −0.00002* | 0.00000 |
| | (0.00002) | (0.00001) | (0.00000) |
| elect_year1 | 0.020*** | 0.063*** | 0.067*** |
| | (0.003) | (0.006) | (0.011) |
| pre_elect1 | −0.023*** | −0.0001 | 0.005 |
| | (0.003) | (0.007) | (0.023) |
| prod_age_per | 0.0002 | 0.019*** | 0.079*** |
| | (0.001) | (0.005) | (0.020) |
| avg_old | 0.0003 | −0.014 | 0.014 |
| | (0.002) | (0.011) | (0.042) |
| inflation | 0.033*** | 0.014*** | 0.005 |
| | (0.001) | (0.003) | (0.007) |
| Observations | 66,446 | 1,988 | 272 |
| $R^2$ | 0.576 | 0.802 | 0.735 |
| Adjusted $R^2$ | 0.533 | 0.780 | 0.695 |
| F Statistic | 7,444.740*** (df = 11; 60392) | 659.704*** (df = 11; 1787) | 59.380*** (df = 11; 235) |
| *Note:* | | | *p<0.1; **p<0.05; ***p<0.01 |

We can observe that the results vary significantly across the groups. The variable of interest, GDP, has negative effect on the 'basic' municipalities, positive effect on the municipalities with extended scope and quite big positive effect on statutory cities, where 1% increase in GDP in the current period results in 1.299 % increase in expenditures per capita.This means that in the bigger municipalities overall expenditures tend to fall significantly during economic crisis whilst in the smallest municipalities they rise. Previous period

GDP is not very relevant for the biggest municipalities, but it is very relevant for 'basic' and 'with extended powers' municipalities. Both with negative relationship, meaning that after a drop in GDP their expenditures stays on higher level for at least one more period. In order to explore how long they carry the effects of the GDP drop, we would need to add more time periods to our model and employ more lags. The election year dummy suggests increase of expenditure in the year of the elections. To finance this, small municipalities decrease their spending in the pre-election year. Moreover the variable for number of inhabitants seems to be statistically significant for small municipalities, hence even more detailed division might uncover some interesting patterns.

Tables 5.4 and 5.5 state regression result for different types of municipalities after decomposing the expenditures again into current and capital expenditures respectively.

The current expenditures regression is in line with previous results showing positive correlation between current expenditures per capita and GDP. For smaller municipalities previous period is also statistically relevant but not so much in magnitude. During the economic crisis, when GDP in given time period drops by 1% point, current expenditures per capita drops by approximately 0.7% in 'basic' and with extended powers municipalities and 1.3% for statutory cities.

This regression does not show any evidence of pre-election expenditure manipulation in statutory cities, on the contrary for 'basic' and with extended powers municipalities the effect is 2.1% and 1.3% respectively. For municipalities with extended powers the pre-election year's increase is also significant with 2% magnitude. Moreover, the current per capita spending in municipalities with extended powers is also highly influenced by demographic factors. Even though the magnitude of *inhibit* seems small, we need to keep in mind that it is measured in units, therefore if the number of inhabitants increase by 1000, the effect is -0.2% for 'basic' and -0.1% for extended powers municipalities, for which this is especially relevant due to the variance in their size. This supports the theory of economies of scale mentioned by Blöchliger *et al.* (2010). If we would be more interested in this relationship, we would need to add a quadratic form of the *inhibit* to determine to which size the coefficient is negative and from which size the expenditures per capita actually begin to rise again.

From the $R^2$ we can observe that for municipalities with extended powers and statutory cities the variation in current expenditures per capita is explained

Table 5.4: Current expenditures for different municipality types

| | *Dependent variable:* | | |
|---|---|---|---|
| | log(curr_exp_cap) | | |
| | Basic municipalities | With extended powers | Statutory cities |
| lag(log(curr_exp_cap)) | 0.094*** | 0.228*** | 0.157** |
| | (0.007) | (0.036) | (0.075) |
| log(rev_per_cap) | 0.182*** | 0.565*** | 0.496*** |
| | (0.009) | (0.035) | (0.068) |
| lag(log(rev_per_cap)) | 0.017*** | 0.004 | −0.003 |
| | (0.005) | (0.025) | (0.065) |
| log(GDP) | 0.719*** | 0.733*** | 1.305*** |
| | (0.024) | (0.123) | (0.156) |
| lag(log(GDP)) | −0.052*** | 0.093*** | −0.052 |
| | (0.015) | (0.032) | (0.068) |
| inhibit | −0.0002*** | −0.0001*** | 0.00000 |
| | (0.00003) | (0.00002) | (0.00000) |
| elect_year1 | 0.021*** | 0.013*** | 0.003 |
| | (0.002) | (0.004) | (0.006) |
| pre_elect1 | −0.003 | 0.020*** | 0.019 |
| | (0.002) | (0.006) | (0.012) |
| prod_age_per | 0.001 | 0.033*** | 0.046*** |
| | (0.001) | (0.006) | (0.010) |
| avg_old | 0.010*** | −0.027** | −0.039 |
| | (0.002) | (0.013) | (0.032) |
| inflation | 0.018*** | −0.007* | −0.004 |
| | (0.001) | (0.004) | (0.007) |
| Observations | 66,255 | 1,988 | 272 |
| $R^2$ | 0.321 | 0.752 | 0.839 |
| Adjusted $R^2$ | 0.252 | 0.725 | 0.815 |
| F Statistic | 2,582.877*** (df = 11; 60201) | 493.826*** (df = 11; 1787) | 111.731*** (df = 11; 235) |
| *Note:* | | | *p<0.1; **p<0.05; ***p<0.01 |

to great extend by our variables. However, for 'basic municipalities' the $R^2$ is quite low.

Table 5.5: Capital expenditures for different municipality types

| | *Dependent variable:* | | |
|---|---|---|---|
| | log(cap_exp_cap) | | |
| | Basic municipalities | With extended powers | Statutory cities |
| lag(log(cap_exp_cap)) | −0.027*** | 0.093*** | 0.140*** |
| | (0.005) | (0.021) | (0.051) |
| log(rev_per_cap) | 2.040*** | 1.846*** | 1.256*** |
| | (0.021) | (0.113) | (0.246) |
| lag(log(rev_per_cap)) | 0.162*** | −0.189** | 0.221 |
| | (0.020) | (0.094) | (0.296) |
| log(GDP) | −0.673*** | 0.186 | 0.992 |
| | (0.095) | (0.403) | (1.109) |
| lag(log(GDP)) | −0.445*** | −0.660*** | −0.271 |
| | (0.066) | (0.156) | (0.336) |
| inhibit | 0.0001 | 0.0001** | 0.00002 |
| | (0.0001) | (0.00005) | (0.00001) |
| elect_year1 | 0.039*** | 0.150*** | 0.207*** |
| | (0.013) | (0.025) | (0.063) |
| pre_elect1 | −0.022* | −0.028 | −0.112 |
| | (0.013) | (0.030) | (0.095) |
| prod_age_per | 0.002 | −0.022 | 0.156** |
| | (0.004) | (0.020) | (0.070) |
| avg_old | −0.015* | 0.034 | 0.211 |
| | (0.008) | (0.047) | (0.128) |
| inflation | 0.020*** | −0.022 | −0.038 |
| | (0.007) | (0.014) | (0.039) |
| year2016 | −0.120*** | −0.346*** | −0.532*** |
| | (0.019) | (0.039) | (0.092) |
| Observations | 61,133 | 1,988 | 272 |
| $R^2$ | 0.247 | 0.416 | 0.472 |
| Adjusted $R^2$ | 0.164 | 0.350 | 0.389 |
| F Statistic | 1,504.615*** (df = 12; 55090) | 105.827*** (df = 12; 1786) | 17.450*** (df = 12; 234) |
| *Note:* | | | *p<0.1; **p<0.05; ***p<0.01 |

Table 5.5 presents the same models for capital expenditure only with the addition of dummy for year 2016. We can observe that for the statutory cities neither current nor previous period is relevant, which means that either statutory cities' capital expenditures are not connected to the GDP development or they react with even bigger delay. For municipalities with extended powers only lag of GDP is significant, thus they also react to economic crisis with

at least one year delay and 1% decrease in GDP in previous period results in 0.66% increase in capital expenditures. For 'basic' both current and previous periods are relevant summing up to total 1.118% increase with every 1% drop in GDP. All the significant elasticities are negative, which might suggest that smaller municipalities actually use their fiscal policies to stimulate the economy during and after the economic crisis.

Besides that, the election year variable reveals capital expenditures manipulation before elections in all the municipality types with magnitude increasing with municipality size and range of responsibilities. On the other hand, the model shows no evidence of manipulation in the pre-election year. Furthermore, we can observe that switching to new EU funding in 2016 had a major influence on capital expenditures in that year, especially for the bigger municipalities, who usually handle more complex and more expensive projects. The capital expenditures per capita in the statutory cities dropped by approximately 41%.

However, we need to be careful with application of our results, especially for the basic municipalities where the adjusted $R^2$ is only 0.247. For the municipalities with extended powers and statutory cities the $R^2$ is 0.41 and 0.47 respectively, which is better although great part of the variation still remains unexplained.

## 5.2 Key findings

The overall model shows negative relationship between expenditures per capita. After decomposing to current and capital, we can observe that this negative relationship is driven by the capital expenditures, even though they only account for about 28 %. We detect a positive relationship between current expenditure per capita and GDP in current period with the elasticity being equal to 0.676%. For the previous period the elasticity is negative with although with lower magnitude of -0.031%. This mean that altogether for every 1% decrease in GDP, the current expenditures per capita decreases by 0.645%. This might be to finance increase of capital expenditures during the economic crisis or simply to compensate for decrease of tax revenues. On the other hand, if the GDP decreases, capital expenditures tend to increase significantly even one period after the drop. For every 1% drop in GDP, the capital expenditures per capita increase by 1.84%. This goes against our hypothesis that current expenditures increase during the economic crisis and to finance this increase municipalities cut their capital spending. Even thought the results are unintuitive, they are

partially in line with Sedmihradská & Klazar (2011) who claim that the capital expenditure rose considerably more then the current expenditures during the last financial crisis. Our result suggest that municipalities might actually use their fiscal policies and increase their capital spending to stimulate the economy. To finance this increase, they decrease their current spending. However, some of this result are not exactly in line with what we can observe at Figure 5.1 and the adjusted $R^2$ is quite low with 0.250 for current and even 0.160 for capital expenditures, therefore we have to be very careful with application of these results.

Then we wanted to understand whether different municipalities behaves differently, therefore we divided our sample to three sub-samples - statutory cities, municipalities with extended powers and 'basic' municipalities. In order to understand these results in context, we need to take in to account for how much of the total local public expenditures does each group account. This is shown by Table 5.6.

Table 5.6: Share of different municipality types on expenditures

| % share of total | 'Basic' municipalities | With extended scope | Statutory cities |
|---|---|---|---|
| Total expenditures | 0.432 | 0.271 | 0.297 |
| Current expenditures | 0.384 | 0.288 | 0.328 |
| Capital expenditures | 0.545 | 0.230 | 0.225 |

We can observe then overall negative relationship of capital expenditures and GDP development is driven by the smaller municipalities, who also accounts for more then half of the overall capita expenditures. For municipalities with extended scope and statutory cities, the GDP development in current period is insignificant. Municipalities with extended scope are negatively affected at least with one year delay, which is in line with the results of Blöchliger *et al.* (2010). There was no evidence of connection between the GDP development and the capital expenditures of statutory cities, although according to Blöchliger *et al.* (2010) municipalities react with at least 1-2 years delay depending on their revenue structure. Therefore more lags would need to be employed to reject the existence of the relationship. For current expenditure positive relationship with GDP development, i.e. economic growth, can be observed. Its magnitude increases from to 'basic' municipalities to statutory cities, i.e. with the population size and range of responsibilities. This suggests that during the economic crisis municipalities, especially the biggest ones, tend to cut their

current spending significantly. The previous period GDP development have a different effect at different municipalities, however the magnitude is quite negligible.

Concerning our last hypothesis about existence of political budget cycles, we can confirm that, in line with previous research from Sedmihradská *et al.* (2011) and Šťastná (2015), there is evidence of presence of political budget cycles in Czech local finance. We observe a significant effect of electoral year on capital spending in all types of municipalities. Its magnitude increases with population size and range of responsibilities. In the statutory cities the capital expenditures in the year of elections increase by nearly 23% according to our model. There is no significant evidence of increase in the pre-election year. The effect of election on current expenditures considerably differs between the municipality types, but generally the effect is much smaller then the increase of capital expenditures. For smallest municipalities there is an evidence of increased current expenditures in the electoral year. For municipalities with extended powers there is a significant increase in current spending in both the electoral and pre-electoral years. For the statutory cities no evidence of pre-election manipulation of current expenditures was found, suggesting the biggest cities target the capital expenditures in a hope of reelection.

## 5.3 Possible extensions and improvements

In order for the research to be more robust, we would need to add more time period to the analysis. Ideally, the analysis would contain all the years from the reform in 2000 to most recent year, which would allow us to study the effect of last financial crisis during the whole process and compare it to current pandemic crisis. Adding time periods before the reform, is not suitable as the local government structure before the reform was very different and therefore would be very hard to asses. Moreover, our sample suffers from some missing observation which may be found and filled, although this would be very time demanding with rather negligible effect. Variable representing location of municipality such as distance from big city, which district it belongs to or the quality of transport are missing from our analysis and may bring some interesting results as Šťastná *et al.* (2009) suggest there is spatial interdependence between Czech municipalities. Additionally, decomposing the expenditures according to their allocation rather then structure might yield some very interesting results if we

would be able find out in which areas the expenditures are rising the most and which investments are being cut during a crisis.

# Chapter 6

# Conclusion

Local budgets play an important role in the overall public spending. This thesis aimed to provide an analysis of expenditures of local governments in Czech Republic. We analysed data for all 6254 Czech municipalities in a period from 2010 to 2020 using the fixed effect model with heteroskedasticity-robust standard errors.

Our main goal was to explore the effect of economic development on municipalities' current and capital expenditures. In order to do this, we estimated their elasticities to GDP. From our results we can observe that current expenditures tend to fall during the economic crisis. On the other hand, capital expenditures tend to rise when GDP falls. This goes against our initial hypothesis, that municipalities need to increase current expenditure during the economic crisis and to finance this increase they tend to cut the capital expenditures. The result suggests that municipalities in fact tend to use their fiscal policies to help stimulate the economy.

Then we tried to asses the hypothesis whether different municipalities behave differently by dividing the municipalities into three groups - statutory cities, municipalities with extended powers (minus those already included in statutory cities) and the rest, 'basic', municipalities. We found out that municipalities with different population size and different scope of responsibilities indeed react to the GDP development differently. All municipality types tend to decrease their current expenditures significantly during the year of economic crisis. Smaller municipalities, i.e. 'basic' and with extended scope municipalities, also react to GDP development in the previous period, although the effect is much smaller then the effect of the current period. On the other hand, only the smallest municipalities show a negative relationship of their capital

expenditures and GDP in both the current and the previous period. Capital spending of municipalities with extended scope reacts to economic development with at least one year delay, as suggested by Blöchliger *et al.* (2010), but the relationship is also negative. We found no evidence of connection between capital expenditures of statutory cities and GDP development, however they might react even with bigger then one year delay which is not included in our model. To asses the outcome of the research of Špaček & Dvořáková (2011) that smaller municipalities are effected less then bigger municipalities, our model suggests that this statement is true for the current expenditures, but definitely not for the capital expenditures. The overall model suggests that in fact the smallest municipalities are the ones that are experiencing rise in expenditures during the economic crisis.

Last hypothesis we tried to evaluate was the presence of political budget cycles in Czech municipalities. We can confirm that there is evidence of pre-election manipulation of expenditures, which is in line with previous research by Sedmihradská *et al.* (2011) and Šťastná (2015). Our results suggest that incumbents in all municipality types tend to increase capital expenditures in the year of the elections. The magnitude of the increase increases with the population size and range of responsibilities. However, our model does not reveal any significant capital expenditures manipulation in the pre-electoral year. As for current expenditures, the smallest municipalities tend to increase their current spending in the year of the elections the most. The municipalities with extended scope increase their current spending in both electoral and pre-electoral years. For statutory cities we found no evidence of pre-election manipulation of current expenditures. Overall, the increase in capital expenditures is much greater then the increase in current expenditures.

It needs to be borne in mind that the question of municipalities' budgets is very complex and they are determined by many factors, of which only few could be explored in this thesis. Moreover, expenditures are to great extend dependant on the current revenues, which were not properly analysed in the thesis. Nevertheless it is necessary to try to understand the local budget as best as possible to increase the efficiency of resources redistribution and their use along with the understanding of their connection to the general economic development.

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# Appendix A

# Appendix

Table A.1: Summary statistics fro different municipality types

| Basic municipalities | N | Mean | St. Dev. | Min | Pctl(25) | Pctl(75) | Max |
|---|---|---|---|---|---|---|---|
| inhibit | 62,590 | 798.808 | 1,108.174 | 15.000 | 225.000 | 890.000 | 20,893.000 |
| avg_old | 62,564 | 41.577 | 2.656 | 26.443 | 39.976 | 42.988 | 65.167 |
| exp_per_cap | 62,590 | 21,018.100 | 21,630.300 | 2,221.588 | 12,217.910 | 23,409.680 | 1,998,112.000 |
| rev_per_cap | 62,590 | 22,439.360 | 18,521.660 | 5,017.332 | 14,540.280 | 24,569.220 | 1,561,099.000 |

| With extended powers | N | Mean | St. Dev. | Min | Pctl(25) | Pctl(75) | Max |
|---|---|---|---|---|---|---|---|
| inhibit | 1,989 | 13,317.960 | 8,025.835 | 2753 | 7,125 | 17,305 | 45,356 |
| avg_old | 1,989 | 42.264 | 1.300 | 36.684 | 41.400 | 43.153 | 46.692 |
| exp_per_cap | 1,989 | 25,026.160 | 7,510.534 | 9,206.074 | 19,854.310 | 28,466.470 | 84,150.340 |
| rev_per_cap | 1,989 | 25,325.950 | 6,589.566 | 10,304.630 | 20,898.090 | 28,421.740 | 75,159.870 |

| Statutory cities | N | Mean | St. Dev. | Min | Pctl(25) | Pctl(75) | Max |
|---|---|---|---|---|---|---|---|
| inhibit | 273 | 92,154.500 | 78,499.350 | 34,778 | 49,739 | 93,470 | 382,405 |
| avg_old | 273 | 42.511 | 1.059 | 39.779 | 41.794 | 43.141 | 45.543 |
| exp_per_cap | 273 | 23,541.780 | 6,908.236 | 13,749.940 | 18,694.220 | 25,778.350 | 52,141.300 |
| rev_per_cap | 273 | 23,699.600 | 6,384.306 | 14,484.360 | 19,307.890 | 25,477.600 | 50,114.660 |

Table A.2: Pooling regression

| | *Dependent variable:* |
|---|---|
| | log(exp_per_cap) |
| lag(log(exp_per_cap)) | 0.035*** |
| | (0.008) |
| log(rev_per_cap) | 0.976*** |
| | (0.006) |
| lag(log(rev_per_cap)) | 0.043*** |
| | (0.010) |
| log(GDP) | 0.262*** |
| | (0.057) |
| lag(log(GDP)) | −0.419*** |
| | (0.057) |
| inhibit | 0.00000* |
| | (0.00000) |
| elect_year1 | 0.021*** |
| | (0.003) |
| pre_elect1 | −0.025*** |
| | (0.003) |
| prod_age_per | 0.001 |
| | (0.0005) |
| avg_old | −0.002** |
| | (0.001) |
| unempl | 0.011*** |
| | (0.001) |
| inflation | 0.036*** |
| | (0.001) |
| extendscope1 | 0.083*** |
| | (0.004) |
| statut1 | 0.068*** |
| | (0.013) |
| Constant | 1.640*** |
| | (0.288) |
| Observations | 62,473 |
| $R^2$ | 0.711 |
| Adjusted $R^2$ | 0.711 |
| F Statistic | 10,971.620*** (df = 14; 62458) |
| *Note:* | *p<0.1; **p<0.05; ***p<0.01 |

Table A.3: Fixed and Random Effect Regression

| | *Dependent variable:* | |
|---|---|---|
| | log(exp_per_cap) | |
| | Fixed effect | Random effect |
| lag(log(exp_per_cap)) | $-0.113^{***}$ | $0.022^{***}$ |
| | (0.007) | (0.007) |
| log(rev_per_cap) | $0.998^{***}$ | $0.979^{***}$ |
| | (0.007) | (0.007) |
| lag(log(rev_per_cap)) | $0.184^{***}$ | $0.055^{***}$ |
| | (0.009) | (0.010) |
| log(GDP) | $-0.183^{**}$ | $0.237^{***}$ |
| | (0.073) | (0.058) |
| lag(log(GDP)) | $-0.194^{***}$ | $-0.423^{***}$ |
| | (0.061) | (0.057) |
| inhibit | $-0.00001^{**}$ | 0.00000 |
| | (0.00001) | (0.00000) |
| elect_year1 | $0.020^{***}$ | $0.022^{***}$ |
| | (0.003) | (0.003) |
| pre_elect1 | $-0.024^{***}$ | $-0.024^{***}$ |
| | (0.003) | (0.003) |
| prod_age_per | 0.001 | 0.0004 |
| | (0.001) | (0.0005) |
| avg_old | 0.002 | −0.001 |
| | (0.002) | (0.001) |
| unempl | −0.001 | $0.011^{***}$ |
| | (0.002) | (0.001) |
| inflation | $0.034^{***}$ | $0.035^{***}$ |
| | (0.002) | (0.001) |
| Constant | | $2.052^{***}$ |
| | | (0.291) |
| Observations | 62,463 | 59,162 |
| $R^2$ | 0.587 | 0.715 |
| Adjusted $R^2$ | 0.541 | 0.715 |
| F Statistic | $6{,}659.561^{***}$ (df = 12; 56204) | $148{,}660.400^{***}$ |
| *Note:* | | $^{*}$p<0.1; $^{**}$p<0.05; $^{***}$p<0.01 |

Table A.4: Other regressions for overall expenditures per capita

| | *Dependent variable:* | | |
|---|---|---|---|
| | log(exp_per_cap) | | |
| | (1) | (2) | (3) |
| lag(log(exp_per_cap)) | 0.128*** | −0.109*** | −0.113*** |
| | (0.006) | (0.007) | (0.007) |
| log(rev_per_cap) | | 0.987*** | 0.998*** |
| | | (0.007) | (0.007) |
| lag(log(rev_per_cap)) | | 0.177*** | 0.184*** |
| | | (0.009) | (0.009) |
| log(GDP) | 0.555*** | −0.648*** | −0.183** |
| | (0.059) | (0.045) | (0.073) |
| lag(log(GDP)) | 0.567*** | 0.488*** | −0.194*** |
| | (0.061) | (0.046) | (0.061) |
| inhibit | | −0.00002** | −0.00001** |
| | | (0.00001) | (0.00001) |
| elect_year1 | | 0.009*** | 0.020*** |
| | | (0.003) | (0.003) |
| pre_elect1 | | −0.013*** | −0.024*** |
| | | (0.003) | (0.003) |
| prod_age_per | | 0.002*** | 0.001 |
| | | (0.001) | (0.001) |
| avg_old | | −0.002 | 0.002 |
| | | (0.002) | (0.002) |
| unempl | | | −0.001 |
| | | | (0.002) |
| inflation | | | 0.034*** |
| | | | (0.002) |
| Observations | 62,482 | 62,463 | 62,463 |
| $R^2$ | 0.163 | 0.583 | 0.587 |
| Adjusted $R^2$ | 0.070 | 0.536 | 0.541 |
| F Statistic | 3,647.210*** (df = 3; 56226) | 7,851.298*** (df = 10; 56206) | 6,659.561*** (df = 12; 56204) |
| *Note:* | | | *p<0.1; **p<0.05; ***p<0.01 |