CHARLES UNIVERSITY

FACULTY OF SOCIAL SCIENCES

Institute of Economic Studies

Master's thesis

2020 **Andrea Hrtková**

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The Effect of Exogenous Revenue Shocks on Local Public Spending: The Case of Czech Municipalities

Master's thesis

Prague 2020

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Academic Year: 2019/2020

Bibliographic note

Hrtková, A. (2020). *The Effect of Exogenous Revenue Shocks on Local Public Spending: The Case of Czech Municipalities*. Master's thesis. Charles University, Faculty of Social Sciences, Institute of Economic Studies. Supervisor PhDr. Lenka Šťastná, Ph.D.

Abstract

This thesis is devoted to an analysis of the impact of exogenous revenue shocks, both positive and negative, on spending in the Czech municipalities. A closer look is also taken into the different reactions of different political affiliations of the mayors to changes in tax revenues. Although there have been written several studies which have focused on reactions of shocks to revenues on local public spending, our research should serve as a starting point in completing existing gaps in this field of study in the Czech Republic. Empirical methods involving the use of dynamic panel data were applied to test the hypotheses. This research shows that changes in tax revenues have a significant impact on the expenditures of the Czech municipalities. However, the results indicate that the extent and direction of this impact differ across different types of expenditures.

Keywords

Municipalities, exogenous revenue shocks, fiscal stress, tax revenues, current expenditures, capital expenditures, political affiliation

Abstrakt

Táto diplomová práca sa zameriava na analýzu vplyvu exogénnych šokov, pozitívnych aj negatívnych, do príjmov obcí v Českej Republike na ich výdavky. Bližšie sa venuje tiež rôznym reakciám rôznych politických strán na tieto zmeny v príjmoch. Napriek tomu, že pár štúdií sa už venovalo reakciám na výdavky miestnej verejnej správy pri zmene príjmov, náš výskum by mal byť začiatkom vypĺňania existujúcej medzery v tejto oblasti výskumu v Českej Republike. Na testovanie hypotéz boli aplikované empirické metódy pre dynamické panelové dáta. Táto analýza ukázala, že zmeny v daňových príjmov majú signifikantný vplyv na výdavky obcí. Navyše, výsledky naznačujú, že veľkosť a smer tohto vplyvu sa líši naprieč odlišnými druhmi výdavkov.

Kľúčové slová

Obce s rozšírenou pôsobnosťou, exogénne šoky do príjmov, fiškálny stres, daňové príjmy, bežné výdavky, kapitálové výdavky, politická príslušnosť

Declaration of Authorship

1. The author hereby declares that she compiled this thesis independently, using only the listed resources and literature.

2. The author hereby declares that all the sources and literature used have been properly cited.

3. The author hereby declares that the thesis has not been used to obtain a different or the same degree.

Prague 31th July 2020 Andrea Hrtková

Acknowledgments

The author would like to express her sincere gratitude to PhDr. Lenka Šťastná, Ph.D., for her help, which went beyond a standard supervising of a master's thesis and for all the valuable remarks and suggestions she provided throughout the process of supervising this thesis.

The author would like to thank doc. PhDr. Jozef Baruník, Ph.D. for his kind help with the methodology of this thesis.

The author would like to thank Mgr. Jakub Nikodym for his irreplaceable help and never-ending support throughout the process of the writing of this thesis.

Master's Thesis Proposal

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Proposed Topic: The Effect of Exogenous Revenue Shocks on Local Public Spending: The Case of Czech Municipalities

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Research Question and Motivation

Local government spending naturally mostly depends on its revenues. These revenues, including taxes as well as transfers from national government and non-tax revenues, are almost constantly in change. They are subject to many external shocks, which often have an unpredictable impact on spending in public sector.

Consequences of lower revenues include cuts in public services, as well as establishment of higher tax rates. Both actions are viewed as unpopular among citizens and politicians tend to be careful with their introduction. Nevertheless, spending must be adjusted to a current economic situation and it is not possible to sustainably finance local public spending without any changes in expenditures once a negative revenue shock occurs.

Although the business cycle itself can create a challenge for effective public spending, in the recent years, among others, primary the Great Recession put a significant fiscal stress on local governments since during recessions its most important sources of income tend to be significantly shorten.

An important study about local government responses to exogenous revenue shocks was published by Cromwell and Ihlanfeldt in 2015, giving evidence from Florida, which was also comparing impact of revenue shocks on public spending of counties and cities. Nevertheless, previous literature did not only research negative shocks but positive as well. For example, a paper published by Rattsø and Tovmo (2002) studied fiscal adjustments to temporary positive income shocks.

Altogether, the key motivation of this Master's thesis is to investigate the effect of changing tax revenues on government spending in Czech municipalities during the years 2003-2018 with the main objective in changing expenditures. Additionally, the question whether there was an

additional change in expenditures before elections during the times of changed revenues will be tried to be answered.

Contribution

The thesis should provide useful information about how municipalities in the Czech Republic behave during the time of changed revenues. It should analyze whether the spending changes due the exogenous shocks to revenues and which expenditures are influenced by it the most.

As it is expected expenditures in general to be reduced during the time of lower revenues and, on the other hand, increased during the time of higher revenues, the thesis will rather analyze to what degree are they influenced by the shocks, however, it should also be able to answer whether there are some expenditures which are not affected by these changes at all or even are affected in a different way as it is expected.

Other important aspect of the research will be to find out what happens to expenditures before elections during the time of changed revenues.

There has not been a lot of studies focusing on the impact of the exogenous revenue shocks on subnational public spending over the recent years. The Great Recession put a huge stress on local governments' revenues. Most of the previous studies were published in pre-crisis period or focused on national government spending. Moreover, there are not studies about changes in local public spending in the Czech municipalities in the past few years.

Therefore, this Master's thesis should conclude with a complex analysis of local government spending's responsiveness to exogenous revenue shocks in the Czech Republic, which could be useful for decision-making process about public spending during future shocks as well.

Methodology

Budgetary data of all Czech municipalities with extended power except for Prague will be used. This comes with a constraint of 205 municipalities that will be included in the dataset. Empirical analysis will predominantly work with data from recent years, starting from 2003 when the municipalities with extended power were established. The data will be collected directly from the Ministry of Finance of the Czech Republic. Older data will be gathered from ARISweb database and the newer one will be gathered from the information portal of the Ministry of Finance - MONITOR.

Revenues will be distinguish based on their origin. Since the aim of this thesis is to analyze which specific expenditures are affected by revenues shocks, expenditures will be further divided into categories.

Apart from expenditures and revenues of the local governments in the Czech Republic, the thesis will take into consideration also political situations in the municipalities as well as demographic information such as population size.

The thesis will use econometric methods for panel data. Due its dynamic structure, we will use generalized methods of moment estimation - Arellano–Bond estimator. (Arellano & Bond, 1991)

Outline

1. Introduction

2. Literature overview

3. Data and methodology

4. Results

5. Limitation of the study and conclusion

Core Literature

Cromwell, E., Ihlanfeldt, K. (2015). Local Government Responses to Exogenous Shocks in Revenue Sources: Evidence From Florida. National Tax Journal, 68(2), 339-376. dx.doi.org/10.17310/ntj.2015.2.05

Rattsø, J., Tovmo, P. (2002). Fiscal Discipline and Asymmetric Adjustment of Revenues and Expenditures: Local Government Responses to Shocks in Denmark. Public Finance Review, 30(3), 208-234. https://doi.org/10.1177/109114210203000303

Eyraud, L., Badia, M.M. (2013). Too Small to Fail? Subnational Spending Pressures in Europe. International Monetary Fund.

Arellano, M., Bond, S. (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. The Review of Economic Studies, 58(2), 277-297. https://doi.org/10.2307/2297968

List of Acronyms

GMM	generalized method of moments
OECD	the Organization for Economic Co-operation and Development
the US	the United States

Contents

1 Introduction

Any kind of spending mostly depends on its sources, which are available for usage. Naturally, this simple rule applies to public spending as well, not excluding local government spending, which is mostly dependent on its revenues. These revenues, including all different kind of taxes as well as transfers from national governments, or, in case of the European Union, also grants from the European Union funds, and non-tax revenues, are not fixed and they vary from one year to another. These constantly changing revenues are a consequence of many exogenous, as well as endogenous, factors. However, external shocks to income of the local governments might be very tricky to deal with since they often have an unpredictable impact on spending in public sector.

Consequences of lower revenues include cuts in public services, as well as establishment of higher tax rates. Both actions are viewed as unpopular among citizens and politicians tend to be careful with their introduction, especially before election. Politicians do their best to be re-elected and cutting provided services is not an easy decision to make for them. Nevertheless, spending must be adjusted to the current economic situation and it is often not possible to sustainably finance local public spending without any changes in expenditures once a negative revenue shock occurs.

Although the business cycle itself can create a challenge for effective public spending, in the recent years, among others, primary the Great Recession put a significant fiscal stress on local governments since during recessions their most important sources of income tend to be significantly decreased. The unemployment rises and the income from taxes that are allocated to the municipalities from the national governments often do not stay unaffected. Moreover, transfers might be coming into the local governments in lower amounts as well since the national governments face their own financial challenges.

The economic crisis of 2008 is now an interesting object of study for many researchers; nevertheless, we have to keep in mind that; although, this crisis happened more than 10 years ago, we are not spare of other challenges in the future. The current situation with the virus Covid-19 has already started to have economic consequences, for example in form of increasing unemployment (MPSV Portál, n.d.) and it is putting a lot of pressure on the governments' budgets. This is hard to predict the exact consequences; however, we cannot rule out a possibility of another major economic crisis arising together with the rise of the virus. As this thesis studies the responses of expenditures to exogenous shock in revenues, we believe it can

be beneficial for the policy makers of the Czech municipalities in the upcoming economic period.

Nevertheless, even though negative shocks into public budgets are an interesting topic of many studies, there also exist positive shocks, which might significantly influence spending and; therefore, they should not be neglected from the research.

Since there is no rule, which would say that all expenditures must be decreased or increased proportionally, it is often only up to local politicians to decide not only if there even is a need to change expenditures at all or there might be some other solution (for example to cut reserves or in case of positive shocks to the budget, to pump them up for "worse times") but also which expenditures will be adjusted to current decreased or increased revenues. Naturally, selection of these affected expenditures might differ from one local government to another and definitely is different across different countries since systems of subgovernments across the countries differ.

This thesis considers local public spending in the Czech Republic. We analyze the Czech municipalities with extended powers for the whole period of their existence from the year 2003 up to the most recent year for which the data were fully available - 2018. The aim of the thesis is not only to provide an answer to a single question whether expenditures are affected by the shocks to revenues of these municipalities but rather to analyze which expenditures are affected and how. By means of an empirical analysis, in addition to examining the effect of changed revenues on spending, a closer look will be also taken on whether the political affiliation of the mayor plays any role in changes in expenditures once a fiscal shock hits the revenues of municipalities.

The structure of the thesis is, as follows:

The first part briefly explains the system of the subnational governments in the Czech Republic, particularly municipalities and their delegated powers. This part is followed by the section about how the Czech municipalities are financed. To finish the theoretical part of the thesis, Literature Overview is presented. This theory should provide the reader with basic information about the already existing research on the impact of exogenous shocks to local public spending.

The theoretical part is then followed by an empirical analysis. The empirical research is local, focusing only on the Czech municipalities with extended powers. Naturally, the results of this

study are followed by a brief outline of the limitations of the research along with presentation of the main conclusions.

2 Local Governments in the Czech Republic

The Czech Republic is a unitary state. According to the constitution of the Czech Republic (PSP, n.d.), the country has a two-tier system of the subnational government with no hierarchical link: municipalities and regions. The councils to both tiers are elected every four years by the citizens; however, the mayor, as well as the head of the region are elected later by the council.

There are currently 14 regions, established in 1997, which correspondents with the NUTS 3 (La Nomenclature de Unités Territorial Statistique) subdivision of countries. The first regional governments took office on January 1, 2001. (Jurčík, 2014) Nevertheless, the basic territorial self-governing communities are municipalities, which act sui juris in legal relations. Their number almost constantly changes, however, with the current number of almost 6,260 municipalities, the Czech Republic is a country with a relatively high fragmentation of the territory in comparison with other countries (ČSÚ, n.d.).

Both, regions and municipalities, act independently of the national level of the government. Responsibilities of the municipalities can be categorized into two groups: independent competencies and delegated powers from the national government.

On the one hand, independent competencies are characterized by implementation of own policies such as management of the municipalities, governing the budget and final account of the municipalities, establishment of legal entities and organizations; management of the municipalities´ offices, imposing penalties for administrative offences, establishment of a program of development and regulation for the cadastral district, establishment of municipal police, holding elections to municipal councils and local referendums, cooperation between municipalities or granting honorary citizenship and community prizes (Act no. 128/2000 Sb. - Zákon o obcích (obecní zřízení)).

On the other hand, there is a large number of services which the municipalities must be providing such as elementary schools, kindergartens, social housing, theatres, libraries, museums and cemeteries; they must take care of the environment in the area, water quality and delivery in the municipality, as well as all other facilities delivery (gas, electricity); they must provide public roads, lighting and transport (Nemec et al., 2016).

Municipalities also provide services on behalf of the national government – these are called delegated powers. However, as a consequence of such fragmented structure of municipalities which the Czech Republic has, not all municipalities carry and exercise the same delegated powers. Municipalities are; therefore, divided into three categories based on the extent of delegated powers (Rok v Obci, n.d.):

I) Municipalities with elementary delegated powers (Municipalities “I”)

II) Municipalities with broader delegated powers (Municipalities “II”)

III) Municipalities with extended powers (Municipalities “III”)

Each municipality "III"; thus, in addition to the agenda belonging to its administrative district, carries out the agenda of the municipality "II" and, in addition, for its own administrative district, the agenda of the municipality "I". Currently there are 205 municipalities with extended powers in the country.

With these delegated powers, a municipality may issue its regulations, if it is in accordance with the law. Municipalities with extended powers may issue regulations valid for their entire administrative district (Rok v Obci, n.d.).

Moreover, among others, municipalities with extended powers can issue driving licences, they have the authority to modify cultural monuments or property falling into protected landscape areas and they must take care of the preparation for emergency situations within their administrative district, carry out rescuing and liquidation work and protect the population. A municipality with extended powers also performs its activities in the area of population registration or provides social and legal protection of children by supervising on the negative effects on children, evaluating families and providing consulting services to them (Janků, 2017).

3 Financing of Municipalities

Since all municipalities are up to some degree independent from the national government, they, naturally, have a budget of their own, which they have to manage and as usual, this budget is divided between revenues and expenditures and other financial activities.

Generally, the income of the municipalities consists from tax revenues, non-tax revenues, capital income and transfers. In the Appendix 1, the reader can find a graph representing the

changes in allocation of revenues shares in the Czech municipalities over the time period 2003-2018.

The main source of revenues can be concluded to be from taxes; however, it is not as simple as in case of the budget of the state. Although municipalities have their own sources of tax revenues, including also local fees such as a fee for owning a dog, a fee for the use of public space, recreational fee, or some entry fees, income coming from these taxes is negligible. Therefore, the main source of tax revenues for them are taxes that are distributed to the municipalities from the collected national tax revenue. One of the few and most significant exclusive income of municipalities coming from taxes is the income from the land value tax and the real estate tax. In comparison, the taxes that are "shared" – meaning that they are collected from the people on national level and then re-distributed into the public budgets (for example within the municipalities) - are personal and corporate income tax and value added tax (Bucharová, 2008).

Under the law of the budget determination of taxes (Act no. 243/2000 Sb. - Zákon o rozpočtovém určení daní), these so-called shared taxes are allocated between each level of public budgets (state, regions and municipalities) based on special formulas. In case of municipalities, the law also sets how to count the share of each individual municipality on these taxes. The algorithm takes into consideration mainly the number of citizens, size of the cadastral area and the number of kids in kindergartens and elementary schools. However, around 90% of the budget is allocation based on the number of citizens. The shared taxes; therefore, can be viewed as unconditional grants.

The second most important source of income for the Czech municipalities are transfers. It must be mentioned that transfers were the most important income of the municipalities up until 2005 when some of the expenses on social services started to be financing directly from the national government. Nevertheless, even nowadays, the largest portion of all transfers consists of those coming from the state budget. In addition, they also float into the municipalities from the state and regional funds and from the structural funds of the European Union. They can be divided into two main types, contribution to the performance of the municipality´s administration and other grants (DVS, 2017)

Within the scope of delegated powers, self-governing units fulfill the obligations of the state, therefore, the state is obliged to contribute to the financial and material costs associated with the performance of state administration. According to the Czech law, municipalities with

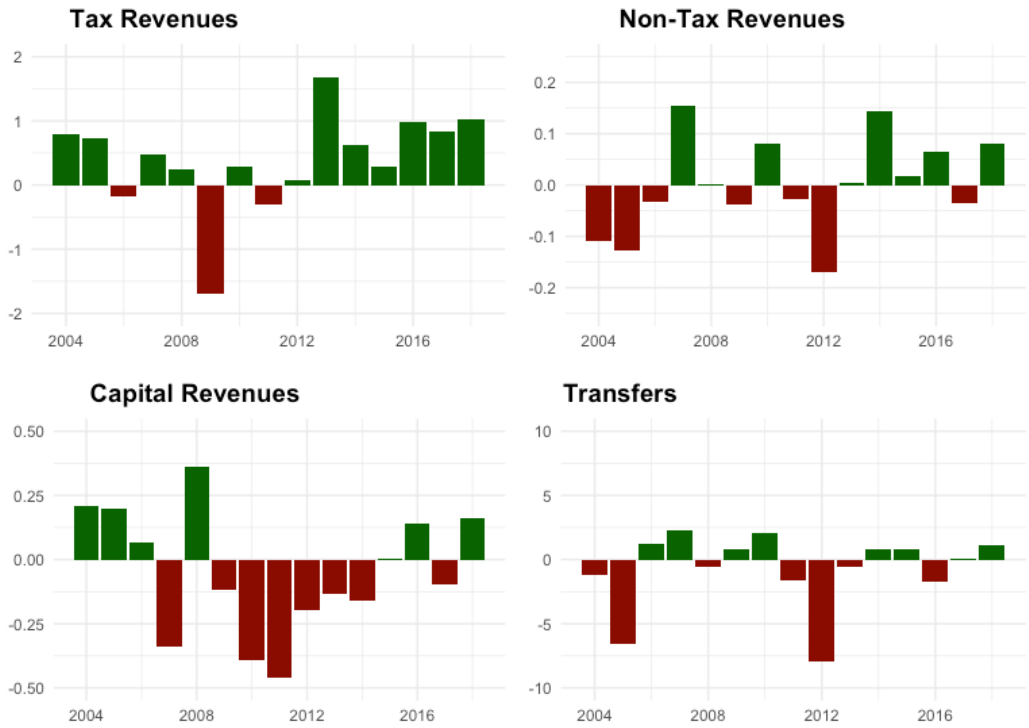
extended powers receive a contribution from the state budget for the performance of tasks in these delegated powers for the state as well. All municipalities receive a contribution to the performance of the administration based on the formula which takes into consideration the extent of delegated powers to state administration and the size of the administrative district, which is expressed in terms of population of the district. In addition, the amount of the contribution to the municipalities with extended powers depends also on the share of the size of the administrative centre and the size of the administrative district, where the size of the administrative centre is expressed in terms of population as well (Ministerstvo vnitra, 2019).

On the one hand, the "other" grants come primary from different ministries and have both forms, investment grants as well as non-investment grants. On the other hand, most of the investment grants come from the Ministry of Regional Development, Ministry of Agriculture, Ministry of the Environment or Ministry of Transport. Investments are directed mainly to the improvement of public services, water and sewerage systems, sewage treatment plants, restoration of the ecological stability of the landscape or reconstruction of the road network under the administration of municipalities. An important source of income from transfers has become also the European Union over the recent years (Opluštilová, 2012).

Non-tax revenues and capital income are relatively stable element of the budget of the municipalities as well. However, the size of the non-tax revenues naturally depends on the activities (such as providing services or income from selling goods) or property (such as renting of their property) of the municipalities themselves. A smaller portion of these revenues comes from received sanction payments, loan repayments, income from financial assets and income from the sale of non-investment property. Capital income then consists mainly of the sale of fixed assets and it is more a supplementary source of financing.

Naturally, the revenues of the municipalities are not stable over the years. In the Figure 1 below, the reader can see the development of year-over-year changes to revenues of the municipalities with expended powers.

Figure 1: Average year-over-year absolute changes to revenues by type



Source: author, based on data collected from the Ministry of Finance

It is visible that average tax revenues are mostly undergoing positive year-over-year changes. Nevertheless, there is a large drop happening in 2009, right after the crisis that hit the market in 2008. Ever since 2012 the average tax revenues increase. In contrast, we can see that transfers actually increased in the year 2009 and they heavily dropped in 2012 and there was again a drop in 2016. Capital revenues seem to be rather decreasing over the years, even during the time of healing of the economy after the crisis, they still underwent negative year-over-year changes up until the year 2015.

The summary statistics for the revenues of the municipalities used in our research (tax revenues and transfers) can be found in Appendix 2.

When it comes to expenditures that municipalities have, their volume is significantly influenced by its own development opportunities, as well as by the range of services that they provide. Naturally, expenditures depend on the volume of the revenues received, reserves created in the past years (in form of budget surpluses), and on the ability of the municipality to increase its revenues by alternative forms of financing (external resources). However, these expenditures and their shares are connected also to the size of the municipalities and differ across smaller

and bigger ones. The expenditures of the municipalities are described in detail in the Chapter 6 of this thesis.

4 Literature Overview

Over the years, there have been written several studies about how local governments all over the world respond to exogenous shocks to their revenues, mostly to their cuts. Nevertheless, since revenues of local governments are up to some degree connected to revenues of national governments, researchers often review previous studies on fiscal stress on national government, or, in case of a federal country, on subnational governments (for example, member states in case of the United States).

To the best of our knowledge, there is no study about the impact of changed revenues on local public spending done so far in the Czech Republic. Nevertheless, it was proven that, in general, Czech municipalities are not in bad financial condition. A study written by Opluštilová (2012) showed that, based on her models, most of the Czech municipalities have great or very good financial health. Only around 8 per cent of all municipalities were ranted negatively. Nevertheless, the author also showed that the financial health is not the same across all municipalities and the size of the municipality matters. Moreover, it also depends on region – for example Hradec Kralové region or Pardubice region have below-average rating of financial have of its municipalities, especially in larger municipalities. In comparison, in Zlín region and Moravskoslezký region, the opposite is true and if there are some municipalities that have below-average financial health are usually the smaller ones. moreover, this research also showed that the Czech municipalities do not usually have problems with covering for their short-term liabilities and they are mostly able to repay their liabilities within five years.

4.1 Offsetting the Shock

Dating back to 1983, Wolman (1983) published his paper on a case study on fiscal stress put on local governments and their responds to it. By this case study he wanted to support his model of decision-making process of fiscally stressed local governments. In this model, cities follow different steps to face cuts in resources and in his paper, he believes these steps to be ordered. First of all, cities naturally tend to take “missing” money from their reserves because, by this move, they do not have to cut expenditures or change tax rates. If reserves are not enough, other, sometimes even a little controversial, methods are used, such as “borrowing” from other

funds, creative bookkeeping, one-time revenue rising (for example by selling some property) or short-term borrowing, in order not to touch expenses and taxes.

When these methods fail as well, according to Wolman, a city rather chooses to increase revenues than to cut provided services since the purpose of local governments is primary to provide services to the public. Therefore, the next step is to raise taxes but only in such a moderate way that it does not harm the current office from getting re-elected. However, if even this move is not enough, local governments have to cut the services which they offer. Firstly, they try to do it the way that the impact on the aggregate level of the services delivered is as little as possible and they do not have to cut the number of employees or their working hours. The most common way how to achieve this is through the efficiency gains. Only if all of these attempts to deal with reduced revenues fail, governments start to reduce expenditures which influence the quality of provided public services.

In contrast to this model, Fisher (1988) claimed in the first edition of his book that most changes that happens immediately, meaning within the same fiscal years, happen rather through changes in spending than in immediate change in taxes since a tax change is a legislative process that takes a while to finish.

Nevertheless, researchers, naturally, often take into consideration not only the immediate changes that occur the same fiscal year as a shock to revenues happens. In the late 80s and early 90s, when a lot of revenue shocks happened in the US, expenditures were often cut right after the change in revenues. For example, in the year 1992, three-fifth of all states decided to make a cut in their budget even after they had already enacted them. However, a lot of states decided rather to increase taxes in the next year than to do changes to the tax system in the current fiscal period. The average tax increase in next fiscal year during the researched era was about six time higher than the average of the increase that happened the same year as the shock to revenues (Poterba, 1993).

Behaviour of the local governments is quite different today compared to the situation in the past century according to Fisher (2010). When comparing reactions to recessions in 2007-2009 and 1981-1982, after the Great Depression, state and local governments in the United States made tax revenue increases in smaller portion and moved more towards a decrease in spending. In 2010, public spending faced a decrease of more than 5 per cent. 30 out of 50 states decided to increase their taxes roughly by only 1.75 per cent of the aggregate revenue in total. In comparison, back in 1984, spending was lowered by less than 1 per cent, what was a

consequence of the fact that 29 states increased taxes by more than 3.1 per cent of aggregate revenue in total. The author believes that; although, there might be many reasons for this change in behaviour, what undoubtably had a significant impact on the change was a fact that over the past two decades, many states acted towards reductions of tax rates and did not use the possible additional money to create a reserve.

Nevertheless, Fisher (2010) believes that reduction of expenditures in not enough in times of a deep financial crisis since to maintain state services and spending positively effect the recovery of both, national and local, economies. The country might have to rather think of increasing income tax, especially in case of taxpayers with higher income, which he sees as the most effective way how to stimulate the economy. He pointed out that it is the income tax that tends to be cut in the United States during the periods of economic growth, instead of using the additional money to create a reserve for "worse time", so it would be logical to increase it when the economy does not grow.

Rattsø and Tovmo (2002) in their study of local governments' adjustment to shocks in Denmark discovered that both, expenditures as well as revenues, are touched by negative shocks and in the current year they are both being adjusted to it. However, "the revenue side" is affected more deeply than expenditures. Similar findings were presented by Poterba (1993). Nevertheless, both of these studies found evidences that especially in the same year as the shock occurs, there is a need for cuts of expenditures.

There are several papers that deal with the question of dynamic adjustment of local government budgets to fiscal shocks all over the world (some of them are summarized below). These studies were focused on long-term adjustments and changes in expenditures, revenues and debt services to the lagged values of deficit, with taking into consideration the intertemporal budget constraints rather than considering only short-term effects. Despite that the studies were using similar methodology with similar variables; not surprisingly, the results differ across different countries. Their common result was that local governments (most often municipalities) definitely tend to adjust after a shock to their budget. It can be concluded that; in general, they have a tendency to move towards a balance budget since a higher deficit positively impacts revenues on the one hand, and; on the other hand, it negatively effects expenditures. Nevertheless, how it is achieved, and which sections of the budget are more likely to be modified after a shock, differ.

The Spanish municipalities, naturally, are proven to be managing their budgets after some period of time on both sides, revenues and spending as well (Solé-Ollé & Sorribas-Navarro, 2009). An increase (decrease) in own-source revenues causes a decrease (increase) in future own-source revenues and in increase (a decrease) in future expenditures. The Spanish municipalities bare the whole adjustment process on the side of the shocks to own-source revenues on their shoulders and grants do not play any significant role in this process. It is because the transfers from the national government in Spain are, similarly, that in the Czech Republic, often in form of capital grants (Solé-Ollé & Sorribas-Navarro, 2009). Therefore, the grants can partially offset the shocks to capital expenditures. Nevertheless, shocks often occur also to current expenditures, which cannot be finance with capital grants. These findings are in contrast to the findings of a similar study done in the United State, where if there is a shock to own-source revenues, the grants offsets around 9 per cent of the change (Buettner & Wildasin, 2006). Moreover, in some countries, for example, in Germany, there are also so-called equalization grants, which should specifically offset a part of the change (Buettner, 2009).

The American study also show that; although, both sides, revenues, as well as expenditures, absorb a part of the shock, the side to which the shock happens, offsets more of the whole change in the future. In particular, when there is a shock to expenditures, two thirds of the change caused by this shock is offset by the present value of future expenditures. They also investigated if the results are similar or different in case of smaller and larger cities. On the one hand, when it comes to shocks to revenues, both own-source and transfers, the effects can be concluded to be the same regardless the size of the local government. However, on the other hand, if there is a rise in expenditures, the smaller local governments rely more on offsetting this raise by increasing own-source revenues; in comparison to the larger jurisdictions which rely more on the transfers and grants from the national government.

In comparison with western countries, a Japanese study published by Bessho and Ogawa (2015) showed that the local governments can rely on the grants from the national government much more than they do in Europe, or even in the United State. The paper showed that around 40 per cent of the change in revenues is offset by the grants and the local governments can increase them if they increase their current expenditures. Therefore, the municipalities in Japan can end up acting a little more irresponsible than municipalities in western countries since they can rely on the help from the national government. However, this happens only in medium and small

municipalities, in the large municipalities, the opposite is true and local governments cannot count on the help from the grants while offsetting innovation in the own-source revenues.

Some of these studies of dynamic adjustments to shocks also support evidences for existence of so-called "flypaper effect". This concept suggests that when a local government (usually a municipality) receives a grant from the national government, it influences more "the spending side" than the "revenue side" (Bailey & Connolly, 1998). Simply saying, local governments tend to rather spend the money than to decrease the own-source (tax) revenues. This phenomenon is also sometimes interpreted as that "money sticks where it hits" (like a fly to the flypaper). According to Filimon et al. (1982) this concept might be a result of incomplete information of the voters and in addition to it, an ignorance of the wishes of the voters from the side of the elected officers.

The American study (Buettner & Wildasin, 2006) showed that, in real numbers, if there is a unitary increase in the received grants, the expenditures increase by 34 cents while the own-source revenues only decrease by 14 cents, which clearly supports the existence of the flypaper effect. The same phenomenon is observed in Germany (Buettner, 2009) when these effects are even stronger and moreover, in case of higher equalization grants, there is no significant impact on a decrease of own-source revenues. The similar evidence is also found in the Spanish (Solé-Ollé & Sorribas-Navarro, 2009) and Japanese (Bessho & Ogawa, 2015) study.

4.2 Asymmetric responses

Researchers in the past often studied the problem of asymmetries in the responses to the shocks to the revenues of the municipalities and other local governments. On the one hand, if a negative and positive shocks have a symmetric response, these shocks do not necessary have an impact on the level of expenditures and revenues over time (in the long run). On the other hand, asymmetric response suggests that these opposite shocks are being handled in a different way (Rattsø¸ & Tovmo, 2002).

A good instrument which could demonstrate the asymmetric response to changes of revenues, are grants from national (or subnational) governments. If one takes into consideration the "flypaper effect", asymmetry is expected to have a form of a "fiscal replacement". This means that, on the one hand, if there is an increase in received amount of grants, there is an increase in spending (Gamkhar & Oates, 1996), while, on the other hand, as it has been stated as a result

from the above-mentioned studies on overall revenues as well, a decrease in received amount of grants is followed by an increase in taxes.

However, even before this study, Stine (1994) introduced in his research a different form of asymmetric responses to cuts in grants in the United States. On the one hand, in case of an increase in received federal grants, own-source revenues were decreased; nevertheless, on the other hand, even though it happened in smaller amount, in case of a decrease in federal grants, own-source revenues decreased as well. Empirical results of his study suggest that a lowered federal aid do not tend to have an inducement effect, local governments are not willing to pump-up own-source income, which would cover the losses from reduced received grants and these lowered grants tend to cause even bigger reduction of expenditures.

Nevertheless, in his study he also pointed out that, in comparison with grants received from the national government, this might be caused by the purpose of the received grants. Federal aids are often used to finance different projects while state aids are used to cover entitlement programs. In case of a decrease in state aids, the loss causes an increase in the own-source revenues, not an additional decrease as in case of a federal decrease. This suggest that the purpose of the received money might matter and local governments are more likely to reduce expenditures associated with some kind of development projects than expenditures that come with entitlement programs.

Rattsø and Tovmo (2002) in their research studied asymmetric responses to shocks to local governments' budgets; however, they did not study changes in expenditures and revenues but rather changes in surplus. They found evidence for the expected asymmetry, especially in case of income tax. In contrast to the situation in the United States summarized by Fisher (2010), income taxes in Denmark do not follow the similar trend as income tax in the United States that tends to be cut significantly during periods of economic growth. Even though they found out that a positive surplus shock decreases tax rates, in case of income tax, the shock is asymmetric. The coefficient value for the positive shocks is about four times lower than for the negative shocks.

4.3 The Role of Transfers and Alternative Financing

It must be remembered that national governments sometimes try to support the sub-national governments affected by the fiscal crisis too. This support mostly happens via transfers for specific purposes. For example, in the United States the 2009 the American Recovery and

Reinvestment Act should have helped via federal transfers to fill the gaps from increasing demand on spending and lowered revenues. These transfers were dedicated directly for funding social programs such as Medicaid. Nevertheless, they should also have covered expenses of additional investments. In general, national governments of the OECD countries prefer these transfers over general-purpose transfers, which were only chosen by Japan and Scandinavian countries during the years of the Great Recession. In Finland, for example, the national government increased the share of the corporate taxes belonging to local governments from 22 per cent to 32 per cent (for the years 2009-2011) (Ter-Minassian & Fedelino, 2010).

These additional financial aids from the national governments might get some pressure off the shoulders of the local governments; however, since the national governments themselves fight with the fiscal challenges, they cannot cover for all of the missing funds. Moreover, it is not as common as it might seem that the national governments send a help in form of additional transfers during difficult times. For example, in comparison, Ireland reduced transfers by 15 per cent in 2009 and the following year it was even by 18 per cent. In addition, many national governments stopped sending many of its existing additional transfers to the local governments by the end of 2010 (Ahrend et al., 2013).

Some researchers also showed that there are not only the two possible options while dealing with the fiscal pressure on the budgets. Naturally, cutting expenditures or increasing taxes are obvious solutions; nevertheless, a local government can choose to borrow funds from alternative sources as well. Despite it might sound as a simple and effective solution, it is not an easy way to solve the problem since there are many budget deficits targets which local governments have to meet even during the time of a crisis. Nevertheless, there are cases when national governments of the OECD countries at least put an afford on easing these conditions during a short period of time when the crisis fit the local governments. For example, Italy gave some space to them on the side of the sale of their assets in order to meet debt obligations, or the Domestic Stability Pact allowed them to exclude some addition expenditures from defined limits on spending (Ter-Minassian & Fedelino, 2010).

Nevertheless, in 2011 the Pact introduced some additional strict conditions and set high sanctions in case of a failure to meet the obligations. According to the pact, the local governments in Italy were not able to increase expenditures over the minimum commitment of the last three years, they could not create debt for financing capital expenditures (investments),

or they could not issue bonds or hire new stuff. In addition, many OECD countries established or set up new subnational government expenditure reduction targets (Ahrend et al., 2013).

4.4 Impact of Changed Revenues on Different Types of Expenditures

Overall, it must be mentioned that there is not a large amount of studies that focus on researching how changes in revenues influence different types of expenditures. Some researchers focused their studies on how local governments make decisions about the budget and; thus, expenditures as well, during the time of fiscal stress. However, more in a general concept rather than that they would study particular expenditures groups.

An article written by Down and Rocke (1984) nicely summed up main existing strategies applied by the local officers towards the handling of the budget and expenditures. They defined the three main ones as bureaucratic routine and incremental budgeting, interest group policies, and managerial approaches. The first theory suggests that allocation of the expenditures is more or less consistent across functional categories of the budget and this remains true even when cuts in the budget are necessary. Therefore, cuts happen across all kind of expenditures. Nevertheless, the theory of incrementalism has been shown as possible to appear on aggregate level; however, deeper down, on disaggregated categories, there are some differences (Reddick, 2003).

The interest group policies theory argues that different subjects such as unions, companies, or citizens put a pressure on local governments and as a consequence, cuts in expenditures are not the same across all categories but reflect the interest of these groups. The last theory says that spending of local governments in not so much in the hands of local groups and that, for example in the United States, the cuts in the budgets are mostly in hands of the state or federal government (Downs & Rocke, 1984).

The study found evidence for rejection of bureaucratic routine and interest group polities theories. They found very little support for any algorithm in cuts in budget that would be based on stable accounts priorities, as well as cuts happening “across the board”. However, their findings are not in contrary with managerial theory; although, they pointed out that this theory was pretty new compared to the other ones. It did not have fully developed theory on what are the expenditures that are “mandatory” for the local governments and the ones that are “controllable” by them yet. Therefore, their results are based on the assumption that local governments cannot completely control expenditure groups that are responsible for avoidance

of layoffs of permanent employees in productive age or for maintenance of existing level of provided services. Although, they did not find any algorithm for cutting of local government budgets, they concluded that municipalities are expected to cut off expenditures on preventive maintenance, or when it comes to employees that they will be replaying retiring employees with entry-level ones.

Some older studies coming from the United States as well, which were based on surveys in the past did not find any rule on how local governments make their decisions about budgetary cuts (for example a study published by Morgan and Pammer (1988)), or their findings are mixed. A study published by West and Davis (1988) also did not find any significant pattern among most of the budget categories; however, they concluded that public safety is most likely to be spared of any expenditure cuts and, on the other side stand the expenditures on leisure and social services that are more likely to be subjects to changes.

In the more recent studies, focusing on the period during the Financial Crisis of 2007-2008, the results are more specific and the evidences for cuts in some budget categories are stronger. Skidmore and Scorsone (2011) in their research paid attention to the time period 2005-2009 in one of the American states - Michigan. First of all, their results from an empirical analysis of how fiscal stress effects public local spending indicates that this fiscal stress has a significant negative effect on both, capital and current, expenditures. However, capital expenditures are more sensitive to the changes. Over the time period they researched, the fiscal stress, as they defined it, increased by nine percentage points and it caused reduction in capital spending as large as 19 per cent in comparison with the drop of only 3.5 per cent for non-capital spending.

Their findings are in consistence with the results obtained from older researches. Although, all of the expenditures except for health and welfare (which is nevertheless not affected statistically significantly by fiscal stress on any confidence level) are affected negatively by fiscal stress, for some categories, such as expenditures on public safety, the effect is neglectable. The categories which are affected strongest are once again the ones that are not crucial for the functioning of the local government and might not have an impact on the safety of the citizens (for example by reducing the number of police officers). These expenditures groups include “park and recreation”, which was proved to be even completely cut off sometimes, or “public works” (including for example maintenance of the roads or water and sewer systems).

Another study done by Cromwell and Ihlanfeldt (2015) which also concerns responses of local governments (in the US as well, in the state Florida) to shocks in revenues, focusing on the

period of the Great Recession, also found out that during the time of fiscal stress, counties tend to significantly cut the capital expenditures. Nevertheless, their results indicate that; although, expenditure groups such as culture and recreation are affected by a negative change in revenues the most, public safety is not spared of cuts either. Their models showed that a 1 per cent decrease in the tax base is responsible for a 0.3 per cent decrease in spending on public safety. When it comes to budget share, nor culture and recreation, nor public safety are touched by the lower revenues by the means of this budget share. The expenditure group that gets a lower budget share in case of lower incomes is transportation and all other categories grow in the share because of this decrease.

This study also considered budgets of the cities. They concluded that since counties have higher powers over the money they get, the impact of the exogenous shocks to revenues is more significant. Nevertheless, in the case of cities, they found out as well that the capital expenditures are more sensitive to changes but mostly when the transfers are cut. When it comes to tax base loss, the estimators in all of the models were insignificant. The authors explained it rationally because cities get money from property taxes, which does not tend to change but transfer from the government tend to have a form of a grant for a specific capital project. However, these decreases in capital expenditures have only a short-run duration while in case of the counties the cuts in capital expenditures remain also in the long-run.

5 Research Question and Hypotheses

The aim of this thesis is to investigate whether exogenous shocks to revenues of local public governments in the Czech Republic, have an impact on the expenditures of the governments and if so, which expenditures are affected and how. Moreover, since the previous literature proved that the responses to the expenditures might be different if the change in revenues in negative or positive, this thesis aims to account for asymmetrical responses as well.

However, the previous research in the Czech Republic did not cover this topic at all; therefore, this thesis is the first study to research these questions. Moreover, it investigates whether there is a different reaction of mayors from different political parties when there is a fiscal shock. Therefore, the hypotheses should help us to identify these effects on the chosen variables and provide the reader and local governments in the Czech Republic with information which could be possibly helpful for their management strategies in times of fiscal stress.

5.1 Hypothesis 1

Negative changes in tax revenues have a stronger effect on changes in expenditures than positive changes in tax revenues.

5.2 Hypothesis 2

Capital expenditures are not significantly affected by the changes in tax revenues since they are often not financed from the tax revenues but from grants and transfers.

5.3 Hypothesis 3

Similarly, as it is in the rest of the world, some budget categories, such as expenditures on administration or social services expenditures, are affected more by the change in revenues than other categories.

5.4 Hypothesis 4

Mayors from left-wing and right-wing blocks decrease expenditures more when there is a negative shock to tax revenues than mayors from other political parties.

5.5 Hypothesis 5

Changes in tax revenues do not only influence the expenditures, they have a significant effect on amount of received transfers too.

6 Data Description and Statistics

In this section the variables used in our analysis, which is based on panel data, and the dataset are described. For our analysis, several data sources were used, as well as different forms of data gathering were applied.

The thesis works with budgetary data of all Czech municipalities with extended powers except for Prague. This allows us to work with 205 municipalities. Prague is not used due to its specific hierarchy since the city itself is not considered as a municipality with extended powers. Empirical analysis will predominantly work with data from recent years, starting from 2003, when the municipalities with extended power were established, and ending in the most recent possible year of 2018. We did not consider the year 2019 because over the period of working on this thesis not all budgetary data, as well as data on the control variables used in the analysis, were available.

6.1 Budgetary Data about the Czech Municipalities with Extended Powers

The budgetary data were taken fom each municipality itself, however, we collected data about the cities alone, not the whole area, which falls within the particular municipality.

The data were collected directly from the Ministry of Finance of the Czech Republic since they are easily accessible to public. Older data were gathered from ARISweb database and the newer ones were gathered from the information portal of the Ministry of Finance - MONITOR. From these databases information about revenues as well as expenditures were collected.

Collected data about the expenditures and revenues are, naturally, adjusted to inflation. The standard approach of the Costumer Price Index was used, with the based year of 2015, what is considered to be the standardize approach in the Czech Republic starting in January, 2017. (ČSÚ, n.d.)

As described in the chapter 3 of this thesis the income of the Czech municipalities can be divided into tax revenues, non-tax revenues, capital income and transfers. Nevertheless, since we want to study exogenous shocks into the revenues of the municipalities, we are primary interested in the tax revenues. The other categories can be easily influenced by policies of the government of a municipality and it would be an impossible to distinguish which shock into them is exogenous and which is not. However, tax revenues also include own-source revenues; nevertheless, as it has been already mentioned, income from these own-source revenues is very small and most of the tax revenues come from the statewide revenues.

When it comes to expenditures, at first, they were divided by type into two categories - capital expenditures and current expenditures. In the empirical analysis, these two categories are mostly studied separately. The expenditures are considered as expenditures per capita due to the large diversity of the Czech municipalities' population.

We used sectoral classification of the budget structure to divide expenditures into categories. The six main categories used in the empirical analysis include State Security and Legal Protection, Industrial and Other Sectors of the Economy, Services for the Citizens, Social and Employment Policy, Public Administration and Services, and Agriculture, Forestry and Fisheries. However, these main categories include many important expenditure groups listed below (Act no. 323/2002 Sb. – Vyhláška o rozpočtové skladbě):

1. State Security and Legal Protection
    a) Security and Public Order
    b) Defense
    c) Legal Protection
    d) Fire Protection and Integrated Rescue System
    e) Preparation for Civil Emergences
2. Industrial and Other Sectors of the Economy
    a) Industry, Construction, Trade and Services
    b) Transport
    c) Water Management
    d) Communications
    e) General Economic Affairs and Other Economic Functions
3. Services for the Citizens
    a) Education and School Services
    b) Culture, Churches and Media
    c) Sport and Leisure Activities
    d) Health Care
    e) Housing, Communal Services and Territorial Development
    f) Environmental protection
    g) Other Research and Development
    h) Other Activities Related to Services for the Citizens
4. Social and Employment Policy
    a) Social Security Benefits and Grants
    b) Employment Policy
    c) Social Services and Activities Related to Social and Employment Policy
5. Public Administration and Services
    a) State Power, State Administration, Territorial Self-Government and Political Parties
    b) Oher Public Services
    c) Financial Operations
    d) Other activities
6. Agriculture, Forestry and Fisheries

Nevertheless, on the one hand, some of these categories, such as Agriculture, Forestry and Fisheries, create only a small portion of all the expenditures and; on the other hand, some other

categories such as Services for Citizens contain many sub-categories which share is much larger. This happens because some of the expenses do not levy on the municipaltlies hemselves but mostly on the Czech national government. For example, public expenses on health care are not small in the Czech Republic (Ministerstvo financí - Sekce veřejné rozpočty, 2019) but they are not primary financed by the cities and municipalities. Therefore, we decided to set our variables not by the sectional classification of the budget structure but by the importance of the expenditures in the budget share of the municipalities. Some expenditure groups that accounted for only a small fraction of the expenses were not considered in the models at all.

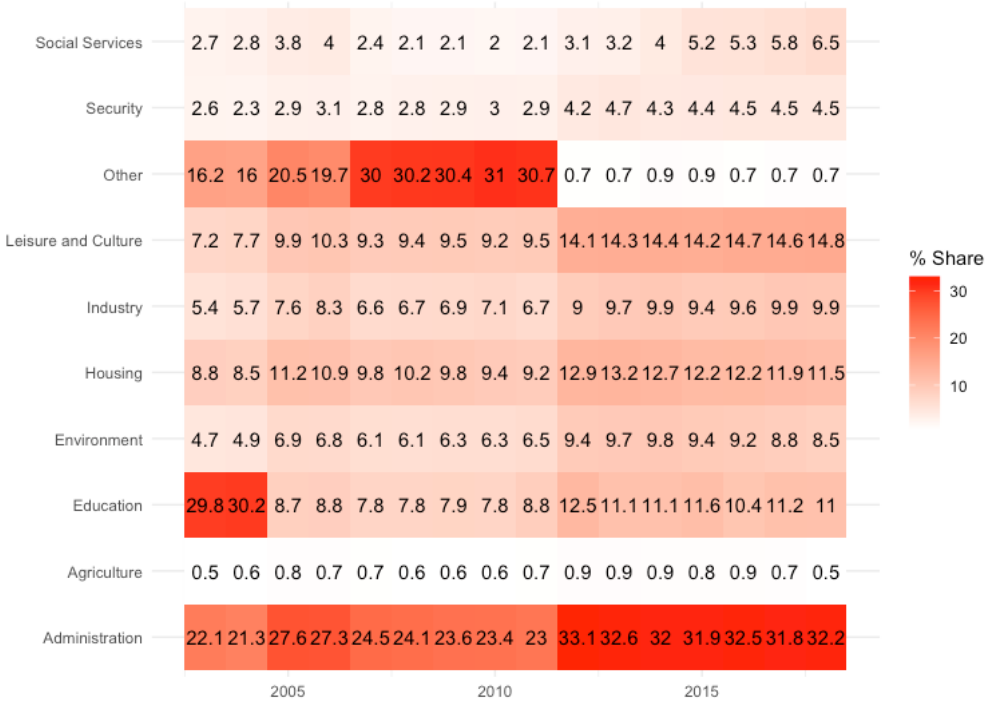
The variables representing the expenses that were introduced and used in the models ended up being:

1. Agriculture, Forestry and Fisheries
2. State Security and Legal Protection
3. Industrial and Other Sectors of the Economy
4. Public Administration and Services
5. Education and School Services
6. Leisure and Culture (including two expenditure groups – Culture, Churches and Media and Sport and Leisure Activities)
7. Housing, Communal Services and Territorial Development
8. Environmental Protection
9. Social Services and Activities Related to Social and Employment Policy

6.2 Shares of Expenditures and Their Changes

In the Figure 2 that is presented below, the reader can see the averages of the shares of the current expenditures in the municipalities in each of the studied years. The differences are large. First of all, there is a visible decrease of the expenditures in the category “Other” in the year 2012. This is caused by the fact that this category includes the expenditure group Social Benefits and Grants. Up until the 2012, the municipalities were paying for a large portion of social benefits for their citizens. Nowadays, most of these expenses are funded directly from the national government. As we can see, from the year 2012, the category “Other” (which includes all of the expenditure groups that are not considered as variables for our analysis) accounts only for a small fraction of the overall expenditures.

Figure 2: % share in the overall current expenditures by categories of current expenditures



Source: author, based on data collected from the Ministry of Finance

Nevertheless, this change visibly influenced the shares of the particular categories of the expenditures and not only the current expenditures but the overall expenditures are well (see Appendix 3 for a graph of overall expenditures shares); therefore, it does not make sense to base the research on the shares and to consider expenditures per capita is a better solution.

From 2012 we experience relatively stable shares of expenditures and we can see some establishing trends. In general, Agriculture, Forestry and Fisheries accounts only for a really small shares in the overall expenditures, creating less than 1 per cent of the all current expenditures. In comparison with the US, the State Security and Legal Protective does not account for a large share in the expenditures in the Czech municipalities either. Almost one third of the all current expenditures is made by expenditures on public administration. Nevertheless, overall, we can see that the shares of expenditures can be considered as stable throughout the years and the most significant changes that happened and changed the percentages completely were structural. Some of the categories have been increasing in the shares in the recent years and some decreasing but these changes are in fractions of a percentage from one year to another and only changes by a little (usually less than 1 per cent) over the years.

A similar figure representing the shares of the capital expenditures can be found below. This should help us to compare the different shares between the capital and current expenditures.

Figure 3: % share in the overall capital expenditures by categories of capital expenditures

Source: author, based on data collected from the Ministry of Finance

There is no significant drop in the shares from one year to another for any category in this case. The trends here are; thus, more observable. The category Agriculture, Forestry and Fisheries usually does not account for more than a 0.5 per cent share in the capital expenditures and overall, it can be concluded that this expenditure group is not the one where the received money float to. However, there are some categories which have a pretty large share in the capital expenditures and small share in the current expenditures and vice versa. The good examples are categories Industry and Administration. As it has been said, Administration takes the largest share in the current expenditures; nevertheless, in the recent years, its share in capital expenditures jumps between 3 per cent to a little less than 7 per cent. In contrary, the largest share in capital expenditures belongs to the expenditure group Industry and its share in current expenditures in the recent years is a little below 10 per cent. Surprisingly, little attention is paid to Environmental Protection. When it comes to capital expenditures, its share is relatively low.

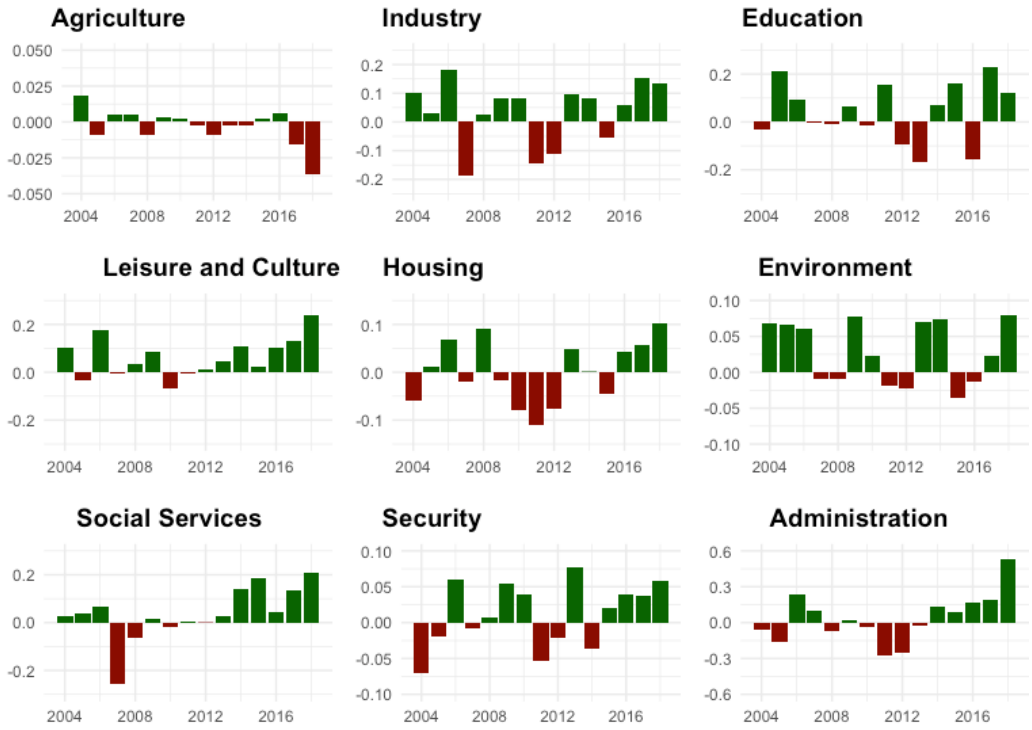
Overall, taking into consideration both, current and capital expenditures, the largest share of expenditures is taken by administration expenses, with about a 25 per cent share and the expenditure group that receives the smallest amount of money is Agriculture.

6.3 Changes in Expenditures

It is important to look not only at changes in shares of per capita expenditures, since; naturally, as one expenditure group experiences a lowered share in overall expenses, the other must get a bigger portion in the overall "pie". For this reason, we decided to provide another angle of how to look at the changes in expenditures. Percentage changes were not possible to be counted since, occasionally, expenditures increase from zero to a positive value and to do average from such changes over the municipalities is impossible. Therefore, the year-over-year changes were chosen as an alternative to these percentage changes.

In the Figure 4, we present the average year-over-year changes to the current expenditures from categories that will be later used in our models.

Figure 4: Average year-over-year absolute changes to current expenditures by category



Source: author, based on data collected from the Ministry of Finance

Most of the year-over-year changes in expenditure groups, negative or positive, are not very large. The largest drop is experienced in the category Education in the year 2005 when there

was a change in financing of schools. That year some of the expenses started to be financed by the national government itself and not by the municipalities, which were receiving transfers from the national government to cover for these expenses before this change. The drop was very large (the per capita expenditures decreased by around ten thousand Czech crowns) in comparison with other changes in this expenditure group. Therefore, we decided to "clean" these expenses that were later covered by the national government and this category is presented in the graph without them. From now on, we work without considering these expenses in our empirical analysis.

Other expenditure groups did not go through such dramatic structural changes. None of them experienced an increase or decrease from one year to another in per capita expenditures that would be close to a thousand Czech crowns. On the one hand, the largest increases are in the group Administration; however, on the other hand, this increase is still less than a thousand crowns, just a little above five hundred crowns. On the contrary, the smallest changes are in the category Agriculture; however, this group only accounts for a very small share in overall expenditures, so it is natural that its expenditure changes will not be in large amounts. Nevertheless, the expenses on agriculture seem to be diminishing over the past years, the changes were negative or close to zero since 2011 with a more visible negative change happening again in the past two years.

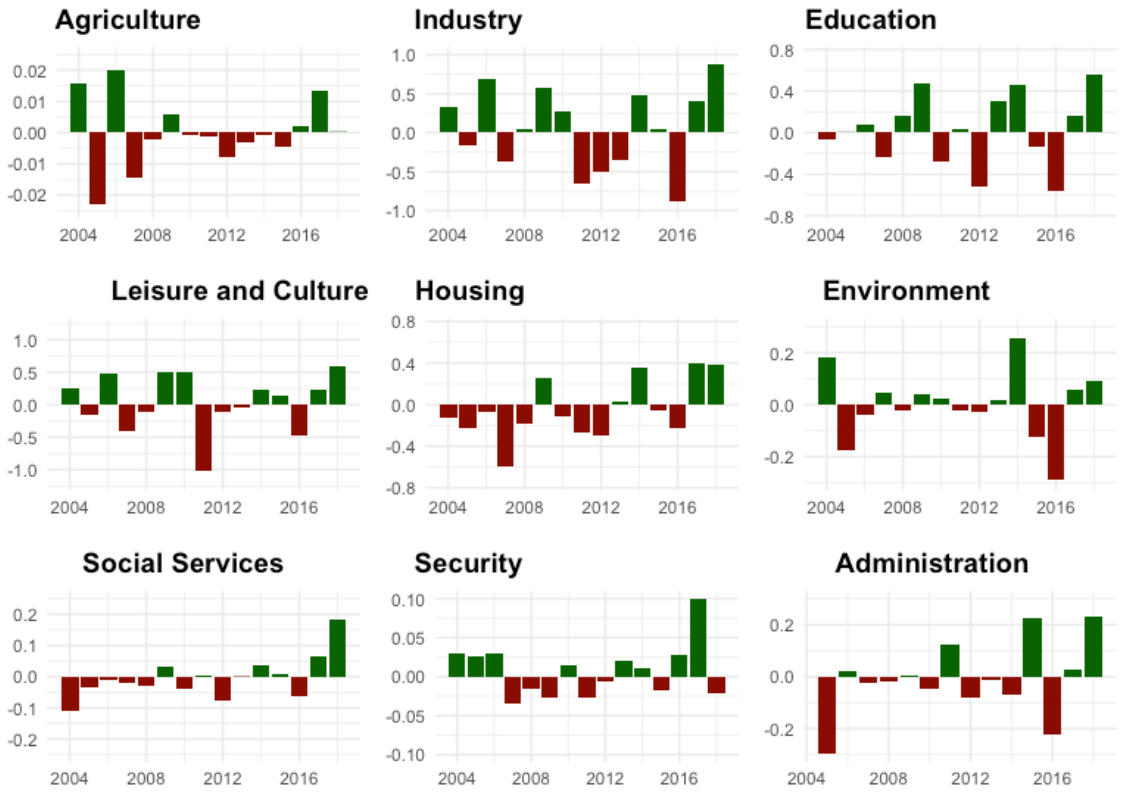
Other categories, such as Social Services, Leisure and Culture or Administration, experience rather positive changes over the past few years. Many groups seem to recover from the decreases in expenses that they were experiencing in the years 2010 up to 2013 and nowadays the trend is rather positive. On the top of this, expenditures on culture and leisure activities and on social services and employment seem to be increasing as well over the past few years. The most visible fall in the leisure expenses happened in 2009; nevertheless, it can be concluded that these expenses follow rather positive trend over the years. Even the expenses on housing, communal services and territorial development experience positive changes over the last three years even though for a longer period of time up until 2013 these expenditures were decreasing. In general, the only expenditure group that have been undergoing negative changes in the recent years is Agriculture and this decrease is the largest one ever experienced in this category of expenditures (although, it is still very small in real numbers).

The expenses on social services experienced a larger fall before the crisis and did not decrease more significantly during the crisis. Nevertheless, it is visible from the graph that expenses of

almost all of the categories were decreasing in the post-crisis years. This indicates that it might take a year or more for the expenditures to get adjusted to the change in revenues and they do not react immediately.

A similar figure as for current expenditures was constructed for the capital expenses.

Figure 5: Average year-over-year absolute changes to capital expenditures by category



Source: author, based on data collected from the Ministry of Finance

The development of the changes in capital expenditures in each category usually do not seem to follow a long-set trends. In comparison with current expenditures, their positive, as well as negative changes, are often higher. Except for expenditures on administration, current expenditures per capita do not undergo year-over-year changes that would be higher than 250 Czech crowns. Nevertheless, even when it comes to the capital expenditures, the year-over-year changes are usually not very dramatic.

Similar as it is with current expenditures, the capital expenditures on agriculture seem to be following rather negative than positive trends. After the crisis of 2008, they were decreasing for a few years and just nowadays, in the recent 3 years their year-over-year changes are positive. Nevertheless, expenditures on agriculture are not large overall; thus, the changes are

very small. In case of capital expenditures, also other categories, such as Social Services or Housing, have experienced a lot of negative year-over-year changes. In general, it cannot be said that some of the budget groups would be completely or mostly spare from decreases. Moreover, decreases in expenditures happen more often in case of capital expenditures than in case of current ones.

Overall, in the last two years, capital expenditures seem to be increasing after the year 2016. In fact, the only category of expenditures that experienced a negative change from the year 2017 to 2018 were expenses on security. Nevertheless, in the year 2016 a lot of expenditure groups including Industry, Education, Leisure and Culture, Housing, Environment, Social Services and Administration, experienced a relatively high drop in comparison with the rest of the studied period. In general, this sharp decline in the volume of capital expenditures in 2016 can be related to the slow start of drawing European subsidies in the new programming period. The important financing of the capital expenditures comes from the European Union, so after the election, there can always be a problem with drawing the subsidies.

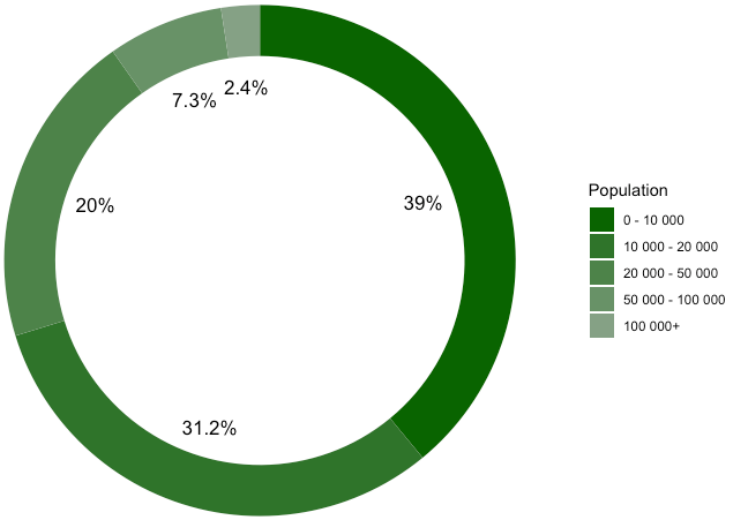
Lastly, the summary statistics for the expenditures used in our research can be found in Appendix 2.

6.4 Demographic and Political Data about the Czech Municipalities with Extended Powers

We collected several demographic and other specific information about the municipalities using different sources. Data about demographic variables used in the empirical analysis were obtained from the Czech Statistical Office. Naturally, we considered information about the municipalities and not about the whole districts municipalities administration to be consistent with the budgetary data that we collected.

First of all, we gained data about population. We established a variable representing the number of citizens in the municipalities for each year. The Czech municipalities with extended powers differ widely in the matter of population, with the smallest municipality having less than three thousand citizens and the largest city having over 350 thousand inhabitants. At the Figure 6 presented below, the reader can see the percentage share of the municipalities which have a similar number of citizens.

Figure 6: % share of population



Source: author, based on data collected from the Czech Statistical Office

As it is visible from the graph, almost 40 per cent of all municipalities used in our dataset have less ten thousand citizens and another 31 per cent have between ten thousand and twenty thousand citizens. In contrast to this, only five cities exceed one hundred thousand citizens. Not surprisingly, the largest cities are not only municipalities with extended power, but they are also center cities of their regions. It can be concluded that our dataset has relatively large diversity of the Czech cities; nevertheless, the Czech municipalities with extended powers are rather smaller or bigger towns than large cities.

We also collected information about the number of young citizens that are defined by the Czech Statistical Office as citizens of age from 0 to 14, citizens in productive age of age from 15 up to 64 and seniors from 65+ years old. Based on these data we created variables representing share of young people, people of productive age, and the elderly within the population in the municipalities.

These shares of citizens differ across cities usually just by a few per cent; nevertheless, the maximum and minimum values are visibly different. Some cities have over three fourth of the population in productive age while some others only have around sixty per cent of working citizens. However, in general, there are only a few municipalities which have higher shares of young citizens than seniors.

Apart from population, political information about the current government in the cities were also collected, particularly about the mayor's political affiliation. Historical data were gathered from the database of the International Political Institute of Masaryk University; nevertheless, the most recent data about the election that took place at the end of the year 2014 must have been collected one by one from the official websites of the municipalities, or from multiple local newspapers for all 205 municipalities individually since there is no updated database with the names of the mayors and their political affiliation.

Based on the data obtained, three variables representing this affiliation were created. First two represented parliamentary parties no matter of their shares, which were further distinguished into variables representing mayors from "left-wing block" and "right-wing block". As left-wing block, we considered Česká strana sociálnodemokrafická (ČSSD), Komunistická strana Čech a Moravy (KSČM) and, for the purpose of this thesis, ANO 2011 falls into this category as well; although, it is more taken as a "catch all party". On the other hand, centre parties that are considered to be centre-right oriented such as TOP 09 or Křesťanská a demokratická unie – Československá strana lidová (KDU-ČSL) were taken as right-wing block together with Občanská demokratická strana (ODS).

Nevertheless, since in the Czech Republic is not uncommon to elect a local party, independent candidates or associations, which do not recognize themselves as political parties or movements or a local political party is elected, we also established variables representing independent and non-parliamentary candidates.

The summary statistics for the control variables used in our research can be found in Appendix 2.

7 Methodology

This thesis brings an empirical analysis that provides an explanation of the relationships between the dependent variables, which are represented by different kinds of expenditures and in one model, the dependent variable is set as revenues from transfers, and independent variables, including the control variables, which were explained in detail in the previous section concerning the used data. The data were gathered to create a panel dataset, with a large variation in the "N" dimension represented by 205 different municipalities and a sufficiently long enough time dimension of sixteen years. By creating our own dataset, we ended up with a nicely structured balanced panel dataset with 3280 observations.

Since it is reasonable to assume that the today's expenditures are influenced by the last's year expenditures, we wanted to account for this in our models and; therefore, we decided that a starting point for our analysis would be a general form of a dynamic panel data model, which includes a single lagged dependent variable:

$$e_{ij} = \beta_0 + \beta_1 e_{ijt-1} + \beta_2 r_{it} + \beta_3 X_{it} + a_{ij} \quad (1)$$

where e_{ij} represents the per capita expenditures in budget category j in time t in a municipality i, e_{ijt-1} is the same dependent variable lagged into the previous period t-1, r_{it} then represents tax revenues in time t and X_{it} contains explanatory variables Population, Shares of Population and Mayor's Political Affiliation. The error term a_{ij} is the sum $v_{it} + \mu_{it}$ containing both, individual-specific effect and idiosyncratic error (Schmidheiny, 2019).

From the beginning, we, naturally, ruled out using the OLS estimator. In general, using OLS method for panel data may bring biased coefficient estimates. OLS regressions may end up being inconsistent because of the unobserved time-invariant individual's characteristics and it is reasonable to be assume that such characteristics might be correlated with our explanatory variables (Wooldridge, 2012).

Nevertheless, standard procedures used for panel data such as standard fixed effects and random effects models only consider effects of the independent variables on the dependent one to be (directionally) symmetric – the estimator is the same whether there is a decrease or increase in the variable, or, as it is in our research, a decrease or an increase in the change. As it was already mentioned in the Literature Overview, asymmetric responses of the changed revenues (positive vs. negative) to the expenditures might be presented in our analysis and the interpretation of the results for symmetric processes might be misleading. Simply saying, a positive change in revenues does not have to have the same impact as a negative one throughout the different categories of expenditures.

Moreover, these standard panel-data procedures are not the best suitable options for dynamic panel model either. Nickel (1981) showed that in case of the use of fixed effect models when dealing with dynamic panel data, the problem of endogeneity arises since the lagged dependent variable is likely to be correlated with the error term. This problem cannot be fixed by higher number of observations. Moreover, if there is also a correlation between the regressors and the lagged dependent variable, the coefficients of these regressors might be biased as well. Because of this so-called "Nickel" bias it is not recommended to use fixed effects models for dynamic

panel data. Hausman and Pinkovskiy (2017) concluded a similar problem in case of random effects models, which suffer from the endogeneity problem as well.

The methodology of dynamic panel data suggests using the Arrelano-Bond estimator, or, as some might know it, the difference estimator, which is much more suitable for dynamic panels than fixed effects and random effects estimators. Originally, the Anderson–Hsiao approach (Anderson & Hsiao, 1981), which uses an instrumental variable estimation, was suggested to be used in case of dynamic panels. Nevertheless, Holtz-Eakin, Newey, and Rosen (1988) followed by Arrelano and Bond (1991) suggested a procedure which creates more efficient estimators using a generalized method of moments estimation rather than an instrumental variable estimation. The method proposed by Arellano and Bond (1991) takes the first-differenced to account for individual effects and then deeper lags of the dependent variable are used as instruments for the endogenous lag of the dependent variable.

Our dataset is suitable for application of the Arellano-Bond estimator since it is designed for the situations where there is a few time periods and a lot of individuals units ("large N but small T"), there are fixed individual effects within the units and the dependent variable probably depends on its past values (which is trying to be accounted for by using the lagged dependent variables as an independent variable) (Baum, 2013). Moreover, since we are interested in analyzing the impact of changed exogenous revenues on expenditures and the difference GMM estimator has basis in first differences (in changes), it is reasonable to base on it our empirical analysis.

Nevertheless, we had to deal with a question of how to construct a dynamic panel model that would easily account for asymmetrical effects of changes in revenues on expenditures. There are many simple methods proposed by different scientists that should account for asymmetries; however, they only consider a standard panel data model, not a dynamic one. They usually modify their original models into the first difference models at first and then they easily account for asymmetries with various methods such as splitting the first differences into two models or introducing dummy variables representing a negative and positive change within the one model (Allison, 2019).

In our dynamic panel models, the proposed solutions are not applicable. As it was already mentioned, the difference GMM has basis in the first differences; therefore, in the end, we would work with changes of the changes, which is not desirable in this research. Nevertheless, we came up with a simple solution to this problem. At first, two indicator functions were

established. The first one accounted for positive changes in revenues and the latter one for negative changes in revenues:

$$I(\Delta r_{it} \leq 0) = \begin{cases} 1, & \Delta r_{it} \leq 0 \\ 0, & otherwise \end{cases} \qquad (2)$$

and

$$\mathrm{I}(\Delta \mathrm{r_{it}} > 0) = \begin{cases} 1, & \Delta \mathrm{r_{it}} > 0 \\ 0, & \text{otherwise} \end{cases} \qquad (3)$$

The original variable representing tax revenues was then multiplied by these two indicator functions, so they would create two new variables. Nevertheless, together they represented the original variable for the tax revenues:

$$e_{jit} = \beta_0 + \beta_1 e_{jit-1} + I(\Delta \mathrm{r_{it}} \leq 0) * \beta_2^- r_{it} + I(\Delta \mathrm{r_{it}} > 0) * \beta_2^+ r_{it} + \beta_3 X_{it} + a_{it} \qquad (4)$$

where,

$$I\big(\Delta \mathrm{r}_{ij} \leq 0\big) * \beta_2^- r_{ij} + I\big(r_{ij} > 0\big) * \beta_2^+ r_{ij} = \beta_2 r_{ij} \qquad (5)$$

Moreover, in the first differences these two variables would separately represent positive and negative changes in revenues.

The final equation, on which all of our models were estimated is as followed:

$$\Delta e_{ij} = \beta_1 \Delta e_{ijt-1} + \beta_2 \Delta r\_p_{it} + \beta_3 \Delta r\_n_{it} + \beta_4 \Delta \mathrm{X_{it}} + \Delta \mu_{\mathrm{ij}} \quad (6)$$

where all of the variables are defined the same way as it was presented in equation (1) and the r_p_{it} represents the newly established variable for a positive change in the tax revenues and, similarly, r_n_{it} represents the negative change in tax the revenues. On this equation we could easily applied the generalized method of moments estimation proposed by Arellano and Bond (1991).

Nevertheless, the used two-step GMM estimator is not robust to heteroscedasticity. The standard robust covariance matrix estimators are not the best solution for the problem arising from heteroscedasticity in case of the difference GMM estimator. For this reason, a special procedure, proposed by Windmeijer (2005), is applied to create the final robust errors. Lastly, the Sargan Test was used to test the validity of the instruments and it is presented together with the Arellano-Bond tests of first and second-order autocorrelation in the errors with the results from the regressions.

8 Results

In this section, the reader is provided with the results coming from the empirical research of this thesis. Due to a high number of different dependent variables, a relatively large number of regressions must have been run. Therefore, the results are provided separately for current and capital expenditures and, naturally, for expanded models as well.

Since for some categorical models that were performed in this research, the positive and negative change to revenues seemed to have similar estimated effect on the expenditures, we, naturally, tested in all of our models whether the coefficients of these variables are statistically different. In some models, this was not the case. It turned out that the effect of positive and negative change to tax revenues is the same for some expenditure groups such as agriculture and housing in almost all of our constructed models. However, still, in many other models the expenditures respond to an increase or a decrease in tax revenues in a different way. For the simplicity of the orientation in the results, for the basic models, the results are provided in the way that the model includes one revenue variable for the categories for which the effect of the negative and positive change can be considered as symmetric and two separate revenue variables, one for a positive change and one for a negative change, if the effect of these two variables was statistically different at lower significance levels.

Nevertheless, in the models with political variables and interactions, such a method would be highly confusing for the reader. Therefore, the results from these regressions are provided with both variables, representing positive as well as negative change. In the Appendix 2, the reader can find explanatory notes to the variables used in the models. Lastly, all of the presented models work with expenditures and revenues per capita.

8.1 Overall Expenditures and Transfers

Apart from the categorical expenditure models, the models accounting for all current, all capital and all overall expenditures were estimated as well and as a starting point of presentation of our empirical research, results from these regressions are provided in Table 1.

One can easily see that, on the one hand, capital expenditures are not influenced by the change in tax revenues; however, they do react positively to the last-year capital expenditures. This finding is in accordance with the Hypothesis 2.

On the other hand, current expenditures increase if there is a positive shock to the tax revenues and they decrease with a negative change. There is a visible and significant asymmetry in responses to these changes. A one-thousand-crown positive change in tax revenues per capita causes the current expenses per capita to go up by CZK 1,189. In comparison, if there is a negative change to tax revenues, current expenditures go down by CZK 1,274. In conclusion, the impact is visibly stronger if there is a negative shock to tax revenues; nevertheless, the difference is not enormous.

The previous year's expenditures influence not only the today's capital expenditures but the current expenses as well. Moreover, the effect is approximately 2.5 times higher in case of the current ones. Both, the share of young, as well as the share of elderly negatively influence the current expenditures. Nevertheless, the effect is stronger in case of a one percentage point increase in the share of young citizens in the population.

In conclusion, we can say that overall current expenditures are influenced asymmetrically by the change in tax revenues and these changes to tax revenues do not have a significant effect on capital expenditures.

Apart from overall expenditures, we believe that there might be some connection between received transfers and tax revenues; thus, in Table 1 we provide results also from the regression where transfers stand as a dependent variable. It is clearly visible that, on the one hand, if the tax revenue increases, it has a positive and statistically significant impact on the received transfers. On the other hand; however, with a decreasing tax revenue, the revenues from transfers decrease significantly as well. The effect is stronger in case of a negative change. the Hypothesis 5 is confirmed by these results. This might be viewed as natural; although, it was showed in the Literature Overview that in some cases some transfers might get higher if there is a decrease in other revenues of the local governments, it is reasonable to assume that if the tax revenues decreases for the municipalities, the revenues decrease for the state as well and the money dedicated to fund investments in municipalities coming in form of transfers might decrease because of it too.

Nevertheless, it must be mentioned that the Sargan test for over-identifying restrictions does not turn out as nicely in these regressions as it is usual for models considering different expenditure groups. Therefore, the validity of the used instruments is not the best in these models.

Table 1: Overall Expenditures – regressions outputs

	Dependent variable:			
	exp	cexp	all_exp	transfers
r		0.366		
r_p	1.189***		1.906***	0.886***
r_n	1.274***		2.044***	0.935***
population	-0.0003	-0.0004	-0.001**	-0.001**
share_young	-1.469***	0.187	-0.596*	0.242
share_old	-0.624***	-0.395	-1.265***	-1.155***
mayor_left	-0.548	0.333	0.822	-0.721
mayor_right	0.614*	-0.054	0.346	-0.175
lag(exp)	0.619***			
lag(cexp)		0.247***		
lag(all_exp)			0.335***	
lag(transfers)				0.380***
N.	3280	3280	3280	3280
Sargan test (p-value)	< 2.22e-16	4.14e-05	9.51e-09	< 2.22e-16
AR(1) (p-value)	1.93e-14	1.06e-08	0.001	3.06e-06
AR(2) (p-value)	0.2947	0.0048	0.0002	4.39e-05

*p<0.1; **p<0.05; ***p<0.01

Source: author, based on data collected from the Czech Statistical Office, the Ministry of Finance and local newspapers

8.2 Current Expenditures

The results from models estimating categorical current expenditures are provided in Table 2.

The effects of changes revenues on current expenditures are very significant in all of the models except for the expenditures on agricultures. The impact is positive in case of a positive change and negative in case of negative one in all of the expenditure groups (in case of a negative change, if there is a positive coefficient it means that the expenditures decrease). For most of the categories the coefficients are higher in case of a negative revenue change than in case of a positive revenue change. Therefore, if the revenues increase by a certain amount, it will have lower effect on expenditures than if the revenues decrease by the same amount. The Hypothesis 1 is confirmed by this finding in case of current expenditures; nevertheless, we have to keep in mind that the impact of changed revenues is not always asymmetric and in case of some expenditure groups the effect is the same for negative, as well as positive change.

Nevertheless, the size of the effect differs across different categories. The strongest effect the changed tax revenues have on expenses on administration. On the one hand, in case of a one-thousand-crown positive change in tax revenues per capita, the on-administration expenses per capita go up by CZK 251. On the other hand, if there is a negative change to tax revenues, they go down by CZK 269. These expenses are affected much more than any other expenses. Such a behavior is not unexpected – the administration costs are natural to be cut, and the cuts are done easier than in some other expenditure groups. This support the Hypothesis 3.

The other expenditures categories that are more sensitive to changes in revenues are leisure and culture, industry, and housing and territorial development. However, still, expenses on administration are affected 2 or even 3 times as much as these other expenses.

In comparison, the smallest effect they have on expenses on social services and employment policy; although, it is still present even in the expenditures on social services where the effect of negative change in tax revenues is stronger. The social services provided to citizens are nowadays mostly coming from the national government and this category of expenditures does not; therefore, bear the possible increased demand for aids completely on its shoulder. Moreover, the expenses on social services and employment policy do not take a large share of overall current expenditures and the similar is true for example in case of expenses on security. The effect of changed revenues on expenses from both of these categories is not large, especially when compared to the expenditures on administration, which takes the largest share in overall expenditures (in the recent years expenses on administration accounted for more than 30 per cent of all current expenditures). When we look at expenditures on agriculture, they are not even statistically significantly affected by the change in tax revenues. Since they only account for less than 1 per cent of current expenditures, there is probably not a lot of "room" for cuts. The similar can be true in case of social services expenses. In comparison, when it comes to administration services, it is reasonable to assume that some cuts can be made not only because of the nature of the expenses but also because a lot of money goes to this expenditure group.

For these reasons; on the one hand, although the finding about the effect of changed revenues on expenses on social services does not correspond to the Hypothesis 3, we cannot say it is not logical. On the other hand, the expenditures on administration are expected to be cut more visibly than other revenues also because they take much larger portion of overall current expenditures than any other group of expenditures.

Apart from revenues, population tends to decrease current expenditures per capita. Despite the fact that this effect seems to be almost neglectable because of the small estimators, one must keep in mind that one additional citizen probably does not make a remarkable change to expenditures even in the smaller cities and it cannot be expected to make a large difference in large cities. Nevertheless, the effect of population is usually statistically very significant, so we can conclude that the increasing number of citizens has a negative impact on current expenses in the Czech municipalities.

Other control variables do not play major roles in our findings. When standing alone, the mayor affiliation does not significantly influence the current expenditures. If the mayor is from the left-wing block, it has a positive impact on expenditures only on education and agriculture. The share of different citizens within the population usually do not turned out significant either. Nevertheless, the shares of young and elderly citizens have positive impact on social services and employment expenditures. This is reasonable to assume since many social expenses are directed towards senior citizens or children.

Last but not least, the lagged dependent variable also almost always turned out to have a positive effect on expenditures of today. The leisure and culture expenditures and social and employment services expenditures are influenced by the last-year amount of expenditures more visibly them other categories, for example, the expenditures on security. This significant and somehow strong relationship between previous-year and current-year expenditures is expected to be presented. When allocating the budget, the policy makers must, naturally, take into considerations the expenses from the previous year within different categories.

Table 2: Current Expenditures – regressions outputs

	Dependent variable:								
	edu	agr	hou	ind	leis	env	sec	adm	soc
r		0.0003	0.068***			0.032**	0.018**		
r_p	0.016**			0.081***	0.075***			0.251***	0.009*
r_n	0.020***			0.091***	0.082***			0.269***	0.013**
population	-0.00003**	-0.00002**	-0.0001**	-0.0001***	-0.0001*	-0.0001	-0.00004***	-0.0001	0.00000
share_young	-0.067***	-0.001	-0.115***	-0.060	-0.004	-0.025	-0.018**	-0.145***	0.064***
share_old	0.053***	-0.007***	-0.023	-0.010	0.003	0.009	0.015**	-0.099***	0.035***
mayor_left_bin	0.054**	0.016**	-0.038	-0.048	-0.009	-0.048	0.018	-0.017	-0.010
mayor_right_bin	-0.018	0.001	0.050	0.045	-0.002	0.002	-0.002	0.091	-0.050
lag(edu)	-0.028								
lag(agr)		0.604***							
lag(hou)			0.475***						
lag(ind)				0.361***					
lag(leis)					0.829**				
lag(env)						0.023			
lag(sec)							0.219**		
lag(adm)								0.222***	
lag(soc)									0.710***
N.	3280	3280	3280	3280	3280	3280	3280	3280	3280
Sargan test (p-value)	0.16	< 2.22e-16	0.35	0.31	0.03	0.73	0.31	6.03e-15	0.11
AR(1) (p-value)	0.0422	0.0011	2.51e-07	0.0027	0.0079	0.0672	0.175	0.026	0.0002
AR(2) (p-value)	0.0086	0.3275	0.2735	0.3614	0.1687	0.1354	0.3752	0.6009	0.0551

*p<0.1; **p<0.05; ***p<0.01

Source: author, based on data collected from the Czech Statistical Office, the Ministry of Finance and local newspapers

8.3 Capital Expenditures

The results from models estimating categorical capital expenditures are provided in Table 3.

As expected, the results are different than they are for the current expenditures. In case of the capital expenses, the changes in revenues do not necessarily have an impact on different categories of capital expenditures that would be statistically significant. Capital expenditures on agriculture, housing, leisure and culture and environment are not influenced by an increase or decrease in tax revenues. This support our Hypothesis 2. We did not expect capital

expenditures to be influenced by shocks to tax revenues as deeply as current expenditures since capital expenditures are mostly paid by transfers.

Moreover, when it comes to capital expenditures, the asymmetry in response to changes in tax revenues is not present so often as it was for current expenditures. Administration and education are the only group which are influenced differently if there is an increase in tax revenues than if there is a decrease. Nevertheless, similarly as it is for the current expenditures, the effect is stronger for a negative change and the expenditures for administration and education tend to increase with increased tax revenues and decrease with decreased ones.

Similarly as for current expenditures, with a positive change in tax revenues, the capital expenditures grow and with a negative change they decrease. Expenditures on security seem to be affected the least, followed by expenses on social services and employment. Nevertheless, capital expenditures on administration belong to the groups of expenditures that are not heavily influenced by the change in tax revenues, which is an opposite situation that we observed in the models for current expenditures. When it comes to capital expenditures, expenditures on industry are affected the most. Similarly, as it was in case of current expenditures on administration, capital expenditures on industry account for more about 30 per cent of all capital expenditures. The categories which account for the largest portion of the expenditures tend to be most sensitive to changes in tax revenues. Apparently, even on local government levels, during a fiscal stress, investments to infrastructure tend to decrease.

Furthermore, the last-year expenditures have a relatively strong, positive, and significant effect on this-year expenditures in all of the categories.

We can conclude that capital expenditures react differently to changes in tax revenues than current expenditures. Nevertheless, we have to keep it mind how the financing of capital expenditures works. Naturally, as it was mentioned in the section describing the dataset used, to catch the effect of exogenous revenues shock to local public spending, we used tax revenues as our independent variable. However, capital expenditures are often investments which are very often funded rather by transfers and grants than directly by tax revenues, which are more likely to be used to cover current expenditures.

As it has already been mentioned, capital expenditures can have a form of some investment project, which is often not projected to be finished within a year; therefore, the significant and positive relationship between the past-year's expenditures and today's expenditures is also expected to be presented. Lastly, none of the control variables have an impact on year-on-year

change in expenditures. When standing alone, whether there is a left-wing mayor or right-wing mayor does not have a statistically significant impact on capital expenditures.

Table 3: Capital Expenditures – regressions outputs

	Dependent variable:								
	cedu	cagr	chou	cind	cleis	cenv	csec	cadm	csoc
r		-0.0001	0.008	0.341*	0.019	0.001	0.011***		0.026*
r_p	0.063***							0.029**	
r_n	0.079***							0.036***	
population	0.0001	-0.00000	0.00000	-0.001	-0.00003	0.00002	0.00000	-0.00001	0.00002
share_young	-0.044	-0.013	-0.077	0.140	-0.139	0.116*	-0.002	0.037	0.048
share_old	-0.031	-0.004	0.032	-0.345**	-0.048	-0.021	0.008	-0.001	-0.017
mayor_left_bin	-0.185	0.053	0.162	0.176	0.117	0.005	-0.045	0.007	-0.090
mayor_right_bin	-0.131	0.0003	0.122	0.081	0.154	0.035	-0.028	-0.026	-0.008
lag(cedu)	0.154***								
lag(cagr)		0.143**							
lag(chou)			0.449***						
lag(cind)				0.266***					
lag(cleis)					0.217***				
lag(cenv)						0.276***			
lag(csec)							0.114**		
lag(cadm)								0.208***	
lag(csoc)									0.359***
N.	3280	3280	3280	3280	3280	3280	3280	3280	3280
Sargan test (p-value)	0.014	< 2.22e-16	0.55	0.22	0.008	0.23	0.34	0.006	0.44
AR(1) (p-value)	4.29e-07	0.0011	2.44e-06	0.0103	9.12e-08	0.013	4.3e-08	3.83e-05	0.004
AR(2) (p-value)	0.0536	0.3275	0.2937	0.1783	0.03	0.28	0.4228	0.008	0.3483

*p<0.1; **p<0.05; ***p<0.01

Source: author, based on data collected from the Czech Statistical Office, the Ministry of Finance and local newspapers

8.4 Political Models

After running the categorical regressions, that included also mayor affiliation, we decided to look at whether there is some difference between the reaction of the left- and right-wing blocks towards the expenditures when it comes to cuts or rises in tax revenues.

Nevertheless, in the previous models, the political affiliation of the mayor did not turn out statistically significantly in most of the models. Since our models have bases in first differences, standard dummy variables do not have to be necessary fit as the best possible independent variables since they do not capture what we want in the first differences. If variables take values 0 and 1, in first differences, they are assigned with values -1,0, and 1. This is not a desirable situation. Because of these reasons, for political model we created a new variable, representing the affiliation of the mayor as a dummy variable after the first differencing of our models. The variables are; therefore, set as followed:

$$mayor\_right_{in} = \sum_{t=2003}^{n} mayor\_right\_bin_{in}, n = 2003, \dots, 2018$$

and

$$mayor\_left_{in} = \sum_{t=2003}^{n} mayor\_left\_bin_{in}, n = 2003, \dots, 2018$$

In these models, for some current-expenditures-categories, it was found that the left or right-wing blocks and their interaction with changes in revenues influence the expenditures. The results from these regressions can be found in Table 4.

In comparison with independent and non-parliamentary mayors, which are our base group, we can, in general, conclude that the right-wing and left-wing blocks decrease some expenditures less that other parties when there is a negative shock to the tax revenues. When there is a positive shock to tax revenues, they tend to increase the expenditures also less than other parties.

In case of the right-wing blocks, the effect seems to be rather symmetric for the negative and positive change to expenditures. The opposite is true for the left-wing blocks and in most of the cases, except for expenses on education and social services and employment policy (and in these categories, the impact of this interaction term is not significant anyway), the effect is different for the right- and left-wing political blocks.

The most noticeable difference between the other parties and left- and right-wing blocks when it comes to reaction after the changed in revenues is in the expenditures on administration. In comparison with the other parties, right and left ones, increase the expenditures less when there is a positive change to revenues. Similarly, they decrease them less in case of a negative shock to the tax income of the municipalities. On the top of this, the left-wing political blocks decrease them more than the right-wing ones.

Nevertheless, when considering the overall effect of changed revenues on expenditures when there is a left-wing or right-wing mayor, one must also consider the effect of the affiliation of the mayor alone. To get a better perspective on this impact, the reader can find in the Appendix 4 figures representing this relationship graphically.

Left-wing mayors have higher expenditures on administration by CZK 1,925 in comparison with the other mayors and; in additional, if the tax revenues go up from one year to another by CZK 1,000, the left-wing mayors increase administration expenses by CZK 196. They decrease them by CZK 211 if there is a negative shock to tax revenues. In comparison, the right-wing have these expenditures higher than mayors from other parties by CZK 2,549 and they increase them by CZK 156 if positive change occurs and decrease them by CZK 185 if negative change happens. However, in the expenditure group leisure and culture; although, the difference is even smaller, the situation is opposite. Very similar effect these two political entities have in case of expenditures on agriculture; nevertheless, their reactions when it comes to shocks in revenues are just a little different than the effect of other political entities.

Table 4: Political interaction with changes in revenues - regressions outputs for current expenditures

	Dependent variable:								
	edu	agr	hou	ind	leis	env	sec	adm	soc
r_p	0.016*	0.004	0.088***	0.097***	0.096***	0.049***	0.029***	0.348***	0.008
r_n	0.020*	0.006	0.090***	0.109***	0.108***	0.053***	0.032***	0.368***	0.012*
mayor_left	0.098	0.097**	0.228	0.200	0.685*	0.226	0.116	1.925***	0.067
mayor_right	-0.070	0.071*	0.501**	0.580*	0.633*	0.311*	0.158	2.549***	-0.135
r_p*mayor_left	-0.002	-0.006*	-0.021	-0.016	-0.051*	-0.022	-0.008	-0.152***	-0.006
r_n*mayor_left	-0.005	-0.007**	-0.022	-0.027	-0.064*	-0.024	-0.010	-0.157***	-0.006
r_p*mayor_right	0.004	-0.005*	-0.036*	-0.043	-0.050*	-0.024*	-0.012	-0.192***	0.007
r_n*mayor_right	0.005	-0.006*	-0.036*	-0.043	-0.053*	-0.026*	-0.013	-0.201***	0.007
population	-0.00002*	-0.00001**	-0.0001**	-0.0001**	-0.0001	-0.00003*	-0.00002**	-0.0001*	0.000
share_young	-0.065***	-0.0003	-0.118***	-0.067	-0.012	-0.024	-0.031***	-0.153***	0.065***
share_old	0.052***	-0.007***	-0.023*	-0.008	0.014	0.009	0.008*	-0.094***	0.035***
lag(edu)	-0.024								
lag(agr)		0.618***							
lag(hou)			0.478***						
lag(ind)				0.373***					
lag(leis)					0.762**				
lag(env)						0.020			
lag(sec)							0.322***		
lag(adm)								0.272***	
lag(soc)									0.701***
N.	3280	3280	3280	3280	3280	3280	3280	3280	3280
Sargan Test (p-value)	0.17	< 2.22e-16	0.69	0.34	0.03	0.69	6.38e-09	6.32e-15	0.12
AR(1) (p-value)	0.0412	0.0011	0.0653	0.002	0.012	0.0653	0.076	0.0171	0.0001
AR(2) (p-value)	0.008	0.3369	0.0906	0.371	0.2121	0.0906	0.4912	0.625	0.0547

*p<0.1; **p<0.05; ***p<0.01

Source: author, based on data collected from the Czech Statistical Office, the Ministry of Finance and local newspapers

Similar regressions were run for the capital expenditures. the situation here is, as usual, a little bit different than in case of current expenditures. The outputs from these regressions can be found in Appendix 5 and the graphical relationship between changes in revenues and capital expenditures with political interactions in Appendix 6. In a few categories, within which is a significant effect on the expenditures of housing, the left-wing blocks increase the expenditures

more than other parties in case of a positive shock to tax revenues. Nevertheless, they also cut them more in case of a negative shock.

In general, it can be said that right- and left- wing blocks and other parties react to changes in tax revenues differently and they often do not cut the expenses of the same category by the same amount.

9 Limitation of the Study

The thesis carefully specifies that its main objective is to do a valid research about the Czech municipalities, and we believe that by covering all of the existing municipalities and working with data from the year of their establishment up to the most recent possible year, we drew a relevant picture about how municipalities in the Czech Republic react to exogenous revenue shocks.

A small weakness of the study is potentially in the division of political parties into "right-wing blocks" and "left-wing blocks". In general, many Czech parties cannot be easily said to be left-wing or right-wing parties – they are rather centre-oriented and cannot be considered as typical "right- ", or "left-wing" ones. Thus, their division into three categories that were used in this study (right-wing block, left-wing block and independent together with non-parliamentary parties) was complicated. Because of the complicated results from the regressions, we chose not to add extra categories for each of different "political philosophies" (centre-right oriented, centre-left oriented, "catch-all" parties and so on) and the decision about to which block the party belongs can be viewed as done subjectively.

Nevertheless, we also have to keep in mind the methodology used. This thesis uses the generalized method of moments estimation suitable for dynamic panel data, which turned out to be a well-behaved estimation all most of our models. However, in some models, the lagged dependent variable did not turn out significant and the difference GMM estimation was not as valid as we would like it to be. Therefore, we believe that for some specific categories there could be a more suitable estimator.

The main limitation of the study we see in the used method when applying it to a long-run effects. In general, we used estimations that tells us the immediate effect of changed revenues on the expenditures. Nevertheless, some of the foreign studies showed that the municipalities do not have to react immediately on the change in revenues and the consequences might come later on. For these purposes, they used vector error correction models. The Literature Overview;

although, showed up that the immediate reaction of the changed revenues often happens on the side of expenditures and in the long run the part of revenues is influenced more deeply. Moreover, since we wanted to account also for asymmetric responses in case of a positive and negative change to tax revenues and keep the valid GMM estimator as well, we decided to primary look at the immediate reaction of the shock to revenues on different categories of expenditures.

10 Conclusion

To the best of our knowledge, this is the very first study to discuss the impact of exogenous revenues shocks on public local spending in the Czech Republic. The contribution of this work to the literature resides mainly on its empirical research based on an analysis of the difference generalized method of moments regressions, which were run on the dynamic panel data. The dataset includes 205 Czech municipalities and the timeline of 16 years, which provided yearly information about the expenditures, which were divided into logical expenditure categories, as well as revenues of the municipalities. Since the thesis wanted to identify the effect of exogenous revenues shocks on the expenditures, the tax revenues are considered as an independent variable in our models. We distinguished between the positive and negative shock into the tax revenues to account for possible asymmetric responses. Our findings suggest symmetric effects of positive and negative change of the revenues on the expenditures in some categories of current expenditures such as expenditures on housing and security; nevertheless, in most of the categories of current expenditures, the effect is rather asymmetric.

This thesis provides complex answers to many questions; nevertheless, the major finding is that, as expected in our hypotheses, the current expenditures react more sensibly to the exogenous revenue shocks than capital expenditures in case of the Czech municipalities. Revenues used to fund capital expenses are not all exogenous and this thesis proved that the changes in tax revenues do not usually have a significant impact on capital expenditures. Nevertheless, there was found a strong connection between changes in tax revenues and capital expenditures on industry and infrastructure. Moreover, there was found a relationship between transfers (which covers for capital expenses) and changes in revenues – if there is a negative change, the transfers decrease as well. The similar is true for positive change.

Apart from this, when it comes to current expenditures, it was proven by our empirical research that the negative changes to tax revenues tend to decrease the expenditures and positive changes

tend to increase them. Moreover, when there is asymmetry presented, the effect is stronger when with a negative change. In general, there was often more significant and stronger relationship between changes in revenues and expenditures in case of expenditure categories which accounts for largest shares among expenditures. In comparison, the categories, which only take a small portion of the overall expenditures (such as expenses on agriculture), the effect of change tax revenues on them was not proven to be existing at all.

Furthermore, we look at the reaction of mayors with different political affiliation. It was proven that for some current expenditures, the left- and right-wing political blocks tend to decrease some categories of expenditures less than other parties when there is a decrease in the exogenous revenues.

Notwithstanding certain limitations, we believe that this thesis provide a complex analysis of the impact of exogenous revenue shocks on spending of municipalities with extended powers in the Czech Republic. We hope that this master's thesis will be helpful for the policy makers of the municipalities in times of fiscal stress. The current challenging economic situation caused by the virus COVID-19 might bring unpredictable consequences to the funding of the local public governments and we certainly believe that this research can help the local policy makers to understand which expenditures are most likely to be cut or are easiest to be cut immediately as a reaction to lower income.

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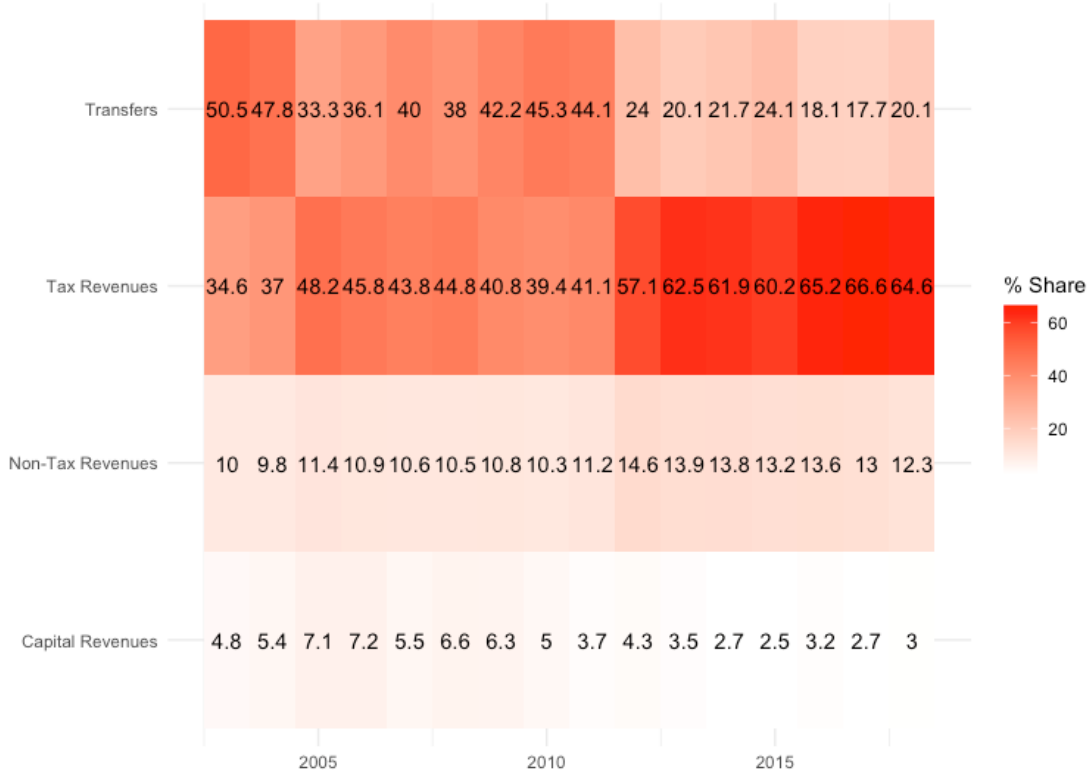
12 Appendices

Appendix 1: % share in the overall revenues by type of revenue



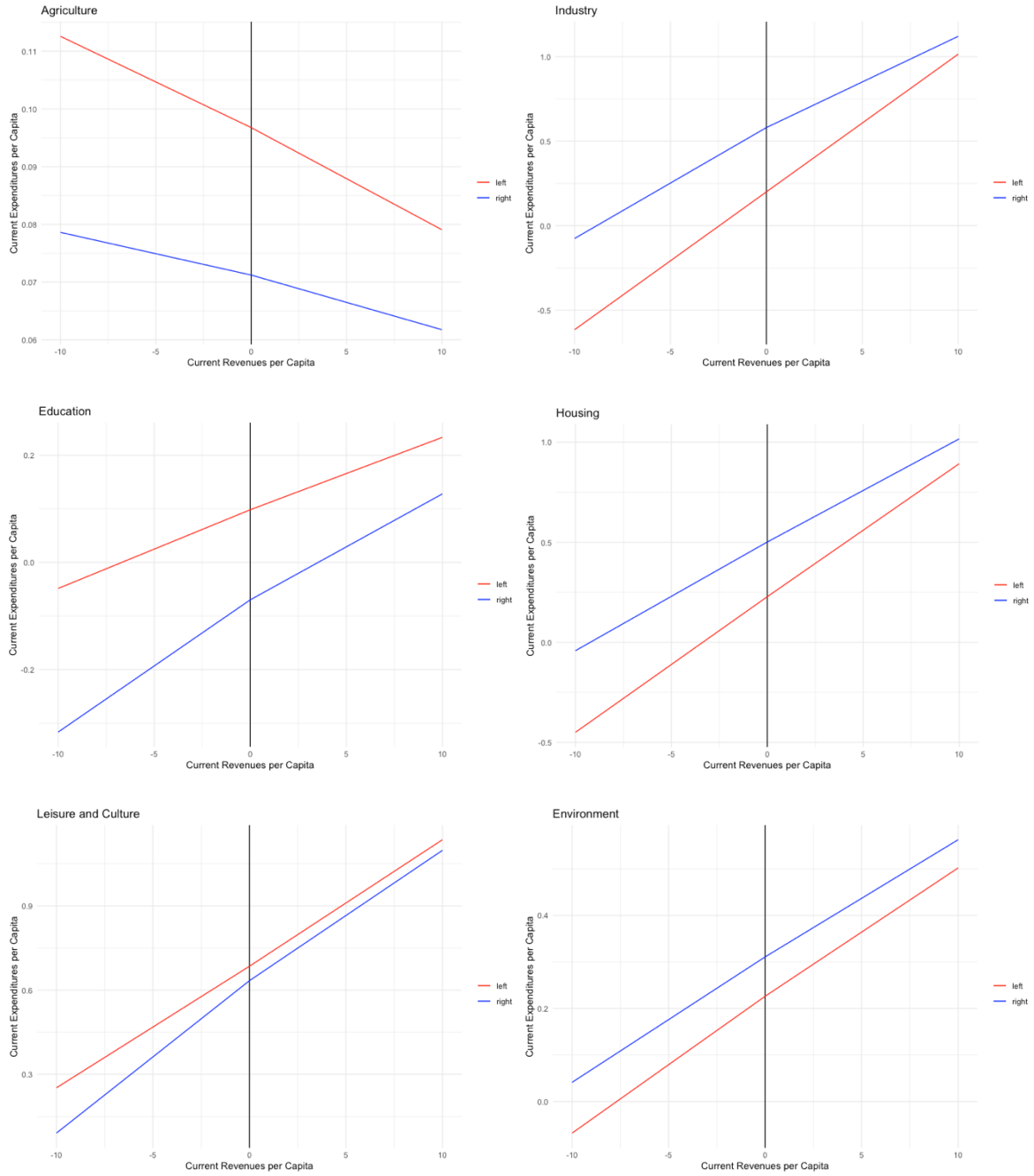
Appendix 2: Description of the used variables and summary statistics

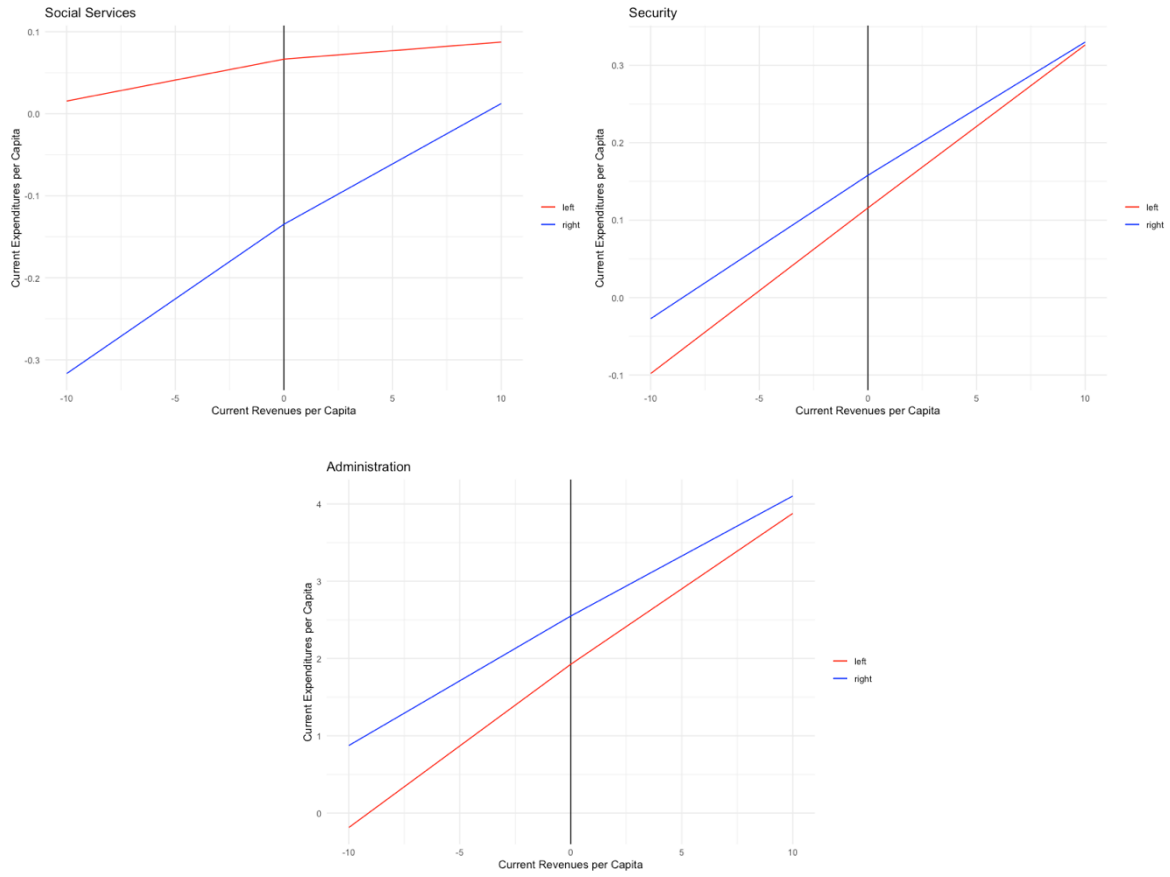
Variable	Description	Unit	St. Dev.	Min	Mean	Max
population	Inhabitants	number of nhabitants	38319	2757	23111	380681
share_young	Share of Young Inhibitants	% of population (0 to 14 years)	1.218	11.440	14.740	20.990
share_prod_age	Share of Inhibitants of Productive Age	% of population (15 to 64 years)	2.969	60	68.712	75.400
share_old	Share of Elderly Inhibitants	% of population (65+ years)	2.890	8.630	16.548	25.640
mayor_left_bin	Left-Wing Block Mayors	binary				
mayor_right_bin	Right-Wing Block Mayors	binary				
mayor_other_bin	Independent and Non-Parliamentary Mayors	binary				
mayor_left	Left-Wing Block Mayors, Newly Established Variable	cumulative sum				
mayor_right	Right-Wing Block Mayors, Newly Established Variable	cumulative sum				
mayor_other	Independent and Non-Parliamentary Mayors, Newly Established Variable	cumulative sum				
agr	Agriculture, Forestry and Fisheries	current expenditures per capita, in TCZK	0.185	-0.015	0.135	1.986
ind	Industrial and Other Sectors of the Economy	current expenditures per capita, in TCZK	1.096	0	1.454	15.645
edu	Education and School Services	current expenditures per capita, in TCZK	0.486	0.058	1.617	8,066
leis	Leisure and Culture	current expenditures per capita, in TCZK	0.764	0.283	2.041	6,272
hou	Housing, Communal Services and Territorial Development	current expenditures per capita, in TCZK	1.262	0.221	2.010	11.282
env	Environmental Protection	current expenditures per capita, in TCZK	0.564	0	1.317	7.934
soc	Social Services and Activities Related to Social and Employment Policy	current expenditures per capita, in TCZK	0.551	0	0.636	3.899
sec	State Security and Legal Protection	current expenditures per capita, in TCZK	0.406	0	0.631	10.292
adm	Public Administration and Services	current expenditures per capita, in TCZK	1.849	1971	5.111	31.146
other	Other Expenditures	current expenditures per capita, in TCZK	3.612	-.,002	3.163	22.809
exp	Current Expenditures	overall current expenditures per capita, in TCZK	4.739	9,867	18.114	65.359
cagr	Agriculture, Forestry and Fisheries	capital expenditures per capita, in TCZK	0.116	0	0.025	3.745
cind	Industrial and Other Sectors of the Economy	capital expenditures per capita, in TCZK	2.762	0	2.125	62.734
cedu	Education and School Services	capital expenditures per capita, in TCZK	1.261	0	0.793	19.231

Variable	Description	Unit	St. Dev.	Min	Mean	Max
cleis	Leisure and Culture	capital expenditures per capita, in TCZK	1.731	0	1.132	30.389
chou	Housing, Communal Services and Territorial Development	capital expenditures per capita, in TCZK	1.997	0	1.510	33.124
cenv	Environmental Protection	capital expenditures per capita, in TCZK	0.829	0	0.258	26.096
csoc	Social Services and Activities Related to Social and Employment Policy	capital expenditures per capita, in TCZK	0.752	0	0.171	22
csec	State Security and Legal Protection	capital expenditures per capita, in TCZK	0.228	0	0.116	3
cadm	Public Administration and Services	capital expenditures per capita, in TCZK	0.619	0	0.322	9.661
cother	Other Expenditures	capital expenditures per capita, in TCZK	0.806	0	0.165	19.000
cexp	Capital Expenditures	capital expenditures per capita, in TCZK	4.525	0.272	6.618	63.146
aagr	Agriculture, Forestry and Fisheries	current and capital expenditures per capita, in TCZK	0.230	-0.015	0.160	3.923
aind	Industrial and Other Sectors of the Economy	current and capital expenditures per capita, in TCZK	3.124	0.049	3.579	63.199
aedu	Education and School Services	current and capital expenditures per capita, in TCZK	1.396	0.059	2.410	21.350
aleis	Leisure and Culture	current and capital expenditures per capita, in TCZK	1.992	0.382	3.173	32.734
ahou	Housing, Communal Services and Territorial Development	current and capital expenditures per capita, in TCZK	2.540	0.297	3.520	41.080
aenv	Environmental Protection	current and capital expenditures per capita, in TCZK	1.008	0	1.575	27.015
asoc	Social Services and Activities Related to Social and Employment Policy	current and capital expenditures per capita, in TCZK	1.007	0	0.807	24.477
asec	State Security and Legal Protection	current and capital expenditures per capita, in TCZK	0.485	0	0.747	10.810
aadm	Public Administration and Services	current and capital expenditures per capita, in TCZK	2.074	2,022	5.433	33.341
aother	Other Expenditures	current and capital expenditures per capita, in TCZK	3.743	0,000	3.328	22.809
all_exp	All Expenditures	overall current and capital expenditures per capita, in TCZK	7.242	11,792	24.474	106.656
r	Tax Revenues	revenues per capita, in TCZK	2.544	8,543	12.782	56.128
transfers	Received Transfers	revenues per capita, in TCZK	6.242	1,138	9.295	66.789

Appendix 3: % share in the overall expenditures by categories of expenditures

Appendix 4: Relationship between revenues and current expenditures with political interactions



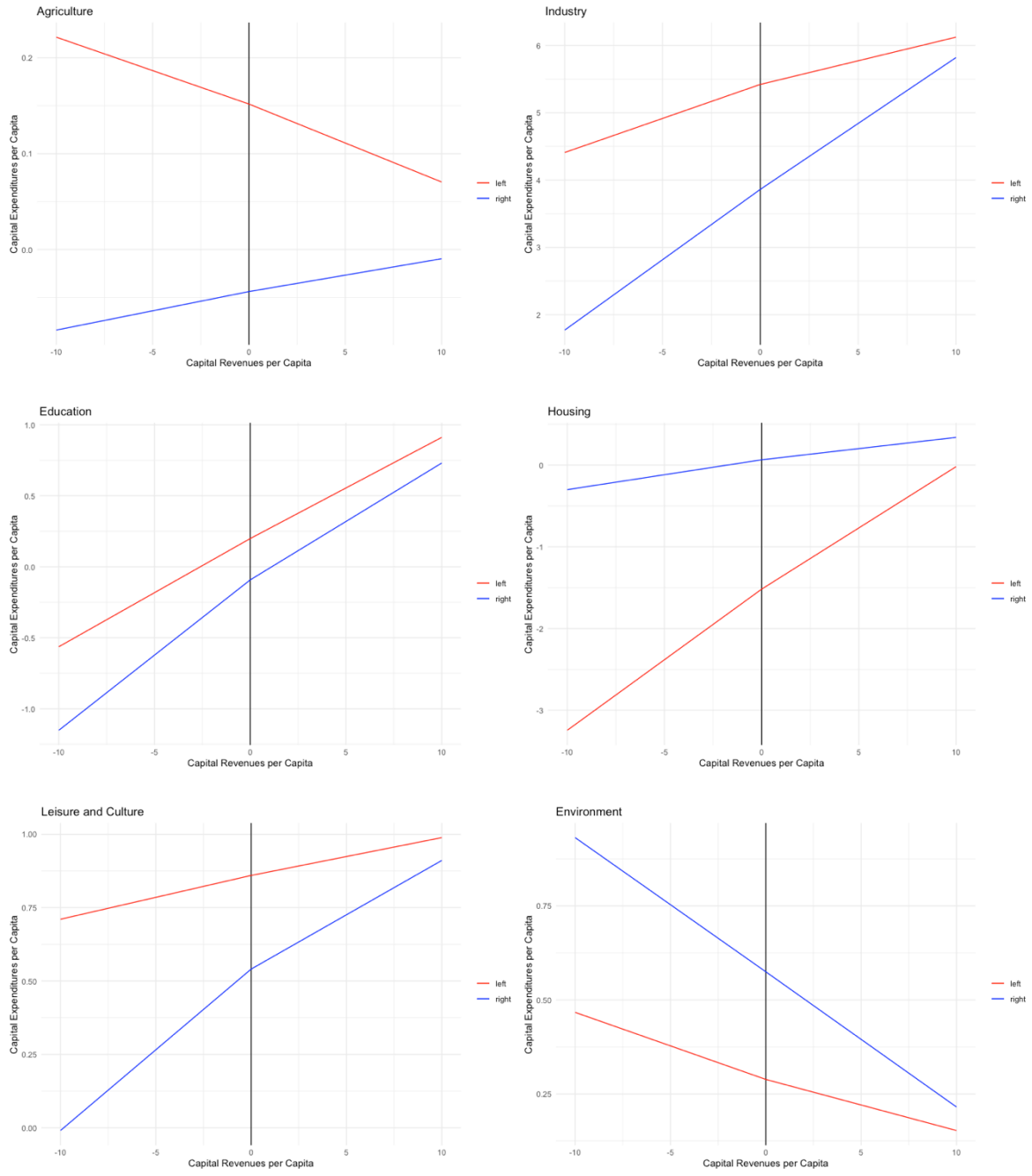

Social Services
Current Expenditures per Capita
Current Revenues per Capita
left
right
Security
Current Expenditures per Capita
Current Revenues per Capita
left
right
Administration
Current Expenditures per Capita
Current Revenues per Capita
left
right

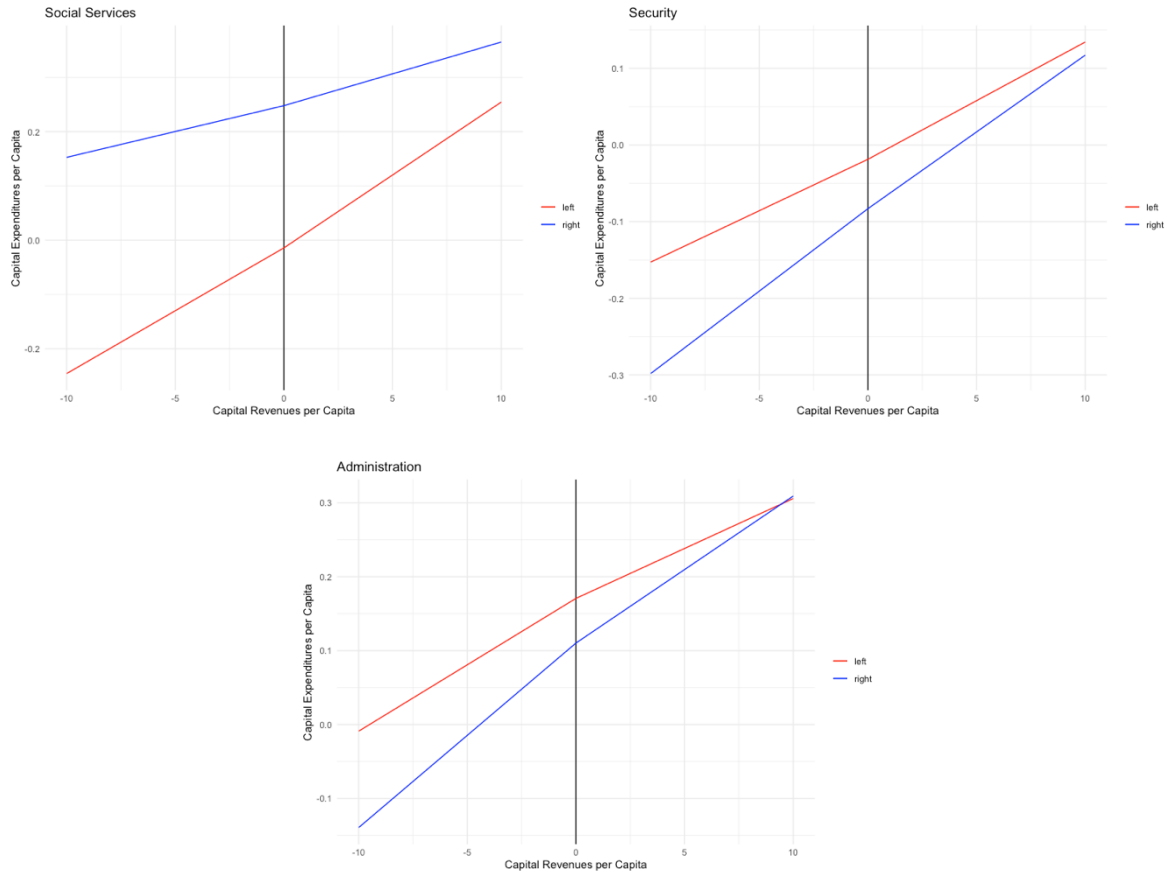
Appendix 5: Political interaction with changes in revenues - regressions outputs for capital expenditures

	Dependent variable:								
	cedu	cagr	chou	cind	cleis	cenv	csec	cadm	csoc
r_p	0.088***	0.0003	0.021	0.512***	0.070*	0.010	0.014***	0.032***	0.030
r_n	0.108***	-0.0002	0.033	0.491**	0.079*	0.003	0.017***	0.039***	0.033
mayor_left	0.199	0.152	-1.518*	5.421**	0.860	0.289	-0.019	0.171	-0.014
mayor_right	-0.092	-0.044	0.064	3.862*	0.541	0.575**	-0.083	0.110	0.248
r_p*mayor_left	-0.017	-0.008	0.128*	-0.442**	-0.057	-0.024	0.001	-0.019	-0.004
r_n*mayor_left	-0.032	-0.007	0.140*	-0.390**	-0.064	-0.021	-0.004	-0.021	-0.010
r_p*mayor_right	-0.006	0.003	0.006	-0.316*	-0.033	-0.046**	0.006	-0.013	-0.019
r_n*mayor_right	-0.002	0.004	0.004	-0.282	-0.024	-0.039*	0.004	-0.014	-0.024
population	0.0001***	-0.00000	-0.00000	-0.0004**	0.00004	0.00003	0.00001	0.00001	0.00002
share_young	0.033	-0.003	-0.061	0.122	-0.120	0.106*	0.006	0.006	0.042
share_old	-0.038	-0.006	0.006	-0.302***	-0.056	-0.014	0.008	-0.005	-0.015
lag(cedu)	0.183***								
lag(cagr)		0.124**							
lag(chou)			0.451***						
lag(cind)				0.277***					
lag(cleis)					0.215***				
lag(cenv)						0.276***			
lag(csec)							0.076**		
lag(cadm)								0.252***	
lag(csoc)									0.359***
N.	3280	3280	3280	3280	3280	3280	3280	3280	3280
Sargan Test (p-value)	0.01	< 2.22e-16	0.55	0.22	0.008	0.23	0.34	0.007	0.44
AR1 (p-value)	4.29e-07	0.001	2.44e-06	0.01	9.12e-08	0.013	4.3e-08	3.83e-05	0.004
AR2 (p-value)	0.0536	0.3275	0.2937	0.1784	0.03	0.28	0.4228	0.008	0.3484

*p<0.1; **p<0.05; ***p<0.01

Appendix 6: Relationship between revenues and capital expenditures with political interactions




Social Services
Capital Expenditures per Capita
0.2
0.0
-0.2
-10
-5
0
5
10
Capital Revenues per Capita
left
right
Security
Capital Expenditures per Capita
0.1
0.0
-0.1
-0.2
-0.3
-10
-5
0
5
10
Capital Revenues per Capita
left
right
Administration
Capital Expenditures per Capita
0.3
0.2
0.1
0.0
-0.1
-10
-5
0
5
10
Capital Revenues per Capita
left
right