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Public investment and municipalities: who receives EU and government subsidies and why?

Master's thesis

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Declaration of Authorship

The author hereby declares that he or she compiled this thesis independently, using only the listed resources and literature, and the thesis has not been used to obtain any other academic title.

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Prague, January 3, 2023

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Abstract

The thesis analyzes the economic and political impact on the distribution of EU funds between municipalities with extended competence in the Czech Republic. The data collected covers the period from 2007 to 2020, which corresponds to the two programming periods of the EU Structural Funds. To estimate the coefficients in dynamic models, we performed a system GMM procedure. The significant results obtained demonstrate a positive effect between the tax revenues of the municipality and the subsidies received. This supports the hypothesis that politicians may allocate more funds to more developed municipalities to achieve greater efficiency. Also, we indicated a political influence on the EU funds allocation process. The size of transfers significantly increases in the election years. This suggests that politicians are channelling more financial support to municipalities ahead of elections in an effort to increase voter support.

JEL Classification	D72, C33, H71
Keywords	EU Structural Funds, subsidies, panel data, municipalities, GMM
Title	Public investment and municipalities: who receives EU and government subsidies and why?

Abstrakt

Práce analyzuje ekonomický a politický dopad na rozdělování fondů EU mezi obce s rozšířenou působností v České republice. Shromážděná data pokrývají období let 2007 až 2020, což odpovídá dvěma programovým obdobím strukturálních fondů EU. Pro odhad koeficientů v dynamických modelech byla provedena systémová procedura GMM. Získané výsledky prokazují významný pozitivní vliv mezi daňovými příjmy obce a přijatými dotacemi. To podporuje hypotézu, že politici mohou alokovat více prostředků do rozvinutějších obcí, pro dosažení vyšší efektivity. Také jsme naznačili politický vliv na proces alokace fondů EU. Velikost převodů výrazně narůstá ve volebních letech. To naznačuje, že politici směřují před volbami větší finanční podporu obcím ve snaze zvýšit podporu voličů.

Klasifikace JEL	D72, C33, H71
Klíčová slova	Evropské strukturální a investiční fondy, dotace, panelová data, obce, GMM
Název práce	Veřejné investice a obce: kdo dostává EU a národní dotace a proč?

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Acronyms

CR Czech Republic

CZSO Czech Statistical Office

EU European Union

FD First Difference

FE Fixed Effect

GMM Generalized Method of Moments

IV Instrumental Variable

LAU Local Administrative Units

NUTS Nomenclature of Territorial Units for Statistics

OP Operational Programme

OLS Ordinary Least Squares

POLS Pooled Ordinary Least Squares

RE Random Effect

SF Structural Funds

Master's Thesis Proposal

Author	Bc. Ekaterina Tolstoguzova
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Proposed topic	Public investment and municipalities: who receives EU and government subsidies and why?

Motivation The European Structural Funds were created to provide the regional policy of the European Union. Their main function is to promote economic convergence between member states, as well as between richer and poorer regions within these states. The EU funds mechanism is designed in such a way that the European Commission develops objectives and policies and thus creates a common framework for structural funds. However, most of the responsibility for making decisions on the selection of specific projects lies with the central governments of the member countries. This leaves a lot of room for decision-makers on the allocation of funds at the national level to achieve their own political goals.

Although the cohesion policy of the European Union is aimed at achieving equality between regions within one state, in reality, some countries are focusing on improving the national economy as a whole. Some politicians are of the opinion that it is more profitable to place subsidies in wealthier regions for greater national benefit (Bloom & Petrova, 2013).

There are also researches confirming that in situations where the central government distributes subsidies, regional funding can follow the principles of a "pork-barrel" policy. Veiga (2012) present, based on data from Portugal, that more funds are transferred to municipalities where the governing party is supported, and that funding increases during election years. Banaszewska & Bischoff (2017) demonstrate similar results in Poland.

Hypotheses

1. EU subsidies are allocated to poorer regions to reduce inequality between regions

2. EU subsidies are allocated to more developed regions to achieve greater efficiency

3. Municipalities with more votes for governing political parties receive more subsidies from European structural funds.

Methodology For this study, I will collect a panel dataset. The data will provide information on municipalities in the Czech Republic for two programming periods of EU Structural Funds, 2007-2013 and 2014-2020. The dataset will contain economic, demographic, and political indicators. Following Veiga (2012) I will build a linear dynamic model that will contain subsidies per capita as the dependent variable. As independent variables I will include socioeconomic data to describe wealth and development of regions, and political data to test the hypothesis about "pork-barrel" policy. The model will include the effect of each individual municipality, which can be fixed or random.

I will use Generalized Method of Moments (GMM) to estimate the model. According to Lee&Yu (2014) this estimator has good efficiency for analyzing the spatial dynamic panel data with fixed effect in cases where n is much large than t.

In addition, I will perform the same analysis, but I will combine the municipalities into NUTS II regions to examine whether the number of grants increased in the pre-election and elections years. Also, I will compare the results between 2007-2013 and 2014-2020 programming periods

Expected Contribution The contribution of this paper is to examine various hypotheses about the distribution of EU subsidies at the national level to explain why some regions receive more EU regional subsidies, while others receive less or nothing at all. Most of the previous research in this area has focused on the 2007-2013 policy period and earlier. In this thesis, we will expand the analysis to another program period 2014-2020 and try to improve the analysis considering the results of previous studies.

Outline

1. Introduction: In this section I will introduce the theoretical background and motivation on examining this topic.

2. Studies on gasoline demand: I will briefly describe how people estimate the price elasticity of gasoline demand.

3. Data: I will explain how I will collect estimates from studies estimating the elasticity.

4. Methods: I will explain modern meta-analysis methods, including the funnel asymmetry test, precision effect test, and multilevel variants of these regressions.

5. Results: I will discuss my baseline regressions and robustness checks.

6. Concluding remarks: I will summarize my findings and their implications for policy and future research.

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Chapter 1

Introduction

The European Structural Funds were created to support the regional policy of the European Union. Their primary function is to promote economic convergence between member states, as well as between richer and poorer regions within these states. The EU funds mechanism is designed in such a way that the European Commission develops objectives and policies and thus creates a common framework for structural funds. However, most of the responsibility for making decisions on the selection of specific projects lies with the central governments of the member countries. This leaves a lot of room for decision-makers on the allocation of funds at the national level to achieve their own political goals. Although the cohesion policy of the European Union is aimed at achieving equality between regions within one state, in reality, some countries are focusing on improving the national economy as a whole. Some politicians have an opinion that it is more profitable to place subsidies in wealthier regions for more significant national benefit (Bloom & Petrova (2013)).

There are also studies confirming that in situations where the central government distributes subsidies, regional funding can follow the principles of a "pork-barrel" policy. It means sponsorship and distribution of grants from the general budget for the needs of local communities, carried out in order to increase the rating of a particular politician among local voters. Veiga (2012) present, based on data from Portugal, that more funds are transferred to municipalities where the governing party is supported and that funding increases during election years.

This process has several implications for the continued functioning of the political system and the quality of democracy. The first consequence is the undermining of the principles of transparency. If the distribution of subsidies

is to be governed by specific rules, but the distribution results do not comply with these rules, then the question arises as to what actually happens in the distribution of subsidies. This situation can then lead to an exacerbation of the topic of corruption in public discourse. According to Warren (2016) and Peters (2016), another consequence is the possible distortion of the communication of third-party voters. In modern democracies, this connection is based on the representation of the interests of the voter. However, suppose the set of voter interests is replaced only by financial gain. In that case, the element of accountability disappears from the whole process, and the parties have complete discretion in actions that may not be in the interests of their constituents. The severance of relations based on the representation of interests can lead to other negative aspects of political behaviour, such as non-participation in elections or protest elections.

The contribution of this paper is to examine the following hypotheses about the distribution of EU subsidies at the national level:

1. EU subsidies are allocated to poorer municipalities to reduce inequality between regions

2. EU subsidies are allocated to more developed municipalities to achieve greater efficiency

3. Municipalities with more votes for governing political parties receive more subsidies from European structural funds.

We are trying to explain why some regions receive more EU regional subsidies while others receive less or none at all. For this proposal, panel data were collected from 2007 to 2020. The dataset contains data on EU funds and socioeconomic data on municipalities to test the first and second hypotheses. The results of the parliamentary elections, as well as their performance in the municipalities, were added to test the third hypothesis about the existence of the "pork-barrel" policy in the allocation process.

Following Veiga (2012) the linear dynamic model was built. It contains subsidies per capita as the dependent variable. As independent variables, we included socioeconomic data to describe the wealth and development of regions, and political data to test the hypothesis about the "pork-barrel" policy. The model includes the effect of each individual municipality, which can be fixed or random. The Generalized Method of Moments (GMM) estimates the model presented in this thesis. According to Lee & Yu (2014), this estimator has good

efficiency for analyzing the spatial dynamic panel data with fixed effect in cases where n is much large than t.

The rest of this work is structured in the following way. In Chapter 2 we describe the background theory for this work and present research on the issue of EU funds allocation, in particular, we describe the pork-barrel politics with an overview of existing work in these fields. Chapter 3 provides information about the administrative division and political system in the Czech Republic. In addition, we include information about political parties in the Czech Republic during the observed period. Chapter 4 is devoted to a description of EU Funds. In chapter 5 we describe our data collection process and provide an analysis of the collected data. In chapter 6 we will describe in detail the models and estimation methods that we use to analyse the hypotheses mentioned above. Chapter 7 contains a crucial empirical result and discussion. In the final chapter, we will provide a summary of this work.

Chapter 2

Literature Review

The distribution of public finances is an important part of the implementation of public policy. According to the European Union's cohesion policy, grants should go first to the worst-performing regions in order to help them reach a more developed level. However, empirical research shows that the distribution of public finances under the influence of political motives distorts and weakens these economic goals. Much of the responsibility for making decisions on the selection of specific projects lies with the central governments of the member countries. In selecting projects for funding and determining the size of grants to be allocated to different districts and municipalities, governments may pursue their own political interests.

In this section, we look at studies that examine the political and economic motivations of governments in allocating funding at the regional level to explain why some municipalities received more EU regional assistance and others received less or none at all.

According to economic theory, capital with higher marginal returns comes from investment in poorer regions, Grieco & Ikenberry (2003), which is in line with EU goals. Bouvet & Dall'Erba (2010) analyzed the impact of economic and political variables on the distribution of EU funds in 1989-1999. They built a Tobit model and found that regions with lower GDP per capita were more likely to receive funding. Dellmuth & Stoffel (2012) in their study of the distribution of subsidies at the regional level in Germany reach similar conclusions.

However, distributing subsidies to regions with existing infrastructure may prove to be a better investment. Politicians may believe that the national economy as a whole will benefit from efficiency gains by allocating money from

EU funds to already developed regions.

A study by De Rynck & McAleavey (2010) analyzes the impact of the European Union's cohesion policy. EU treaty obligations, provisions, and policy instruments encourage economic convergence both between member states and between regions within these countries. They conclude that policy uncertainty may lead politicians in less developed member countries to be more interested in raising the overall economic level of the state, thereby choosing economic efficiency in the hope of further foreign economic convergence.

The issue of efficiency over fairness in the distribution of subsidies is more relevant in the new EU member states. Bloom & Petrova (2013) devote their research to the distribution of EU funds in the municipalities of Latvia and Bulgaria. Using the OLS method, they study the impact of socioeconomic variables on the size of subsidies received. They obtained statistically significant results, indicating that in both countries, more funds were directed to wealthier areas. Marin (2020) analyze data from Romania for the period 2009-2012. The multiple linear regression model shows that rural municipalities with high administrative capacity and high levels of social development are more likely to have more projects approved for European funding.

In addition to economic motives, politicians may also have personal goals in the distribution of funding at the regional level. According to Hoare (1992), in an environment where political parties are dominated by individual elected actors, resource allocation is mainly used to ensure sufficient support for the proposed legislative agenda. In the literature, the term "pork-barrel" politics is used to refer to cases where the ruling parties direct public finances to certain areas based on political interests in order to gain the favour of voters. The United States is a typical example of this individual model. Much of the work on "pork-barrel" politics has been done within the single-member district organizational structure of the United States. Members of Congress are trying to allocate more funding to their districts to boost voter acceptance (Cox & McCubbins (1986); Lee (2000)). The "pork-barrel" politics also was studied in Cox & McCubbins (2005). They analyzed the Canadian data and found that party leaders allocate subsidies to improve party success.

A similar situation exists in parliamentary systems with a multi-member composition. Political parties prevail over individual actors, which is typical for European states. Golden & Picci (2008) found that when constituencies elect politically more powerful MPs from ruling parties, they receive more investment, which may indicate political influence in the subsidy distribution

process in Italy. Veiga (2012) analyzed the distribution of funds between the municipalities of Portugal in the period from 1974 to 2005. They built a dynamic model and found that political motives influence the allocation of funds by the national government to municipalities. Grants to municipalities increase during local election years, and larger grants are given to municipalities where the national party has received more voter support. Similar results for municipalities in Poland were obtained in Banaszewska & Bischoff (2016) and in Bloom & Petrova (2013) for Latvia and Bulgaria. Research findings from Hungary also confirm the influence of politicians on the distribution of funds. Murakozy & Telegdy (2016) and Papp (2019) showed that among municipalities governed by politically independent mayors, coordination with the central government increases per capita funds allocated to public funds and for construction purposes.

Czech studies by Hána (2013) and Hána (2014) have also identified a "pork-barrel" policy. These analyses cover the distribution of subsidies by districts or municipalities and indicate their influence for party reasons. The works provide factual knowledge about the functioning of distribution mechanisms in the Czech Republic at the national level. Spac *et al.* (2018) used binary logistic regression to analyze municipality data for the Central Bohemian Region between 2014 and 2016. They found that party affiliation strongly affects a municipality's chances of receiving a subsidy, especially when funds are released before an election. However, political variables had little effect on the size of the subsidy received by the municipality.

As noted earlier, the topic of the distribution of public finances has an important place in the economic discussion. Although the number of studies analyzing the distribution of European funds at the regional level in member countries is growing, they are still few. Most of the previous research in this area has focused on the 2007-2013 policy period and earlier. They mainly have focused on the "pork-barrel" policy and have not taken into account the wealth and development of the municipality. In this thesis, we will expand the analysis to another program period 2014-2020 and try to improve the analysis considering the results of previous studies. The theoretical literary background of the methodology and motivation for the selection of a model for this study are discussed in Chapter 6.

Chapter 3

Institutional background in the Czech Republic

This chapter provides information about the administrative division and political structure of the Czech Republic. The first section describes in detail the administrative structure of the Czech Republic and the peculiarities of subnational administration in regions and municipalities. One of the hypotheses that we want to check in this work is whether municipalities that vote for governing parties receive more subsidies. For this, we need a better understanding of the electoral process in The Czech Republic and which parties ruled between 2007 and 2020. So the second section is devoted to a brief description of the political system and the electoral process. And the last section will provide a brief summary of the elections to the Chamber of Deputies that were held between 2006 and 2020.

3.1 Administrative division

The NUTS (La Nomenclature des Unites Territoriales Statistiques) classification was introduced by the Statistical Office of the European Communities (Eurostat) in cooperation with other EU institutions for the purpose of classifying a unified structure of territorial units. The construction of the classification was based on the uniform methodological principles of Eurostat, taking into account the administrative organization of a particular state.

On January 1, 2000, the CZ-NUTS classification was introduced for the standardized classification of territorial units in the Czech Republic. This system is used for statistical monitoring and analysis by the Czech Statistical

Office (CZSO) and the European Statistical Office (Eurostat). Since 2008, the NUTS classification has consisted of 4 levels. For territorial units below the region, there is a system LAU (Local Administrative Units), the purpose of which is to capture territorial units of a regional nature. Both statistical systems are interconnected.

Source: Ministry of Regional Development CZ

Figure 3.1: The administrative division of the Czech Republic

In the Czech Republic, according to this classification, the NUTS 0 and NUTS I levels correspond to the entire country. The NUTS II level was created in the Czech Republic artificially for the needs of the European Union. It comprises eight territorial units without their own administration, called cohesion regions, which represent the grouped NUTS III regions. The NUTS III level includes 14 territorial entities, including 13 regions and the capital city of Prague. Act No. 129/2000 Coll. (Establishment of Regions) gives the regions the status of the highest territorial self-government units. In the region, the state administration is carried out by its own bodies in two main types of activity: independent and delegated powers. Their exact volume is specified in the Act on Regions. Unlike delegated powers, independent powers are not subordinate to state authorities; they are autonomously exercised by the regions in

accordance with the legal system. Elections to regional councils are held every four years, after which a regional council and a regional governor are formed.

Regions, in turn, are divided into districts and municipalities. Act No. 128/2000, Coll. on Municipalities (Establishment of municipalities) defines a municipality as a territorial entity, which is the main territorial self-governing community of citizens. According to the CZSO, there were 6253 municipalities in the Czech Republic by 2016. Municipalities have independent competence in the implementation of their own policies, as well as delegated powers, that is, provide services from the national government. Depending on the degree of delegated authority, municipalities can be divided into three groups: municipalities with elementary delegated powers, authorised municipal offices, and municipalities with extended competence. Each municipality with extended competence, in addition to its own functions, fulfils the duties of an authorised municipal office, as well as a municipality that exercises delegated powers in the usual scope. There are currently 205 municipalities with extended competence in the Czech Republic.

3.2 Political system

The Czech Republic is a unitary state, a representative democracy and a parliamentary republic with a multi-party system. Executive power is delegated to the president, and the government is headed by the prime minister. The legislative power consists of the parliament, the judicial power is exercised by a system of courts.

The government consists of the prime minister, deputy prime minister, and ministers. The government is directly responsible to the Chamber of Deputies, which expresses confidence in it. The government can issue regulations within the laws and expand them. It also draws up the state budget and the state final report.

The Parliament of the Czech Republic has two chambers. It consists of the Chamber of Deputies and the Senate. In the Senate, the upper chamber, a third of the 81 senators are elected every two years by a two-round majority system. Elections to the Senate are regulated by Act No. 247/1995 Coll., on elections to the Parliament of the Czech Republic. The Senate considers bills submitted to it by the Chamber of Deputies. In addition, it has the right to the legislative initiative so that it can submit its own bills to the Chamber of Deputies.

The Chamber of Deputies is the lower chamber, it consists of 200 deputies who are elected for a period of four years by a proportional system. Elections are held in 14 multi-member constituencies, replicating the regional structure. The number of mandates in individual constituencies is not known in advance, it is determined only after the elections using the number of votes cast in individual constituencies. Only deputies from parties or movements that exceed a 5% electoral gain receive mandates. The limit is 5% for a party or movement, 8% for two-member coalitions, and 11% for multi-member coalitions. Elections to the Chamber of Deputies are regulated in more detail by the Act on Elections to the Parliament of the Czech Republic (No. 247/1995 Coll.). The Chamber of Deputies adopts laws, approves the state budget, has the right to change constitutional laws, approves the sending of military personnel abroad, and decides a number of other issues important for the legislative functioning of the state.

3.3 Czech legislative elections between 2006-2020

In this work, we are focused on EU funds programming periods between 2007 and 2020. During this time, there were three elections to the Chamber of Deputies in 2010, 2013 and 2017. However, we are also interested in the elections held in 2006 since, according to our "pork-barrel" policy hypothesis, representatives elected in those elections might affect the distribution of EU funds. So let's briefly describe the results of these elections.

The 2006 Parliamentary elections were held in June. Five parties crossed the 5% threshold that is ODS, ČSSD, KSČM, KDU-ČSL, and Strana Zelených. ODS gained first place with 35.38% of the votes, and thus Mirek Topolánek, ODS party leader, was named by the president to form a government. To form a government, ODS needed support from other parties. Therefore, they formed a coalition with KDU-ČSL and Strana Zelených. The government of Mirek Topolánek lasted till May 8 2009 and resigned due to a vote of no confidence. Jan Fisher was named a new prime minister and formed a temporary government until the elections of 2010.

The Legislative elections of 2010 were held at the end of May. Again five parties crossed the 5% threshold - ČSSD, ODS, TOP 09, KSČM and Věci veřejné. Even though ČSSD received first place with 22% of votes, Peter Nečas, the leader of ODS party (20% of votes), was named the new prime minister. ODS formed a coalition together with TOP 09 and Věci veřejné. The government

of Petr Nečas was forced to resign as a result of the corruption scandal. A caretaker government of Jiří Rusnok was appointed by the president. However, it didn't receive a vote of confidence leading to snap elections in 2013.

The early elections of 2013 were held at the end of October. In these elections, seven parties crossed the 5% threshold - ČSSD, ANO, KSČM, TOP 09, ODS, Úsvit and KDU-ČSL. ČSSD gained first place with 20% of votes, and their leader Bohuslav Sobotka was named prime minister. ČSSD formed a coalition with ANO and KDU-ČSL. The government of Bohuslav Sobotka served its full term before the elections of 2017.

The last legislative elections that we will look at were held on October 20 and 21, 2017. Nine parties crossed the 5% threshold in these elections - ANO, ODS, Pirati, SPD, KSČM, ČSSD, KDU-ČSL, TOP 09 AND STAN. With almost 30% of votes and a win in every electoral district, ANO received first place. Andrej Babiš, the leader of ANO, was appointed prime minister and to create a government ANO formed a coalition with ČSSD. The government of Andrej Babiš served its full time and officially resigned before the elections of 2021.

Chapter 4

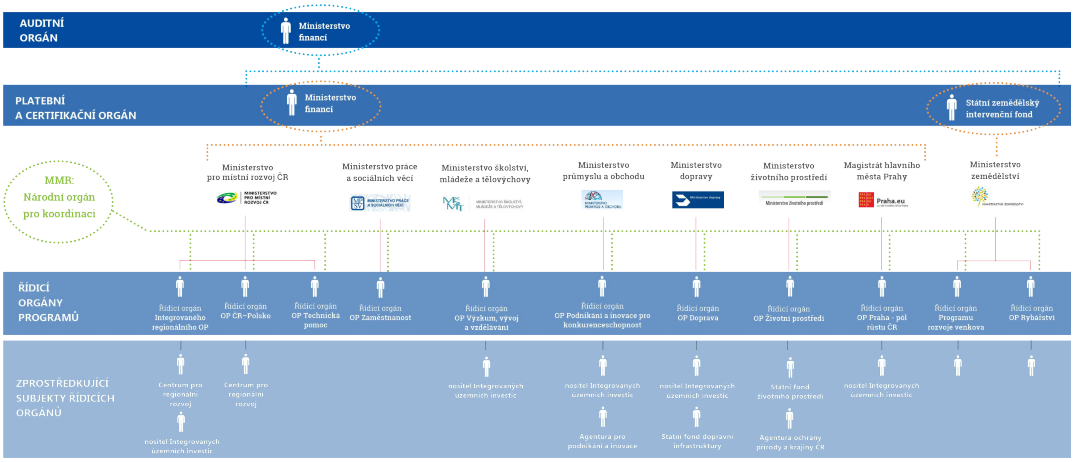
European Structural and Investment Funds

The ESIF consists of five different funds, all of which fall within the scope of Regulation (EU) No 1303/2013 of the European Parliament and of the Council. The Structural Funds consist of two components: the European Regional Development Fund (ERDF), which has provided financial support since 1975 for the development and structural changes of regional economies, economic change, increased competitiveness, as well as for territorial cooperation throughout the EU, and the European Social fund (ESF), which was created in 1958 and seeks contributions to support the adaptability of workers and enterprises, access to employment and participation in the labour market, social inclusion of disadvantaged people, the fight against all forms of discrimination and the creation of partnerships to drive reforms in the field employment. The other three funds that are part of the ESIF are the Cohesion Fund, which exclusively supports less developed Member States, the European Agricultural Fund for Rural Development (EAFRD) and the European Maritime and Fisheries Fund (EMFF).

One of the main goals of the European Union is to improve the standard of living. The cohesion policy aims to balance differences between EU regions through support from EU funds. Their goal is to support economic growth and at the same time reduce social and economic inequalities between states and regions of the European Union. To implement the cohesion policy, the EU adheres to seven-year plans, and programming periods. The Czech Republic, like the rest of the Member States, prepares program documents and strategies for each period, which describe the budget and goals that the countries plan to achieve. Since joining the EU, the Czech Republic has been participating in

the four program periods.

The distribution process of grants begins with European institutions jointly approving the allocation of money for cohesion policies and individual funds. Member states then determine their priorities and agree with the European Commission on how the money will be distributed. The result of the negotiations is the so-called Partnership Agreement, in which money from European funds is divided into particular operational programs. Each operational program contains information on specific goals, priorities, and supported activities, and indicates who can apply for a grant. The governing authority controls the fulfilment of the assigned tasks, compliance with the rules and the smooth progress of the delivery. Individual projects that meet the established priorities are financed from operational programs. Support can be received by municipalities, regions or schools, as well as private companies and small businesses. The amount of the subsidy varies depending on the type of the project, usually 50-85% of the total budget.



Source: www.dotaceeu.cz

Figure 4.1: Implementation structure of EU funds in the Czech Republic

The implementation of the program has several levels. This concerns the structure and responsibilities of the institutions responsible for program management and implementation. Figure 4.1 shows the implementation structure of European funds in the Czech Republic. According to Government Resolution No. 198/2006 in the Czech Republic, the Ministry of Regional Development acts as the National Coordinating Authority (NCA). It is the partner of the European Commission for the Czech Republic, manages the Partnership

Agreement at the national level, and is the methodological body in the field of implementation.

The Ministry of Finance plays the role of an audit authority. It is responsible for ensuring that audits are carried out to verify the effective functioning of the program management and control system and for the implementation of activities in accordance with the general regulation. In addition, with the support of the State Agricultural Intervention Fund, it is responsible for the overall financial management of funds provided to the Czech Republic from the EU budget and for expenditure verification. Eight ministries act as managing authorities, which are responsible for the effective and efficient economical management and implementation of the program in accordance with the principles of sound financial management.

4.1 Programming period 2007-2013

According to Hovorka & Kus (2014) the Czech Republic was able to receive about 26.69 billion euros from various funds between 2007 and 2013. The European Union financed a maximum of 85% of the costs, the Czech state had to co-finance the projects.

To attract EU funds, the Czech Republic identified specific objectives that included a competitive economy, an open, flexible and cohesive society, an attractive environment and balanced territorial development. 26 operational programs were adopted, which are divided into thematic, regional, programs for Prague, and programs within the framework of the European goal of territorial cooperation.

Most of the allocated resources went towards the Convergence objective. The aim of this objective is to support the economic and social development of NUTS II regions with GDP per capita below 75% of the European Union average. Eight thematic operational programs have been created for this objective in CR. Regional operating programs (ROP NUTS II) have been developed for all cohesion regions except Prague. Figure 4.2 demonstrates the distribution of the funds between operating programs. Most of the resources were allocated to OP Transport and OP Environment, with a share of 21,5% and 18,5% respectively. Funds between the regional programs were distributed approximately equally and made up about 18% of all allocations.

OP Abbreviation	Name of OP / ROP	Financial source	Managing authority	Allocation-EU sources (CZK bn.)	Share in total allocation (%)
1st target: Covergence					
Thematic OP					
OP T	OP Transport	CF/ERDF	Ministry of Defence and Armed Forces	151,7	21,5
OP E	OP Environment	CF/ERDF	Ministry of the Environment	130,6	18,5
OP EI	OP Enterprise and Innovation	ERDF	Ministry of Industry and Trade	81,8	11,6
OP RaDfI	OP Research and Development for Innovations	ERDF	Ministry of Education, Youth and Sports	55,3	7,8
OP EC	OP Education for Competitiveness	ESF	Ministry of Education, Youth and Sports	46,6	6,6
OP HRE	OP Human Resources and Employment	ESF	Ministry of Labour and Social Affairs	49,9	7,1
IOP	Integrated Operational Programme	ERDF	Ministry of Regional Development	42,8	6,1
OP TA	OP Technical Assistance	ERDF	Ministry of Regional Development	4,6	0,7
Regional OP					
ROP NW	ROP NUTS II North-West	ERDF	RC North-West (Usti nad Labem)	19,8	2,8
ROP MS	ROP NUTS II Moravia-Silesia	ERDF	RC Moravia-Silesia (Ostrava)	19,7	2,8
ROP SE	ROP NUTS II South-East	ERDF	RC South-East (Brno)	18,8	2,7
ROP CM	ROP NUTS II Central Moravia	ERDF	RC Central-Moravia (Olomouc)	17,6	2,5
ROP NE	ROP NUTS II North-East	ERDF	RC North-East (Hradec Kralove)	17,4	2,5
ROP SW	ROP NUTS II South-West	ERDF	RC South-West (Ceske Budejovice)	16,6	2,4
ROP CB	ROP NUTS II Central Bohemia	ERDF	RC Central Bohemia (Prague)	14,9	2,1

Source: Hovorka & Kus (2014)

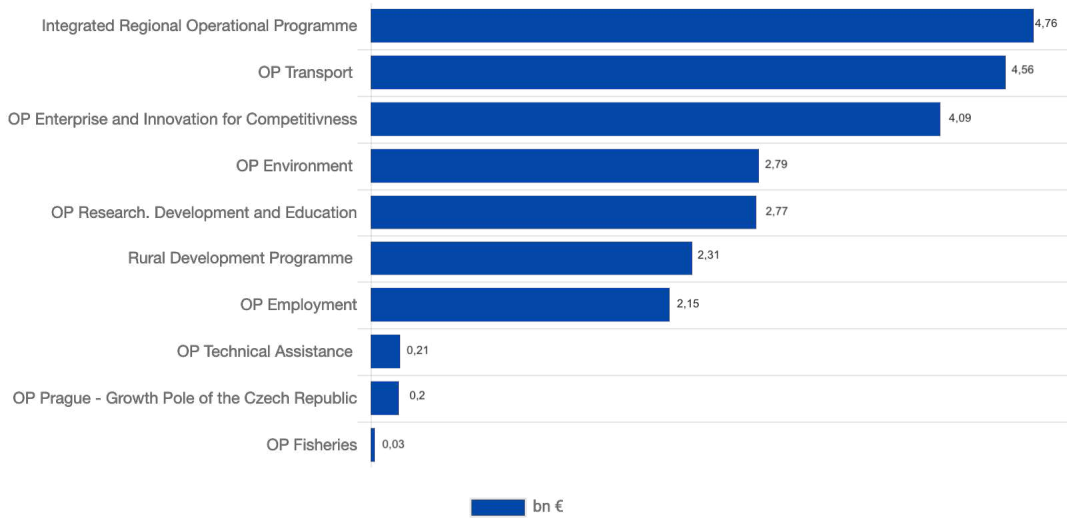
Figure 4.2: Operational Programmes in programming period 2007-2013

4.2 Programming period 2014-2020

The funds allocated by the European Union in the program period 2014-2020 were mainly aimed at maximizing the implementation of the goals stated in EU Strategy 2020. The goal of the Europe 2020 Strategy was to achieve sustainable economic growth in the EU through more effective investments in education, research, development and innovation, and the development of the competitive industry. For the programming period 2014-2020, the European Commission has approved funding for the Czech Republic in the amount of almost 24 billion euros.

In comparison with the programming period 2007-2013, the number of operational programs has been reduced in the Czech Republic. Seven regional operational programs for the period 2007-2013 were combined into one. The priority of this Integrated Regional Operational Programme is to enable the balanced development of the territory, improve the quality of infrastructure, improve public services and public administration and ensure the sustainable development of municipalities, cities and regions. The system also included the Rural Development Program and the Fisheries Operational Program (in line with the Rural Development Policy and the General Fisheries Policy). Figure 4.3 presents the distributions of funds between operational programs. Most of

the resources have been allocated to the Integrated Regional Operations Programme. Next, come OP Transport and OP Enterprise and Innovation for Competitiveness, which received 4.56 and 4.09 billion euros, respectively.



Source: www.dotaceeu.cz

Figure 4.3: Operational Programmes in programming period 2014-2020

Chapter 5

Data

The chapter describes the data collection and preparation process. It provides detailed information about the structure of the obtained data, including descriptive statistics and a description of the data analysis. A panel dataset was collected for the analysis presented in this thesis. The data cover the period from 2007 to 2020, which corresponds to the two programming periods of the EU Structural Funds. A dataset of 205 municipalities with extended competence in the Czech Republic from various sources is used to test the hypotheses formulated above. The Capital City of Prague simultaneously plays the role of municipality and region. Due to its specificity, it is not included in the analysis.

The final dataset is provided in two forms. The first contains socioeconomic data on municipalities and data on EU funds to test the first two hypotheses about an EU Cohesion Policy in the subsidy allocation process. The second form is used to test the third hypothesis about "pork-barrel" politics. Therefore, the dataset was enriched with political indicators, so we added the results of the parliamentary elections.

A table with a summary of descriptive statistics for all data collected, some additional figures and information about the obtained data are provided in the Appendix.

5.1 EU Funds data

The basic components of the dataset are lists of grant applications, including the size of the required subsidy. The lists of operations for both programming periods were obtained from the European Fund Portal in the Czech Republic[1].

[1] www.dotaceeu.cz

This data contains information about specific projects implemented in a given period and recipients of support from European Funds. For each project, information is provided on the amount of support, from which operating program it was received, the name, and the identification number of the recipient of the grant. We filtered out only those projects for which the grant applicant was the municipality with extended competence. We then grouped the data by the identification number of the applicant and year to get the final amount of subsidies each municipality received in that particular year.

The figure 5.1 below demonstrates the distribution of the total amount of EU funds received by all municipalities over the years. The first programming period officially began in 2007, but the first subsidies received were only registered in 2008. We clearly see that municipalities draw subsidies unevenly over the years. The largest amount of subsidies was received by the municipalities in 2011, amounting to almost 15 billion CZK. The main decrease is observed in 20015 and 2016. This may be due to the fact that in these years only residual project grants for the program period 2007-2013 were received, and project grants for the period 2014-2020 have only just begun to be disbursed.

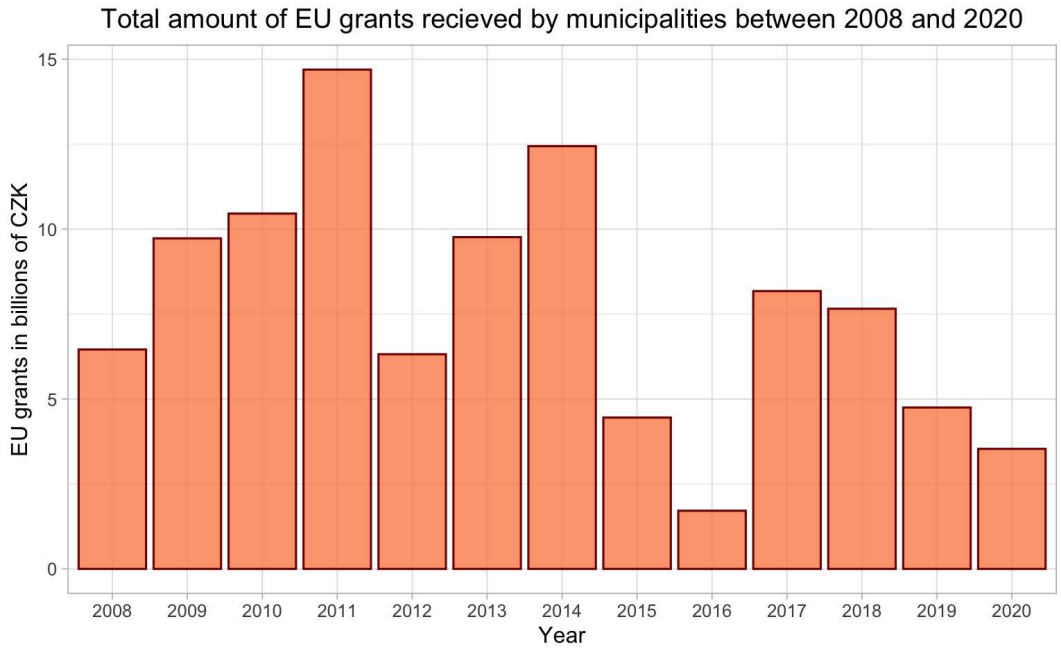


Figure 5.1: Total subsidies received by year

Figure 5.2 shows boxplots by year. They provide us with more detailed information about the distribution of subsidies between different municipalities. We can see that in 2008 half of the municipalities did not receive subsidies. This

can be explained by the fact that, as mentioned above, the first projects in the 2007-2013 programming period started paying only in 2008. In addition, we see that in most years the difference between the maximum amount received and the 3rd quartile is large, so we can conclude that there are some municipalities that received enormously large amounts of grants.

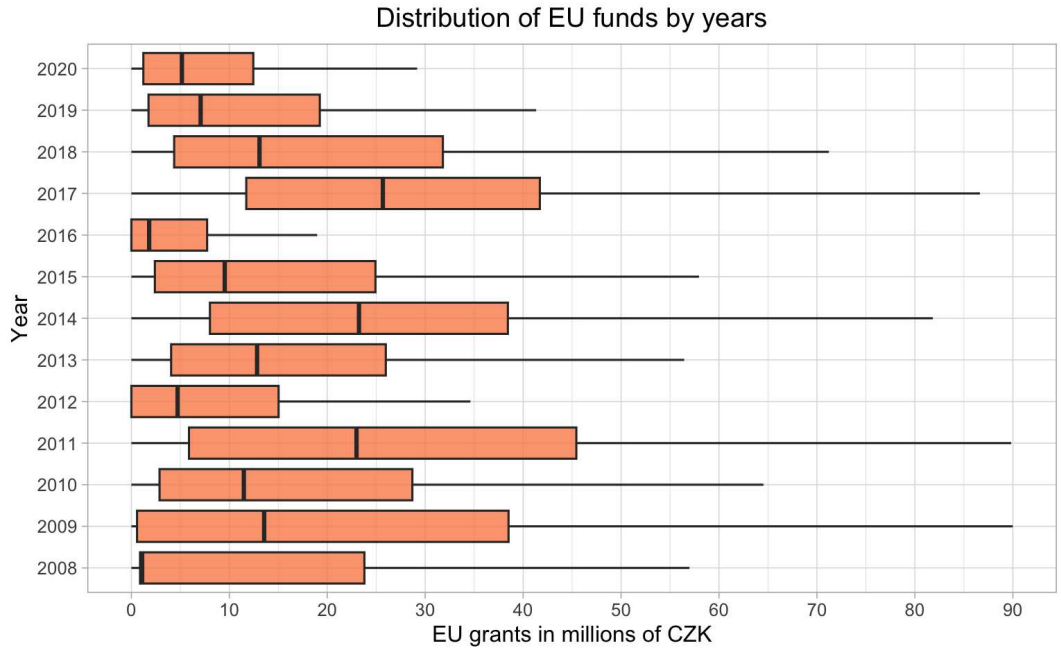


Figure 5.2: Comparison of the total amount of subsidies received by years

In our empirical model (more information is provided in Chapter 6), we analyze per capita subsidies received because we want to account for differences in municipality size. Figure 5.3 demonstrates the histogram and boxplot, that provide information about the distribution of funds per capita over municipalities during 2008-2020. The outliers have been removed to display more accurate visual information on graphs. The 30% of the municipalities received about 100 CZK per person. On the boxplot, we can clearly see that half of the municipalities received less than 400 CZK per person. The histogram also confirms our finding that about 5-7% of municipalities received more than 2000 crowns per person, which is twice as much as 75% of municipalities received.

More information on the ESIF allocation process and analysis of grants received by the Czech Republic is provided in Chapter 3.

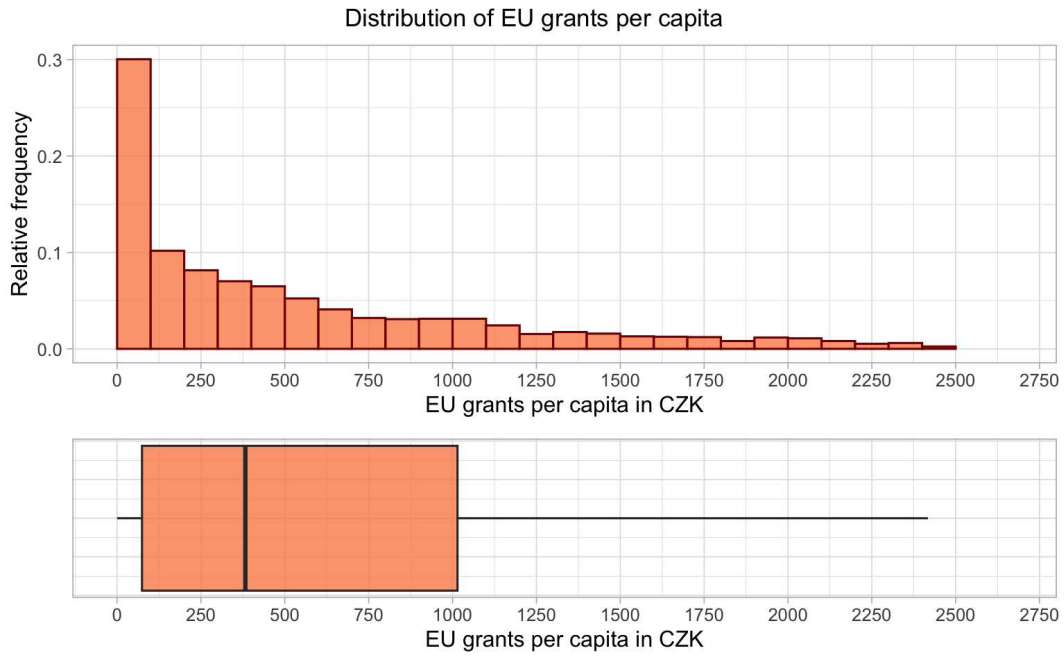


Figure 5.3: Distribution of subsidies per capita

5.2 Municipality data

Socioeconomic indicators were obtained to determine the economic activity of each municipality. Information about population and unemployment rates in each administrative division was taken from the Czech Statistical Office[1]. Data for the unemployment rate in 2012 and 2013 are not available. Therefore, the values were manually added, assuming that the unemployment rate increased linearly between 2011 and 2014.

The financial indicators of economic entities of the Czech Republic are available in the public domain in the MONITOR system. MONITOR[2] is a specialized information portal of the Ministry of Finance, providing free access to budgetary and accounting information at all levels of government and territorial autonomy. Using the R package "satatnipokladna"[3] we obtained the budget data for all municipalities from 2010 to 2020. Earlier data for the period from 2007 to 2009 were obtained in the Data Archive application, which is part of the MONITOR portal.

Local budget data were collected for municipalities with extended competence. From the received data, we filtered budget items that correspond to rev-

[1] www.czso.cz
[2] www.monitor.statnipokladna.cz
[3] statnipokladna

enue and the balance of revenue and expenses. We analyze the actual revenues and expenses achieved during the accounting period. Data are shown after consolidation at the state level. The budget composition refers to all movements on selected synthetic accounts. With the help of consolidation items, revenues and expenses are cleaned of such movements of funds that mean only transfers within the monitored organization and therefore do not mean an actual increase or decrease in the municipality's funds.

The thesis analyzes three classes of revenues in the budgets of local governments, which are tax revenue, non-tax revenue and capital revenue. The fourth class of budget revenues is represented by transfers. We exclude transfers as they contain subsidies, and it is not possible to distinguish between state grants and EU grants at the local level. Figure 5.4 represents the histogram and boxplot that provide information about the distribution of total obtained revenue between municipalities. Half of the municipalities had less than 200 million CZK during the period 2007-2020. We can see that about 5% of the municipalities had revenue that is large than 700 million CZK.

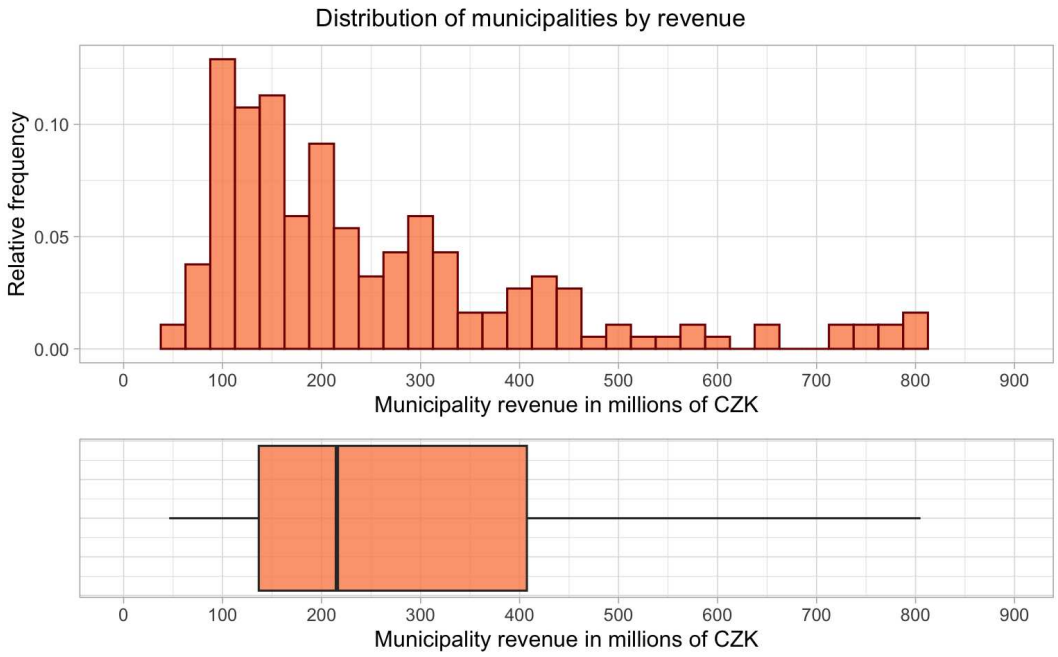


Figure 5.4: Distribution of municipality revenue per capita

Tax revenues belong to non-refundable and current revenues. Tax revenues constitute a decisive part of the current revenues of the general budget in the Czech Republic. The second group of income consists of non-tax income. Unlike tax revenues, municipalities can affect non-tax revenue. These are mainly

income from own activities and levies of surpluses of organizations with a direct connection, received penalty payments and refunds of transfers, income from the sale of non-investment property and received instalments of borrowed funds. The capital income contains income from the sale of long-term assets, including received donations and contributions for the acquisition of long-term assets, as well as income from the sale of shares and ownership interests. These are one-time and irregular incomes. Figure 5.5 shows the distribution of municipal revenues by class by a year. The total amount of revenue increased over the period 2007-2020. We see that tax revenue is the largest part, it contains more than half of the total income each year.

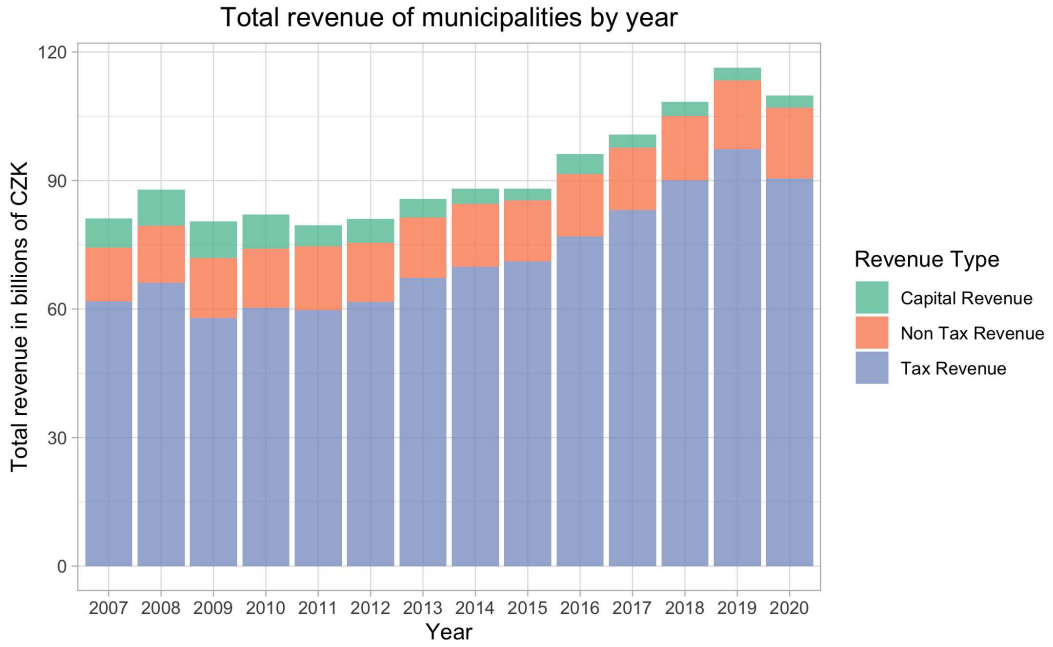


Figure 5.5: Grants distribution per capita

From the balance sheet, we collected the long-term tangible assets of the municipalities with extended competence. These are assets that the organization uses in the vast majority of cases for its activities for a period of more than 12 months, primarily land, buildings, machinery and equipment. This activity is mainly the provision of public goods and services to taxpayers. Thus, the valuation of this property is not determined by its current market value. It is determined by the size of funds spent on its acquisition, adjusted for how long and how intensively this asset was used by the organization. This is important information about the quality and quantity of public goods and public services that an organization can provide to taxpayers in the future.

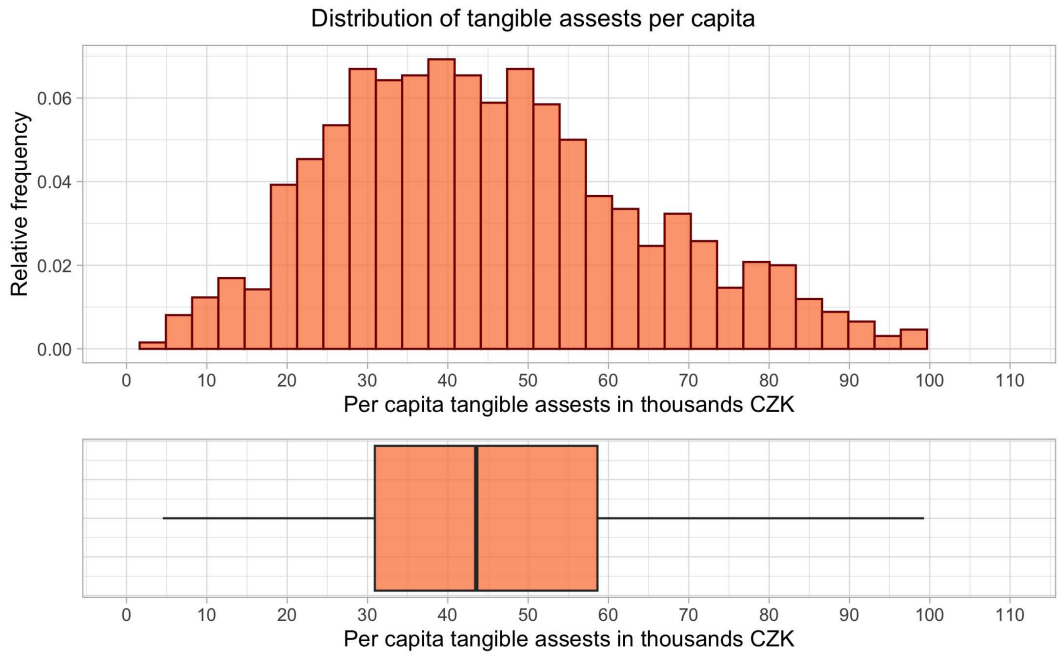


Figure 5.6: The administrative division of the Czech Republic

Figure 5.6 shows the distribution of long-term tangible assets per capita. We can see that the data is almost normally distributed. Half of the municipalities in 2007-2020 had 43 thousand CZK per person.

5.3 Election data

To test the "pork-barrel" politics hypothesis, we need to obtain data on the elections to the Chamber of Deputies in 2006, 2010, 2013 and 2017. We download this data from the Czech Statistical Office [1]. The data we download contains for every municipality information about the percentage of votes that a party that participated in the elections received. For our purposes, we must know whether a governing party has won in a given municipality. In section 3.3 we described the results of those elections, and we mentioned which parties formed a coalition and which parties got to the parliament. First of all, we filtered out the parties that didn't cross the 5% threshold. Then we define a governing party as a party that was part of a coalition after a given election. Based on that, we calculate how many votes a coalition received in each municipality as a sum of the votes of all parties that were part of the coalition. Since we filtered out parties that didn't cross the 5% threshold, the sum of all remaining votes

[1] www.volby.cz

will be less than 100%. Therefore we recalculate the percentage of votes for coalition parties as the actual percentage of votes that the coalition received divided by the sum of votes that all parties that crossed the 5% threshold have received. Based on this adjusted percentage, we created a dummy variable "*is_coalition_win*" that equals 1 when the coalition received more than 50% of votes and 0 otherwise.

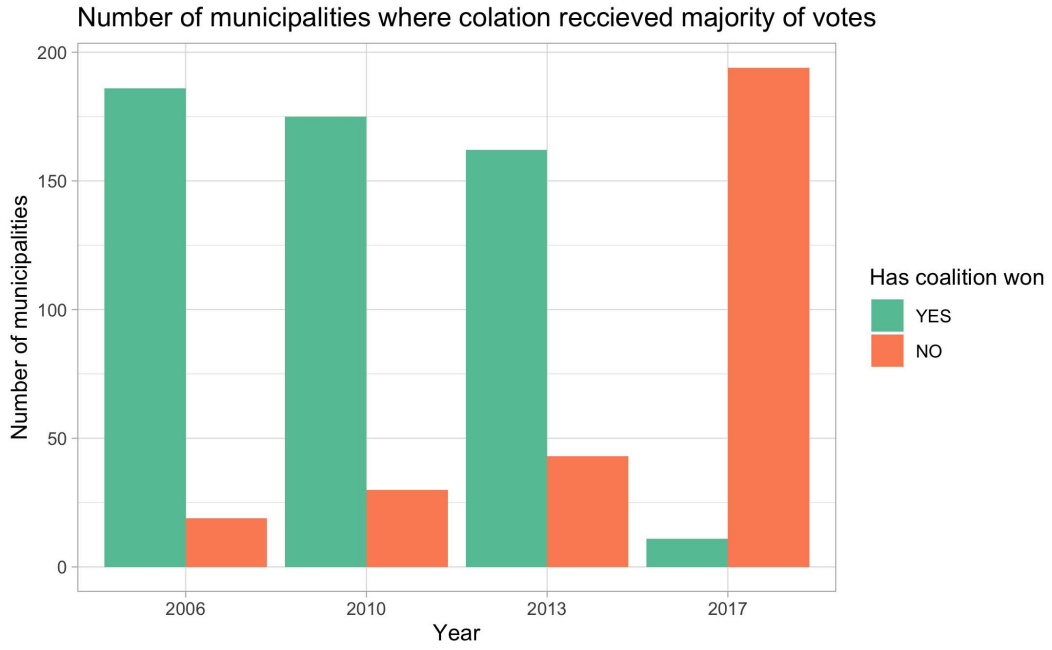


Figure 5.7: The number of municipalities in which the coalition won

The figure 5.7 above shows the number of municipalities in which the coalition won (received more than 50% of votes after adjustment). In this figure, we can see that parties that formed a coalition usually won in the majority of municipalities, except for elections in 2017. After those elections, ANO formed a coalition with ČSSD. Together they didn't receive the majority of votes. However, the remaining parties were too ideologically different and couldn't form a majority coalition.

Also, for each municipality, we record the party that received the most votes. And based on this, we create two additional dummy variables. The first one, *is_overall_winner* indicates whether the party that won in a municipality won the most votes in the whole Czech Republic. And the second dummy variable indicates whether the party that won in the municipality was part of the coalition.

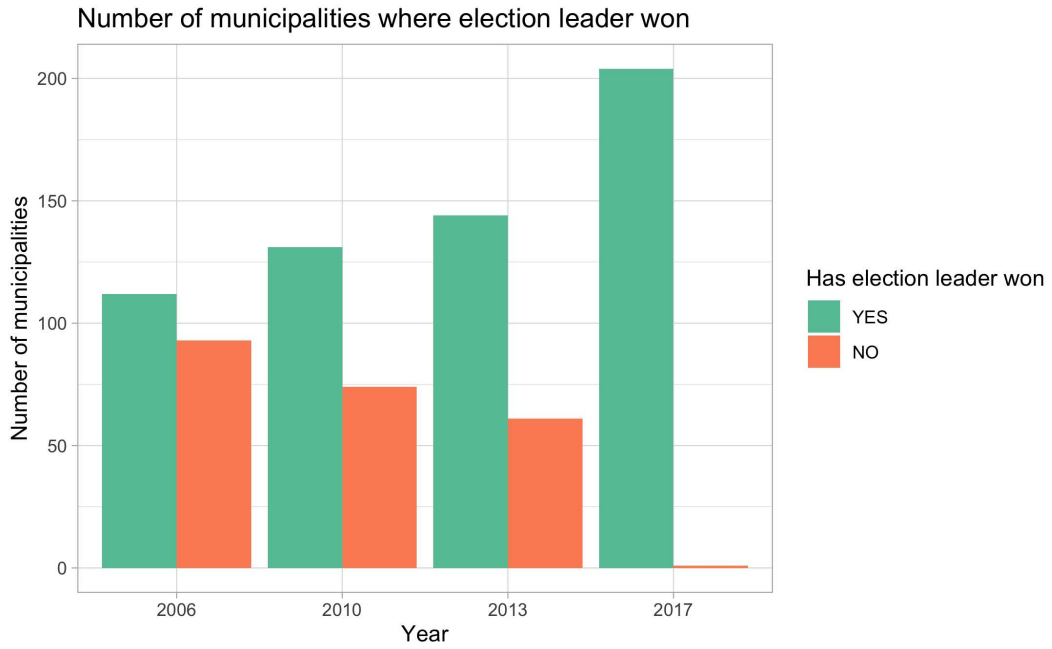


Figure 5.8: number of municipalities where election leader won

In the figure 5.8 above, the most notable observation is that in 2017 election leader won in the absolute majority of municipalities. Indeed, that was a landslide victory for Andrej Babiš and his party ANO. The figure 5.9 below shows the number of municipalities where the party that gained most of the votes was also part of a coalition. From this graph, we can see that governing parties won in most of the municipalities in the elections of 2013 and 2017. In 2010 we see a different situation. The party that wasn't in the coalition won in the majority of municipalities. Indeed, in 2010 ČSSD gained first place. However, ODS, TOP 09 and VV formed a coalition.

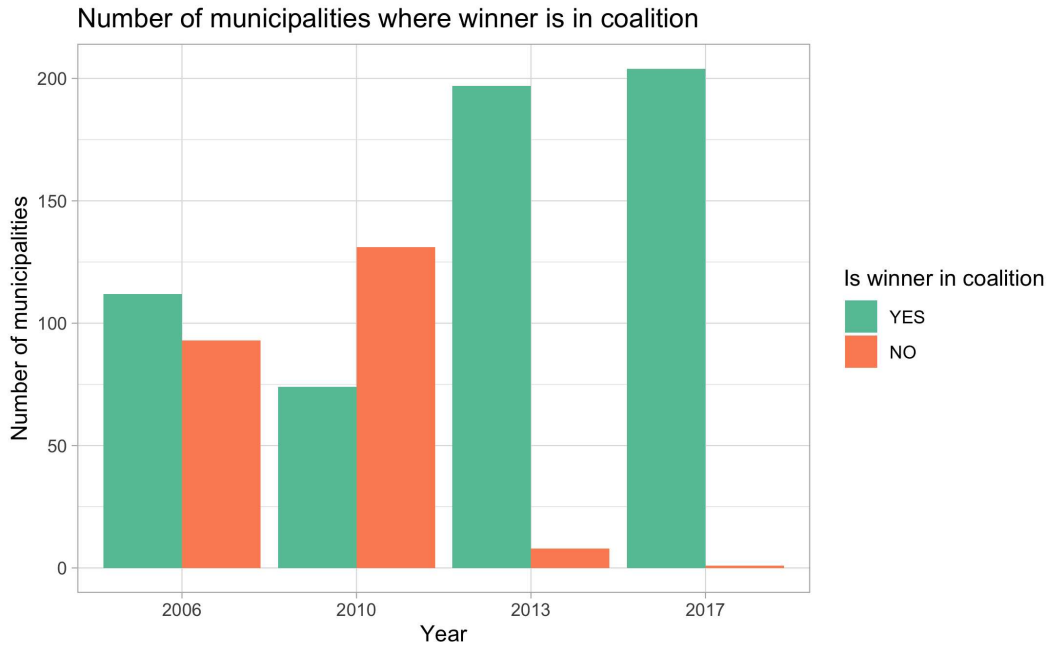


Figure 5.9: Number of municipalities where the leading party was in the coalition

There are two important notes to make. In the text above, when we talk about a coalition, we mean a formal coalition that was formed **after** elections. In the elections of 2006, 2010, 2013 and 2017, there were no coalitions similar to SPOLU and Piráti a Starostové in the elections of 2021. Also, for simplicity, we assume that if a coalition was formed after the elections, it existed till the next elections. For example, we assume that the coalition formed after the elections of 2006 was formed immediately and existed through the years 2006, 2007, 2008 and 2009. Even though, in reality, the coalition was not formed right away and, in 2009 effectively ceased to exist after the Cabinet of Mirek Topolánek received a vote of no confidence. However, this simplification is still a good approximation for governing parties, and it allows us to work with the data more easily.

Chapter 6

Methodology

The next chapter presents the econometric aspects of the methodology used in this thesis, as well as the rationale for the chosen models and estimation approaches, which were supported by the relevant theoretical literature. We first describe the basic methods with panel data and discuss issues that may arise. Then we provide information about dynamic panel data models and explain the advantages of the system GMM approach over the basic methods. The last section describes the empirical model and lists the variables.

6.1 Basic panel data methods

First, to analyze the collected data, we consider the standard methods of working with panel data. The basic model represents a standard linear regression model pooling on the panel data. It is described by the following equation:

$$y_{it} = \boldsymbol{x}'_{\boldsymbol{it}}\boldsymbol{\beta} + \alpha_i + \epsilon_{it}, \tag{6.1}$$

where $i = 1, \ldots, N$ corresponds to particular municipality, $t = 1 \ldots, T$ represents the period of time, and $\epsilon_{it} \sim iid\ N(0, \sigma^2)$.

The dependent variable y_{it} corresponds to the size of subsidies received in the municipality i in year t. The set of explanatory variables is represented as $\boldsymbol{x}'_{\boldsymbol{it}}$ in the regression. The time-invariant variable α_i represents the unobserved individual effect between municipalities. In our case, it could contain the socioeconomic indicators of each municipality, which are not directly included in the model.

This model is obtained by collecting all data for i and for t into one large regression with NT observations. The pooled model does not actually take

into account the structure of the panel data and does not allow for realizing the potential of the panel data, in particular, the individual characteristics of the individual units under study. In addition, assumptions of exogeneity and homogeneity must be present for the Pooled OLS estimator to be consistent and effective. The time-independent variable α_i can lead to bias and inconsistency in estimates. We have not included some municipality-specific variables, such as educational attainment, demographics, etc., that may be correlated with one or more explanatory variables. Thus, we cannot claim that $Cov(\alpha_i, \boldsymbol{x'_{it}},) = 0$. Therefore, we assume that there may be heterogeneity between municipalities in our dataset, leading to biased and inconsistent estimations.

6.1.1 Fisrt difference

Following Wooldridge (2012) and Greene (2012) we can apply the first difference approach, which helps to solve a possible problem by avoiding the time-independent omitted variables α_i. The first differencing does not include any heterogeneity, since it takes into account changes over time. In this case, the initial model takes the following form:

$$y_{it} - y_{it-1} = \boldsymbol{\beta(x_{it} - x_{it-1})'} + (\alpha_i - \alpha_i) + (\epsilon_{it} - \epsilon_{i(t-1)}) \tag{6.2}$$

The variable α_i does not depend on time, so it vanishes, and we can rewrite the equation:

$$\Delta y_{it} = \Delta(\boldsymbol{x'_{it}})\boldsymbol{\beta} + \Delta(\epsilon_{it}), \tag{6.3}$$

where $i = 1, \ldots, N$, $t = 2 \ldots, T$, and $\epsilon_{it} \sim iid\ N(0, \sigma^2)$.

However, if there is a slight variation in the first difference of the dependent variable, this can result in a high standard error in the first difference estimates.

6.1.2 Fixed effect

According to Hausman & Taylor (1981), a fixed effect estimate is appropriate when there is a specific individual effect in panel data. The main assumption of the Fixed Effects approach is that the omitted effect α'_i is correlated with the explanatory variables included in the model. Therefore, $E[\alpha_i|x_i] \neq 0$.

The Fixed Effect model is formulated in the following form:

$$y_{it} - \bar{y_i} = (\boldsymbol{x'_{it}} - \bar{x_i}')\boldsymbol{\beta} + \epsilon_{it} - \bar{\epsilon_i}, \tag{6.4}$$

or

$$\tilde{y}_{it} = \boldsymbol{\beta}\tilde{\boldsymbol{x}}'_{it} + \tilde{\epsilon}_{it}, \quad i = 1, \ldots, N \quad and \quad t = 1 \ldots, T. \tag{6.5}$$

where $\tilde{y}_{it} = y_{it} - \bar{y_i}$, $\tilde{x}_{it} = x'_{it} - \bar{x_i}'$, and $\tilde{\epsilon}_{it} = \epsilon_{it} - \bar{\epsilon_i}$ are within transformations. It allows us to exclude unobserved individual effects from the equation, and then to estimate the β coefficients using the ordinary least square method. Applying the usual OLS method to this model, we obtain an estimator that is called within estimator or fixed effect estimator.

6.1.3 Random effect

The Random Effects model takes a different approach to interpreting variables. Individual effects are assumed to be random. Therefore, α_i is uncorrelated with independent variables, implying the following: $E[\alpha_i|x_i] = 0$. This model can be seen as a trade-off between pooled regression, which imposes a strong homogeneity constraint on all coefficients of the regression equation for any i and t, and fixed-effects regression, which allows each sample to enter its own constant and thus actually accounts for the existing one, but unobservable heterogeneity. The Random Effect model takes the following form:

$$y_{it} = \boldsymbol{x'_{it}}\boldsymbol{\beta} + u_i + \epsilon_{it}, \tag{6.6}$$

where $i = 1, \ldots, N$ and $t = 1 \ldots, T$.

Compared to the first difference or fixed effect, the random effect does not completely eliminate time-independent variables. This allows us to evaluate this effect.

6.2 Dynamic panel data analyses

Then, following Veiga (2012), we built a dynamic model and added a lagged dependent variable to Equation 6.1 to take into account the autoregressive component of the series, as we assume that the received subsidies in the previous year can affect the amount of financial support in time t.

The general dynamic model takes the following form:

$$y_{it} = \boldsymbol{x'_{it}}\boldsymbol{\beta} + \gamma y_{it-1} + \alpha_i + \epsilon_{it}, \tag{6.7}$$

where $i = 1, \ldots, N$ and $t = 2 \ldots, T$.

Pooled OLS, First Difference, Fixed Effect, and Random Effect are standard panel data approaches. They have a number of disadvantages in the context of a dynamic panel data model. According to Nickell (1981), a serious difficulty arises with the one-way fixed effects model in the situation with a short panel: many individuals and few time periods (N>T). The within transformation creates a correlation between regressor and error. It leads to a bias in the estimate of the coefficient of the lagged dependent variable. The same problem affects the one-way random effects model. The u_{it} error component enters every value of y_{it} by assumption so that the lagged dependent variable cannot be independent of the composite error process.

To overcome these issues, it is proposed to use the instrumental variable (IV) estimator proposed by Anderson & Hsiao (1981). They used second and third lags of y as the instruments for the lag of the dependent variable. These IVs will be strongly correlated with the lagged dependent variable (and its difference), but not correlated with the composite error process. In case we believe that this can follow the AR(1) process, we can backtrack one more period and use the third and fourth lags of y.

Arellano & Bond (1981) suggested a new approach with a Generalized Method of Moments (GMM). They assumed that instrumental variables from the Anderson-Hsiao estimator do not include all of the information available in the sample. Assuming the following equation:

$$y_{it} = \boldsymbol{x'_{it}}\boldsymbol{\beta} + \boldsymbol{w'_{it}}\boldsymbol{\delta} + \alpha_i + \epsilon_{it}, \tag{6.8}$$

where $\boldsymbol{x'_{it}}$ is a set of strictly exogenous regressors, $\boldsymbol{w'_{it}}$ are predetermined and endogenous independent variables. First differencing the equation removes the α_i and its associated omitted-variable bias.

Later researches by Arellano & Bover (1995) and Blundell & Bond (1998) found out the weaknesses of Arellano and Bond estimator or difference GMM. They state that lagged levels are often not good instruments for the first differences of variables, especially if the variables are close to a random walk. They introduced the system GMM estimator and suggested adding the lagged levels

as well as lagged differences.

The dynamic nature of the model, allows us to analyze how EU funds depend on its own past realisations. A number of public finance studies, including Veiga (2012) and Golden & Picci (2008), have analyzed EU funds using GMM approaches. According to Lee & Yu (2014) the Blundell and Bond system GMM estimator is the best approach for the short panel when the number of individuals N exceeds the number of time periods T, which is consistent with our dataset. Also, this method is suitable if the explanatory variables are not strictly exogenous, which is possible in our case. Therefore, generalizing these features and previous studies, we decided to apply the System GMM estimator to our dynamic models. Empirical results are described in chapter 7.

6.3 Empirical model

We build two regressions to test our hypotheses. The first regression helps to study how the level of prosperity and development of the municipality affects the distribution of subsidies.

$$EU\_funds_{it} = \beta E_{it} + \alpha_{it} + \epsilon_{it}$$

The amount of EU funds received by municipalities is the dependent variable. We used the per capita form to account for differences in size between municipalities, and the logarithmic form to control the percentage changes in amounts of received subsidies.

The set of explanatory E_{it} includes socioeconomic indicators to account for the development and wealth of each municipality. Since the data is not published immediately and becomes available to politicians with a delay, we use these variables in time $t-1$. The independent variables that were created are listed below.

- $Unemployment_{it}$ measured as the share of job seekers from the total number of economically active residents of the municipality.
- $Tax\_revenueit$ is included as an indirect indicator of the economic activity of citizens, whether in the field of small business or dependent activity.
- $Non\_\ tax\_revenueit$ indicate revenue from the municipality's own activity. Unlike other incomes, the municipality can significantly influence both the size and the structure of these incomes.

- $Capital\_revenueit$ shows the ability of the municipality to raise money for long-term investments.

- $Tangible\_assets_{it}$ represents the long-term tangible assets of the municipality. It demonstrates the ability of the municipality to act and carry out the planned policies, whether through the direct use of the real estate, renting it out to generate additional income for the municipality, or well-chosen investment loan guarantees.

All financial indicators are presented per capita and used in a logarithmic form. We expect a negative sign of the coefficient for variables reflecting the revenue and assets of the municipality if the subsidies are directed to reduce differences between regions.

The second regression was built to test the "pork-barrel" politics. For this purpose, we add election variables into the initial equation, so it takes the following form:

$$EU\_funds_{it} = \beta E_{it} + \delta P_{it} + \alpha_{it} + \epsilon_{it}$$

The P_{it} variable is a set of additional variables with information about the election results in the Czech Republic. The following explanatory variables are included in the model to test the hypothesis of political influence on the distribution of funds between municipalities:

- $\%Coalition\_vote$ - this variable represents the adjusted percentage of votes received by the parties that formed a coalition. In section 5.3 we described in more detail how we calculated this value.

- We add dummy variable $is\_electoin\_year$ to test the hypothesis of pork-barrel politics. In an election year, it has a value of 1, otherwise, it is 0. Subsidies are expected to increase in election years as politicians seek to motivate voters.

- The variable $is\_coalition\_won$ is a dummy and equals 1 in the coalition received the majority of votes based on the adjusted percentage of votes in the municipality and 0 otherwise.

Chapter 7

Empirical Results

The following chapter describes the main empirical results. In the first section, we focused on the economical data from municipalities and tested if the wealthy and more developed regions received more financial support from EU funds. We analyzed and interpreted the estimations results of static models obtained from the first difference, fixed effect and random effect approaches. The system GMM estimation results are provided for the dynamic forms of the model. We provided several tests to check the assumptions for these models and discussed the robustness of the results.

In the second section, we provide the results of testing the hypothesis that the personal interests of politicians can affect the allocation of subsidies on the local level. We presented the results of the selected estimation approaches for both static and dynamic models. We analyzed the obtained results and discussed their compatibility with the previous studies.

The additional estimation results are presented in the Appendix.

7.1 The impact of economic determinants of municipalities on the allocation process of EU funds

Following the theory described in Chapter 6, we started our empirical analysis by constructing a basic linear regression and estimated it using standard panel data estimation methods.

The initial model takes the following form:

$$\lg(EU\_funds_{it}) = \beta_1 \lg(Tax\_revenue_{it-1}) + \beta_2 \lg(Non\_tax\_revenue_{it-1}) + \\ + \beta_3 \lg(Capital\_revenue_{it-1}) + \beta_4 \lg(Tangible\_assets_{it-1}) + \\ + \beta_5 Unemployment_{it-1} + \alpha_i + \epsilon_{it} \quad (7.1)$$

Table 7.1 summarizes estimation results using pooled OLS, First Difference, Fixed Effect, and Random Effect approaches.

Dependent variable: EU_funds				
	POLS	FD	FE	RE
$Tax\_revenue$	0.278314**	4.836730***	0.123168	0.273077*
	(0.136366)	(0.866322)	(0.360331)	(0.156138)
$Capital\_revenue$	0.042052	0.014899	0.044050	0.044030
	(0.033262)	(0.051858)	(0.042824)	(0.035187)
$Non\_tax\_revenue$	0.038478	-0.312640	-0.104123	0.026761
	(0.081954)	(0.265788)	(0.184597)	(0.094983)
$Tangible\_assets$	0.165323*	1.420404**	-0.146382	0.174462*
	(0.09433)	(0.679296)	(0.396041)	(0.092658)
$Unemployment$	0.097991***	0.336278 ***	0.093478***	0.101258***
	(0.017962)	(0.063416)	(0.035053)	(0.019439)
Number of observations	2665	2665	2665	2665
R-Squared	0.034518	0.025795	0.074536	0.024738
Adj. R-Squared	0.033066	0.024207	0.068129	0.023271

Note: *, ** , *** denotes rejection of null hypothesis at the 10%, 5% and 1% level of significance, respectively. A robust standard error is presented in parentheses.

Table 7.1: Regression results: Polled OLS, First Difference, Fixed Effect, and Random effect

We found that the $Tax\_revenue$ coefficient has a positive sign in all cases. The estimates are statistically significant except for the fixed effect approach. A positive sign of the coefficient means that the municipalities with bigger tax revenue receive more subsidies. This supports our second hypothesis that it is preferable for a country to allocate grants to wealthier municipalities. The estimates $Capital\_revenue$ and $Not\_tax\_revenue$ mostly have a positive sign of the coefficients, but all these estimates are statistically insignificant. The coefficient estimates of long-term tangible assets, $Tangible\_assets$, are statistically significant and positive in all cases except for the fixed effect. Similar to tax revenue, tangible assets have a positive impact on EU funds, therefore it also supports the hypothesis of efficient distribution rather than cohesion. The coefficients of $Unemployment$ are positive and statistically significant even at 1% in all cases. According to this, we can conclude that municipalities with higher unemployment rates received more EU funds.

In order to determine how reliable the results of the estimates mentioned above we run several diagnostic tests. We started by analyzing the pooled OLS model and ran the Breusch-Pagan Lagrange multiplier test. The null hypothesis of this test states that the variance across entities is zero, thus there is no panel effect. The p-value is statistically significant, so we should reject H_0. This shows us that there are significant differences between our municipalities, so a simple OLS is not efficient with these data.

According to Wooldridge (2012), if the idiosyncratic errors, u_i, are serially uncorrelated, then the fixed effect approach is more efficient than the first difference. We run Wooldridge's test for serial correlation in panels. In Table 7.2, we see that the p-value is small, so we cannot reject the null hypothesis that there is no serial correlation. From this, we conclude that FE is more efficient than FD. In addition, the F-test for single effects confirms that FE is more effective than pooled OLS.

	Breusch-Pagan Lagrange Multiplier Test	**Hausman Test**	**F test for individual effects**	**Wooldridge's test for serial correlation in panels**
Test statistic	24.667	2.5689	1.5394	893.74
DF	1	5	df1 = 205, df2 = 2455	df1 = 1, df2 =2253
p-value	6.814e-07	0.7661	3.578e-06	2.2e-16
H1	significant effects	one model is inconsistent	significant effects	serial correlation in differenced errors

Table 7.2: Test results

The main difference between fixed effect and random effect is the approach to the individual specific term α_i. In the case of FE, we assume that there is a correlation between this time-independent term and the explanatory variables. Information about whether this correlation exists helps to make a choice between FE and RE. We run the Hausman test. H_0 states there is no correlation. The alternative hypothesis is that the correlation exists. The obtained test statistic and p-value are presented in table 7.2. The p-value is large, so we cannot reject the null hypothesis. Therefore we can conclude that the Random Effect model is more preferable for our analysis.

The static model (Equation 7.1) does not take into account all features of our data. According to Veiga (2012), the subsidies received in the previous year have a statistically significant effect. Therefore we build the dynamic model and add the first lag of EU_funds. So the model takes the following form:

$$\begin{aligned}\lg(EU\_funds_{it}) = \delta \lg(EU\_funds_{it-1}) + \beta_1 \lg(Tax\_revenue_{it-1}) + \\ \beta_2 \lg(Non\_tax\_revenue_{it-1}) + \beta_3 \lg(Capital\_revenue_{it-1}) + \\ \beta_4 \lg(Tangible\_assets_{it-1}) + \\ + \beta_5 Unemployment_{it-1} + \alpha_i + \epsilon_{it} \quad (7.2)\end{aligned}$$

According to Lee & Yu (2014) Blundell and Bond's system GMM estimator is the most appropriate with panel data when the sample contains more individuals N than time periods T. When using the GMM scoring system, we must take into account the possible problem of over-identification of instruments. This can happen when the number of instrumental variables is too large and approaches the number of individuals in the data. According to Roodman (2009), in a situation where the number of time periods is relatively small, using all the possible sets of lags available will lead to a huge number of instruments, which can subsequently affect the loss of efficiency. Therefore, we limit the number of lags used and specify only 2-5 lags when creating GMM instruments.

To verify the reliability of the results, we run two main specification tests. The Sargan test is provided to control the validity of the instruments. Another important diagnostic is the AR test for autocorrelation of residuals. The residuals of the differenced equation should have a serial correlation. Still, if the assumption of serial independence of the original errors is presented, the difference residuals should not exhibit significant AR(2).

Following Croissant & Millo (2008) we run the one-step and two-step system GMM estimation procedure in software R. As mentioned above, we add 2-5 lags of EU_funds as an instrumental variable. Also, we include instrumental variables of 2-5 lags of $Tax\_revenue$ and $Tangible\_assets$, as we assume that the previous data of these identifiers can influence the allocation of subsidies.

Table 7.3 demonstrates the estimation coefficients and robust standard errors. Similar to the static model, all of the dependent variables are presented in time $t-1$. The two-step system GMM are presented as they should be asymptotically efficient. Before we begin to interpret the results in more detail, we will run diagnostic tests to ensure that the model requirements are met.

Dependent variable: $lg(EU\_funds)$		
	One-step	Two-step
$lag\_lg(EU\_funds)$	0.0848690 ***	0.0723341***
	(0.0218715)	(0.0236169)
$lag\_lg(Tax\_revenue)$	1.4204725***	1.6541509***
	(0.3925302)	(0.5400128)
$lag\_lg(Capital\_revenue)$	-0.0069824	0.0023631
	(0.0366872)	(0.0445017)
$lag\_lg(Non\_tax\_revenue)$	0.0043958	0.0474574
	(0.1207072)	(0.136022)
$lag\_lg(Tangible\_assets)$	-0.3380978	-0.7073127*
	(0.3030682)	(0.4015359)
$lag\_Unemployment$	0.0095331	0.0093814
	(0.0334286)	(0.0397923)

Note: *, ** , *** denotes rejection of null hypothesis at the 10%, 5% and 1% level of significance, respectively. A robust standard error is presented in parentheses.

Table 7.3: Regression results: system GMM

Related test results are provided in Table 7.4 for the one-step procedure. The null hypothesis of the Sargan test states that the instruments are valid instruments, thus uncorrelated with the error term and that the excluded instruments are correctly excluded from the estimated equation. The p-value is small, but we cannot reject the null hypothesis at 5% significant level. Therefore, we can assume that the instrumental variables are valid. The results of the AR(1) and AR(2) tests are also in line with our expectations. AR(1) is insignificant and therefore the first-order serial correlation presents, however, it is expected due to the lagged dependent variable. The statistic of AR(2)is significant, therefore requirements of the estimator are met.

	Sargan test	AR(1)	AR(2)	Wald test
Test statistic	175.6044	-9.053355***	0.2997671	45.87236***
p-value	0.05379	2.22e-16	0.76435	3.1389e-08

Note: *, ** , *** denotes rejection of null hypothesis at the 10%, 5% and 1% level of significance, respectively.

Table 7.4: Test results: one-step system GMM

The diagnostic test results for the two-step system GMM estimation procedure are provided in Table 7.5. The statistic of the Sargan test is equal to 153.3147 and the p-value is 0.34388. Therefore we can assume that selection of the instruments is correct. Similar to the one-step, the test statistic AR(1) is insignificant, and at the same time, the statistic AR(2) is significant, which meets the requirements of the model.

In both cases, we can reject the null hypothesis of the Wald test for coefficient. That suggests that our variables are significant to that model fit.

	Sargan test	AR(1)	AR(2)	Wald test
Test statistic	153.3147	-7.66986***	0.1345926	50.16264***
p-value	0.34388	1.7218e-14	0.89293	4.361e-09

Note: *, ** , *** denotes rejection of null hypothesis at the 10%, 5% and 1% level of significance, respectively.

Table 7.5: Test results: two-step system GMM

We can see that the estimation results in the 7.3 table are very similar for the one-step and two-step approaches. The first lag of the dependent variable is statistically significant, indicating a constant amount of EU funds received by municipalities. The estimated coefficient of $Tax\_revenue$, as in static analysis, is statistically significant. In the case of two-step, the coefficient of the long-term tangible assets is also statistically significant. Both these variables, $Tax\_revenue$ and $Tangible\_assets$ have a positive sign of estimated coefficient, thus having a positive effect on the EU funds. It is consistent with our second hypothesis that municipalities with better economic performance re-

ceived more financial support from EU funds. This finding is also supported by Bloom & Petrova (2013) and Bouvet & Dall'Erba (2010), who found similar results by analyzing data from Portugal and Germany respectively.

The estimation results of $Capital\_revenue$ and $Non\_tax\_revenue$ do not seem to influence the allocation process. The estimated coefficient of $Unemployment$ is small, however, it is not statistically significant in comparison with static analysis.

Summing up, we can say that obtained results are miscellaneous. The estimated coefficient of tax revenue in most approaches is statistically significant and has a positive sign. This is in line with our hypothesis that politicians prefer efficiency to equity when making subsidy allocation decisions. However, the capital revenue, as well as non-tax revenue, did not demonstrate any significant effect on EU funds. And the estimated coefficient of long-term tangible assets in a two-step system GMM procedure has a negative sign, therefore wealthier municipalities received fewer subsidies.

7.2 "Pork-barrel" politics

The next step of our analysis is to verify the existence of the political influence on the allocation process of EU funds between municipalities. As was described in Chapter 6, we enriched our model from Equation 7.1 with three politically related variables: $\%Coalition\_vote_{it}$, $is\_coalition\_won_{it}$, and $is\_election\_year_t$.

Taking into account our previous results, we decided to remove $Capital\_revenue$ and $Non\_tax\_revenue$ from the model, as their effects were tiny and coefficients were statistically insignificant. We were following the steps described in the previous section and started our analyses with the static model:

$$\begin{aligned}\lg(EU\_funds_{it}) = \beta_1 \lg(Tax\_revenue_{it-1}) + \beta_2 \lg(Tangible\_assets_{it-1}) + \\ + \beta_3 Unemployment_{it-1} + \beta_4 \%Coalition\_vote + \\ \beta_5 is\_coalition\_won_{it} + \\ \beta_6 is\_election\_year_t + \alpha_i + \epsilon_{it} \quad (7.3)\end{aligned}$$

The coefficient β_5 is supposed to demonstrate the effect between municipalities, where the parties from the coalition won, and the municipalities, where the coalition obtained less than 50%. The positive coefficient is expected in

the case that "pork-barrel" politics in the Czech Republic exists. The dummy variable $is\_election\_year_t$ should represent the effect of the allocation of subsidies in the year of the election and the periods between elections. We expect politicians to increase the amount of transfers during election years to increase voter support.

As a first step, we estimate our model with standard panel data approaches that were described in Chapter 6. Table 7.6 demonstrates the obtained estimation results.

Dependent variable: EU_funds				
	POLS	FD	FE	RE
$lag\_lg(Tax\_revenue)$	0.447996*** (0.142954)	5.4870544*** (0.9082626)	-0.130079 (0.394208)	0.413184** (0.160596)
$lag\_lg(Tangible\_assets)$	0.279157** (0.116506)	1.2035114* (0.6620343)	-0.106552 (0.389692)	0.275348 ** (0.131710)
$Unemployment$	0.096769*** (0.020269)	3.417552*** (6.3096e-02)	0.069312** (0.035430)	0.096867*** (0.021944)
$\%Coalition\_vote$	0.059710*** (0.015552)	0.1646601*** (0.0473368)	0.021686 (0.021249)	0.012744 (0.010125)
$is\_coalition\_won$	0.0600483** (0.0155487)	1.4832*** (3.4284e-01)	0.035999 (0.028840)	0.070410 (0.022044)
$is\_election\_year$	0.7650791*** (0.1154209)	5.7179e-01*** (1.1225e-01)	0.7310158*** (0.1184156)	0.762833*** (0.113961)
Number of observations	2665	2665	2665	2665
R-Squared	0.055675	0.085935	0.074536	0.046739
Adj. R-Squared	0.053187	0.083325	0.068129	0.044228

Note: *, ** , *** denotes rejection of null hypothesis at the 10%, 5% and 1% level of significance, respectively. A robust standard error is presented in parentheses.

Table 7.6: Regression results ("pork-barrel"): Polled OLS, First Difference, Fixed Effect, Random Effect

The obtained results are mostly in line with our expectations. The effect of $Tax\_revenue$ and $Tangible\_asstes$ are similar to our previous static analysis, and they are positive and statistically significant. Therefore, municipalities with better financial performance obtained more subsidies. According to estimation results of $Unemployment$, the higher unemployment rate in the region attracts more financial aid.

The estimations of political variables $\%Coalition\_vote$ and $is\_coalition\_won$ are statistically significant in pooled OLS, and first difference approaches. They have a positive effect on EU funds. Therefore more funds are channelled to the municipalities, where government parties get more support in elections. Also, we obtained a similar conclusion as Veiga (2012), that the size of transfers significantly increases in the election years. This suggests that politicians are channelling more financial support to municipalities ahead of elections in an effort to increase voter support.

	Breusch-Pagan Lagrange Multiplier Test	**Hausman Test**	**F test for individual effects**	**Wooldridge's test for serial correlation in panels**
Test statistic	26.656	4.5509	1.5564	880.42
DF	1	6	df1 = 205, df2 = 2455	df1 = 1, df2 =2253
p-value	2.431e-07	0.6026	1.925e-06	2.3e-16
H1	significant effects	one model is inconsistent	significant effects	serial correlation in differenced errors

Table 7.7: Test results ("pork-barrel")

Table 7.7 demonstrates the results of diagnostic tests. We provided several tests to compare the efficiency of the models. The statistically significant statistic of the Breusch-Pagan Lagrange multiplier test suggests rejecting the null hypothesis that there is no panel effect. The p-value of Wooldridge's test statistic is small, therefore, fixed effect estimators are more efficient than the first difference. In addition, the F-test for single effects confirms that FE is more effective than pooled OLS. The null hypothesis of the Hausman test cannot be rejected, so the random effects estimator seems to be more efficient in our case.

In the next step, we perform the analysing of the following dynamic form of the model:

$$\begin{aligned}\lg(EU\_funds_{it}) = \gamma \lg(EU\_funds_{it-1}) + \beta_1 \lg(Tax\_revenue_{it-1}) + \\ \beta_2 \lg(Tangible\_assets_{it-1}) + \beta_3 Unemployment_{it-1} + \\ \beta_4 \%Coalition\_vote + \beta_5 is\_coalition\_won_{it} + \\ \beta_6 is\_election\_year_t + \alpha_i + \epsilon_{it} \quad (7.4)\end{aligned}$$

Following Roodman (2009), we have limited the number of instrument variable lags to five. We included 2-5 lags of EU funds as instrumental variables. Also, we add instruments of four lags of tax revenue and unemployment, as they demonstrates the most significant effect in static analysis.

Dependent variable: EU_funds		
	one-step	two-step
$lag\_lg(EU\_funds)$	0.0855263***	0.0891715***
	0.0222744	(0.0236567)
$lag\_lg(Tax\_revenue)$	0.2458617	0.2441490
	(0.2560310)	(0.2753440)
$lag\_lg(Tangible\_assets)$	0.2046532	0.2056049
	(0.2056376)	(0.2200752)
$Unemployment$	0.0829645***	0.0823370 ***
	(0.0263154)	(0.0274787)
$\%Coalition\_vote$	0.0032359	0.0029393
	(0.0109346)	(0.0118888)
$is\_coalition\_won$	0.1361065	0.1429046
	(0.1878995)	0.2010959
$is\_election\_year$	0.8859658***	0.8794968***
	(0.1205528)	(0.1217199)

Note: *, ** , *** denotes rejection of null hypothesis at the 10%, 5% and 1% level of significance, respectively. A robust standard error is presented in parentheses.

Table 7.8: Regression with political variables: system GMM results

Table 7.5 demonstrates the estimation results after applying the one-step and two-step system GMM estimation procedure. Unfortunately, we can see that most of the estimation results are statistically insignificant. The first lag of the dependent variable is statistically significant, indicating a persistence amount of EU funds received by municipalities. The variable *Unemployment* has positive significant results. However, the coefficient is approximately equal to 0.08, which is a really small effect on the EU funds. The third statistically significant coefficient has a variable *is_election_year*. As in the case with standard methods, we see that the election year increases the amount of allocated subsidies.

	one-step		two-step	
	Test statistic	p-value	Test statistic	p-value
Sargan test	199.1747	0.11124	186.8405	0.17449
AR(1)	-10.36909	2.22e-16	-7.962147	1.6908e-15
AR(2)	0.2997671	0.76435	0.1345926	0.89293
Wald test	8746.132	2.22e-16	6826.123	2.22e-16

Table 7.9: Test results for the GMM model with political variables

To verify the assumption of the model we provided several tests. Their results are presented in Table 7.9. The null hypothesis of the Sargan test did not reject, therefore, we can assume that we selected valid instruments. AR(1) and AR(2) test statistics are also in line with the requirements of the model. The Wald test results demonstrate that our variables significantly fit our model.

Summing up all the results obtained, it can be concluded that there is a significant difference between the allocated funds in an election year and between election periods. However, we have not received significant results, on whether the municipalities that supported the national government party received more financial support.

Not all the expected results were obtained. The lack of data may cause the limitation of the obtained results. This problem lies in the fact that not all municipal indicators are publicly available for all time periods. According to Veiga (2012), it could be helpful to use the data that are related to the specific goals of the programming period. She included in her model the

variables $\%Households\_without\_water$ and $Illiteracy\_rate$, which demonstrated significant estimation results. Also, the Papp (2019) and Spac *et al.* (2018) suggest including information about the party affiliation of the mayor of the municipality and the results of the local election.

Chapter 8

Conclusion

This thesis is devoted to studying the economic and political factors influencing the distribution of EU funds. Since most of the research examines the distribution of EU funds between member countries or regions, we have focused on the local level and contributed to the empirical literature on the analysis of financial transfers from ESIF to municipalities.

We tested several hypotheses. Firstly we studied the effect of the economic indicators, which demonstrates the wealth and development level of the municipality, on the distribution of subsidies. We analyzed whether the distribution process of subsidies is in line with the cohesion policy of the EU and directed to poorer municipalities or whether the government of the Czech Republic is trying to improve the overall economic level of the country and therefore provides more financial support to the municipalities with better infrastructure. Then we focused on the political influence and tested the "pork-barrel" hypothesis. We analyzed whether politicians are pursuing their own interests and providing additional subsidies to specific municipalities to improve their electoral results.

The panel data were collected for the analysis presented in this thesis. We obtained data covering the period from 2007 to 2020 for 205 municipalities with extended competence in the Czech Republic. The standard panel data estimation approaches were applied to the static models. For the dynamic model, we selected the Blundell & Bond (1998) system GMM estimator.

The obtained results were mixed. We found that municipalities with higher tax revenue received more financial support. This supports the hypothesis that politicians may allocate more subsidies to more developed municipalities to achieve greater efficiency. However, the effects of unemployment and the amount of long-term tangible assets in the municipalities show that poorer re-

gions with higher unemployment received more subsidies, which corresponds to the cohesion principles of the EU. Also, the political influence also was indicated. The size of transfers significantly increases in the election years. This suggests that politicians are channelling more financial support to municipalities ahead of elections in an effort to increase voter support.

The author suggested several ways to improve the analysis in future studies. It is possible to enrich the dataset with the data, which demonstrates more aspects of the development level of the municipality. Data relating to a specific operational program during a program period can give a clearer picture of the level of development of a municipality when deciding on the allocation of subsidies. In the case of "pork-barrel" analysis, following Papp (2019), we proposed to add information on local elections, including the party affiliation of the mayor of the municipality.

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Appendix A

Additional data description

	Tax revenue	Capital revenue	Tangible assets	population	unemployment	EU fund
Min	2.536e+07	0.000e+00	8.487e+07	8555	0.920	0.000e+00
1st Qu	9.902e+07	2.653e+06	7.610e+08	20394	3.620	1.100e+06
Median	1.636e+08	7.981e+06	1.304e+09	29968	5.360	9.795e+06
Mean	3.533e+08	2.433e+07	2.464e+09	45287	5.682	3.489e+07
3rd Qu	2.980e+08	1.938e+07	2.263e+09	54816	7.478	3.398e+07
Max	1.148e+10	1.576e+09	6.100e+10	382405	15.080	1.990e+09

Table A.1: Descriptive statistic of socioeconomic data

	Tax revenue	Capital revenue	tangible assets	population	unemployment	EU fund
Min	667.1	0.00	4518	8555	0.920	0.00
1st Qu	4200.0	92.18	30976	20394	3.620	34.69
Median	5571.9	241.69	43480	29968	5.360	325.89
Mean	6117.7	454.96	46908	45287	5.682	754.08
3rd Qu	7352.5	562.94	58571	54816	7.478	951.24
Max	32257.3	8581.26	173277	382405	15.080	21061.25

Table A.2: Descriptive statistic of per capita socioeconomic data

Appendix B

Additional estimation results