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Faculty of Social Sciences

Institute of Economic Studies

BACHELOR THESIS

Panel Data Research on Corruption. Russia's perspective.

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Academic Year: **2014/2015**

Declaration of Authorship

The author hereby declares that he compiled this thesis independently, using only the listed resources and literature. This thesis was not used to obtain another academic degree.

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Prague, July 27, 2015

Signature

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Bibliography Reference

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Extent of the Thesis

79,670 characters (with spaces)

Abstract

The thesis assesses causes and consequences of public sector corruption, using panel data specification. The model presented in this work extends and updates the existing model, where new studies are incorporated and new methods for empirical evidence are used. Moreover, the analysis is expected to be more accurate and comprehensive than the existing one, since cross-sectional analysis is substituted by panel data analysis, which captures unobserved heterogeneity and country specific effects. The main correlations I am interested in are between the level of public corruption in a country and three other important variables: level of market competitiveness within economy, level of education in a country and the extent of democracy there. Hence, the topic is covered from both points of view: theoretical and empirical. Additionally, the model is applied for different samples of countries (developing and developed) in order to investigate if global tendencies hold for specific groups of countries or not. Furthermore, the work includes an example of Russian economy, where it is studied from theoretical and graphical perspective and only after that the proper inference is made, applying my general model for sample of developing countries.

Empirical research shows that corruption and competition are negatively related. In addition, higher secondary education and more political rights (democracy) have depressing effect on corruption in a country. On the other hand, increase in percentage of people with tertiary education leads to higher corruption. However, when the full sample was divided for samples of developing and developed countries, the support for all above mentioned hypotheses was not found, since some variables were insignificant.

The methods implemented in current work are as follows: G2SLS random-effect IV and Fixed-effects (within) IV regressions. That is a combination of Fixed effects and Random effects models with Instrumental Variable technique. Additionally, OLS and 2SLS methods are used.

JEL Classification	A12, C33, C36, I20, H40
Keywords	Corruption, education, democracy, competitiveness, Russia, endogeneity, panel data, fixed effects, random effects

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Acronyms

UNDP	United Nations Development Programme
CPI	Corruption Perception Index
GCB	Global Corruption Barometer
BPI	Bribe Payers Index
TI	Transparency International
WGI	Worldwide Governance Indicators
GDP	Gross Domestic Product
FDI	Foreign Direct Investments
OECD	Organization for Economic Cooperation and Development
USD	United States Dollar
IMF	International Monetary Fund
UN	United Nations
WEF	World Economic Forum
OLS	Ordinary Least Squares
2SLS	Two-stage Least Squares
IV	Instrumental Variables
BUE	Best Unbiased Estimator
BLUE	Best Linear Unbiased Estimator
G2SLS	Generalized Two-stage Least Squares
LS	Least Squares
RE	Random effects
FE	Fixed Effects
HAC	Heteroscedasticity and Autocorrelation Consistent

Bachelor Thesis Proposal

Author:	Ksenia Pogodina
Supervisor:	Doc. Ing. Tomáš Cahlík, CSc.
Proposed Topic:	Panel Data Research on Corruption. Russia's perspective

Topic Characteristics: Corruption was and remains the world's one of the biggest problems, especially in developing countries. By corruption here I mean the "the abuse of public power for private benefit", that is a bribe demands of government officials. This paper reviews existing studies on possible causes and consequences of corruption and builds an econometric model, based on theoretical and conceptual framework related to corruption. The main correlations I am interested in are between level of public corruption in country and three important variables: level of market competitiveness within economy, level of education in this country and the extent of democracy there. Hence, the topic is covered from both points of view: theoretical and empirical. In addition, I will check the robustness of my results applying the model for different samples of countries: developing and developed. Furthermore, I will make an inference for Russia, as a representative of still developing countries.

Hypotheses:

1) The higher the level of corruption is (or amount of bribe payment demanded from formal firms), the lower is the competitiveness of the economy.
2) Increased democratization is associated with lower corruption and thus would be expected to increase competition.
3) The more educated the citizens of a particular country are, the less corruption exists in this country.

Methodology: The data used in this study is from number of sources like: World Bank, Transparency International, Freedom House. The methods implemented in current work are as follows: G2SLS random-effects IV and Fixed-effects (within) IV regressions. That is a combination of Fixed effects and Random effects models with Instrumental Variable technique. Additionally, OLS and 2SLS methods are used.

Expected Contribution: My aim is to extend and update the existing model, where it will incorporate new studies and new methods for empirical evidence will be used. Moreover, the analysis is expected to be more accurate and comprehensive than the existing one, since cross-sectional analiysis is substituted by panel data analysis.

Outline:

1. Introduction: Corruption is a very hot topic of discussion, and an important concern for many countries.
2. Theoretical and Conceptual Framework: The base for my future model.
3. The model: Specify the model (choice of independent and dependent variables).
4. Data and Methodology: I will explain what data I will use and the way how I will collect it. Moreover, I will engage theoretical and empirical approaches.
5. Results and Interpretations: I will discuss my regressions and robustness checks.
6. Conclusion: I will summarize my findings and their implications for future research.

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Author

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Introduction

Recent years corruption is attracting a great deal of attention, since it is generally viewed as one of the main obstacles to the economic growth and development. That is why it is important to identify its causes and consequences to curb or decrease its costs in proper way. There is a long history of models attempting to identify its causes and consequences (like Mauro, 1995; Treisman, 2000) yet empirical analysis is complicated. One reason that it is difficult to assess the direction of causality of these indicators. Moreover, the data is difficult to obtain and it is often available only for few countries and a small number of years. These investigations by and large are related to cross–country analyses, based on comparative assessments of the extent of corruption in various countries. However, cross-country estimations may induce an omitted variable biases because of enormous unobservable or unmeasurable differences in institutions and cultures between countries, which are neglected.

Literature suggests that development of democratic institutions would reduce opportunities for economic rent and, thus, benefits to be derived from corruption (Emerson, 2006). Also, market competition being a development goal of a country is often linked with low level of corruption. That is, government officials collect bribes for providing permits and licenses, access to markets, hence introduction of competition and regulation therefore could help curtail corruption (Shleifer and Vishny, 1993). Several authors found a link between the degree of education of citizens and level of corruption prevailing in a country (Beets, 2005). Along with factors mentioned above there are plenty of others that could influence the level of corruption and possibly at the same time be its consequence. However, whether it is in fact true is rather an emprical question, which I will focus on in my thesis.

Although corruption exists in all countries it is more widespread in lower income or developing countries and Russia is not an exception being a representative of still developing countries. Institutional and cultural frameworks that typify specific countries might influence the scale of corruption. Hence, I am interested whether dependencies of study variables across different samples follow the global trend or have competely opposite effect on each other. Russia in particular is studied here from theoretical and

graphical perspective and only after that the proper inference is made, applying my general model for sample of developing countries.

The thesis is organized in the following way. In Chapter 1 related theoretical and conceptual framework is covered, where necessary justifications for the choice of variables in my model are made. Additionally, the topic is viewed from the perspective of Russia. Chapter 2 is dedicated to the model specification. Chapter 3 describes the sources and type of data employed in my work. The dataset consists of 37 countries throughout years 2005-2013. Additionally, the approaches and methods, which I will use in my regression analysis are represented in details. Chapter 4 is drawn upon results obtained from my empirical research. Interpretations for full and restricted datasets are represented as separate sections.

1. Conceptual and Theoretical Framework

1.1 Definition, description and classifications of corruption

Corruption was and remains the world's one of the biggest problems, especially in developing countries. The definition of corruption varies not only from country to country but from discipline to discipline. Economists usually define corruption as "the abuse of public power for private benefit" (Tanzi, 1998). Sociologists have also offered a variety of definitions, where they classify this term as white, grey and black depending on the extent of consensus of what corruption is (International Social Science Journal, 1996). Transparency International defines corruption as "the abuse of entrusted power for private gain". Shleifer and Vishny (1993) determine this term as "the sale by government officials of government property for personal gain". According to reviewed sources, most definitions related corruption to behavior of public officials, which means that this phenomenon is primarily found in public sector. However, it should not be concluded that it cannot exist within private activities.

Even if the definition of corruption is agreed on, many conceptual ambiguities still remain: causes, consequences and costs of corruption are debatable; and so are the methods how to fight or prevent it. Nevertheless, despite the disagreements corruption has recently attracted an extraordinary amount of interest.

Because corruption comes in many forms and types, many categorizations have also been made in order to explain and talk about it in broader terms, as well as to make distinctions between different forms of corruption.

Heidenheimer (1989) distinguishes three different evaluations of corruption in society: Black, Grey and White. Black corruption refers to the type of corruption that most people would condemn and would want to see punished. Grey corruption refers to a type that some may want to see punished, and others not, is thus to a large extent determined by

culture. White corruption refers to a type of deviant behavior that is commonly shared as 'acceptable' by everyone within a community.

On the other hand, Pedersen and Johannsen (2008) have developed a typology of corruption based on scale: Petty, Grand and Systematic corruption. Petty corruption occurs at a smaller scale and within established social frameworks and governing norms. This form of corruption is particularly common in developing countries and where public servants are significantly underpaid. Grand corruption is defined as corruption occurring at the highest levels of government in a way that requires significant subversion of the political, legal and economic systems. Such corruption is commonly found in countries with authoritarian or dictatorial governments but also in those without adequate policing of corruption. Systematic corruption is corruption, which is primarily due to the weaknesses of an organization or process. It can be contrasted with individual officials or agents who act corruptly within the system.

According to Alemann (1995) corruption may occur at different levels: Individual corruption takes place primarily in relations between individual citizen and public officials. Business corruption takes place primarily in relations between enterprises/companies and public officials and authorities. Political corruption takes place in the higher echelons of public administration and on a political level.

In my current work I will focus on public corruption, that is spread among government officials, who have self-interest in demanding a bribe payment.

1.2 Measurement of corruption

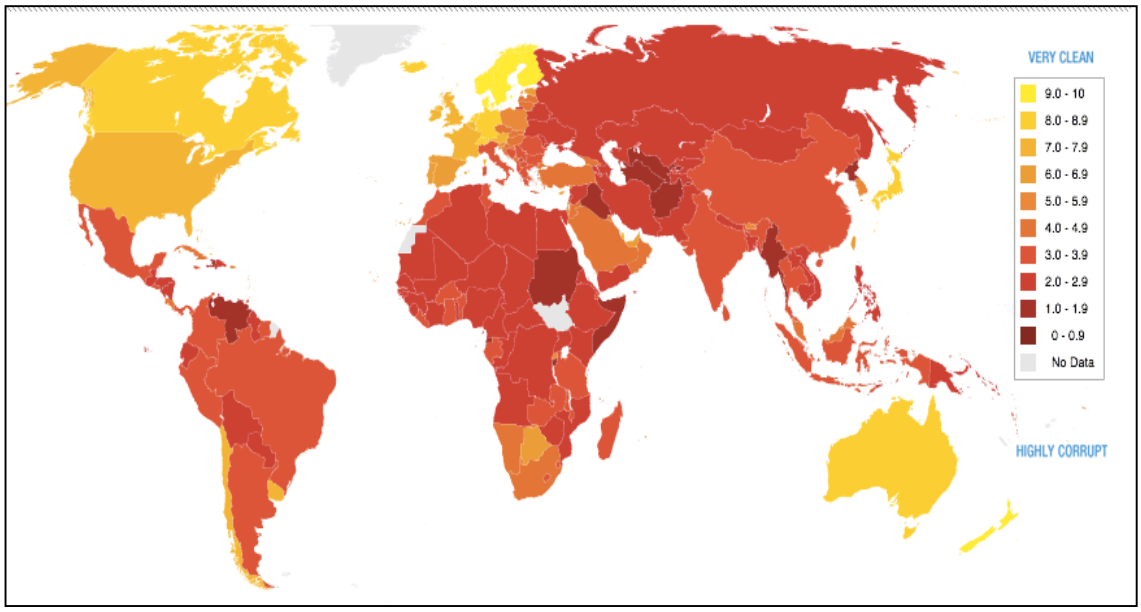
Regardless of one's preferred conceptual definition, the choice of measurement techniques from a limited set of feasible alternatives inevitably produces an implicit definition that can differ significantly from others. Every assessment methodology measures a different mix of these various dimensions of corruption.

By its nature, corruption is secretive and complex, hence, it is impossible to measure it with complete accuracy. However, several approaches regarding estimation of corruption exist: perception and experience based indicators, indicators based on a single data source and composite indicators, proxy indicators (UNDP, 2008). As research has shown, the

dominant one is perception-based approach via cross-national indices drawn from a range of surveys and expert assessments. The perceptions of country analysts, business people or the general public form the basis of corruption indices, such as Corruption Perception Index (CPI), Global Corruption Barometer (GCB), Bribe Payers Index (BPI) were developed by Transparency International.

CPI index is published annually since 1995 and the best known of all tools offered by this organization and most used worldwide. It ranks countries by their perceived levels of corruption, as determined by expert assessments and opinion surveys, according to their perceived levels of public sector corruption. It ranks almost 200 countries on a scale of 0 to 10, with 0 indicating high levels of corruption and 10 indicating low levels. Developed countries typically rank higher than developing nations due to stronger regulations. For example, the 2011 Corruption Perceptions Index demonstrates that public frustrations are well founded. No region or country in the world is immune to the damages of corruption, the vast majority of the 183 countries and territories assessed score below five on a scale of 0 (highly corrupt) to 10 (very clean). New Zealand, Denmark and Finland top the list, while North Korea and Somalia are at the bottom. Russia is ranked at 143-th place out of 183 with 2,4 on 0-10 scale, together with Azerbaijan and Belarus. Figure 1 below summarizes these findings.

Figure 1: Corruption Perception Index 2011



Source: www.transparency.org

In contract to CPI index, Global Corruption Barometer is a public opinion survey that offers views of the general public on corruption and its impact on their lives, including personal experience with bribes. Important is that the Barometer also provides insights into how willing and ready people are to act to stop corruption. The 2013 Barometer reflects the responses of more than 114,000 people in 107 countries, and offers the greatest country coverage to date.

Alternatively, the researchers at the World Bank adopted the basic approach of the TI CPI, but attempted to improve on it in several respects (Kaufmann et al., 1999) in their Worldwide Governance Indicators (WGI) project. This project reports aggregate and individual governance indicators for 212 countries for six dimensions of governance: Voice and Accountability, Political Stability/ Absence of Violence, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption. To produce one of the six components, for example Control of Corruption, the World Bank started by collecting existing perception indicators. They used only those perception indicators that contain useful information for assessing the quality of Control of Corruption in different countries from their point of view.

Despite the strengths of those measurement tools it has its weaknesses as well. The two main problems are the sample bias and transparency problems. In particular, it is unclear what the corruption indices actually reveal, since the types of corruption and their meaning vary from one country to another (Thompson and Shah, 2008). According to TI, the original purpose for their perceptions-based indicator was to raise awareness of corruption and to provide researchers with better data for analyzing the causes and consequences of corruption (Knack, 2006). The problem is that there are different forms of corruption. The extent of corruption in a country may depend on the frequency of corrupt acts, the amount of bribes paid or the gain that contractors achieve through corruption (Thompson and Shah, 2005).

1.3 Determinants of corruption

This section reviews the possible causes of corruption implied in previous research. I will focus on determinants that are further used to proceed with empirical analysis of my model. Of course, there are many more of them and the probelm is that it is also difficult

to determine causal relationships; causation can often go in both directions (Rose-Ackerman, 2006). Here, I will represent the studies that views corruption as an outcome.

Many empirical studies tried to find out the relation between corruption and economic and non-economic factors. But agreement is rarely found among researchers on the determinants of corruptions (Alt and Lassen, 2003). In several works, it is found that a variable is significant in one regression but it becomes insignificant when some other variables are combined with it. According to one studies, some variables have positive relation with corruption like, government involvement in the economy, inequality and absence of competition in the market and others have negative like growth, level of education and economic freedom etc. However, other studies state opposite.

The level of democracy

Level of democracy is one of the representative of non-economic factors that influence the level of corruption prevailing in particular country. In line with press freedom or share of population affiliated by a particular religion are also empirically investigated by various researchers. The democracy is a set of principles and practices that develop institutions of the country, which protect individual freedom. The basic elements of the democracy are: (a) the formulation of government, majority must be preferred. (b) The existence of free and fair elections. (c) Protection of minorities and respect for basic human rights (Laza Kekic, 2007). This means, democracy includes institutional as well as cultural elements. In democratic societies, the public representatives derive their power from the public and use it (serve) for the interest of the public. Empirically the findings investigated by Suphacahlasai (2005), Kunicova and Rose-Ackerman (2005), Gurgur-Shah (2005), Braun- Di Tella (2004), Brunetti-Weder (2003) Chang-Golden (2004), Herzfeld-Weiss (2003), Persson et al. (2003) and Lederman et al. (2005) showed a negative relation between level of democracy and corruption. Broadman and Recanatini (2000) in their article examining 26 transition countries found the same relationship.

From a theoretical point of view, there are several reasons why it is expected that democracy may reduce corruption. Elections increase the probability that corrupt officials will be exposed and punished, as the opposition has an incentive to uncover corrupt activities by the incumbent, and voters have an interest in not reelecting politicians that favour their own private interests over those of the electorate. Moreover, competitive

elections likely to decline the private rents that can be appropriated by officials, since offers of favourable treatment for special interests can be undercut by the opposition (Myerson, 1993; Ades and Tella, 1999). Democracy can also entail a more open system of government, which means that private information on how the system works will become less prevalent, and information rents will go down. Effective checks and balances within government may similarly limit the ability of officials to divert from impartial practices. In other words, knowing someone in power becomes less valuable. Furthermore, democracy may affect the normative perceptions of corruption in a society, making corrupt activities less attractive as they carry a greater stigma, and possibly also influence the type of individuals appealing to public office. All in all, democracy may reduce corruption by reducing private benefits of corrupt actions and increasing expected costs.

There are, however, also theoretical arguments against. Election campaigns demand financing, and more competitive elections may make political parties and candidates vulnerable to pressure from funders (Rose-Ackerman, 1999). And as shown by Pani (2011), even a rational and informed median voter may choose to vote for a corrupt government for strategic reasons. In some societies, it has been argued that the introduction of democracy has served to reinforce existing patron-client relationships, leading to the democratization of corruption rather than its reduction. The effect of a more open government is also ambiguous. Bac (2001) argues that transparency makes it easier to identify, which official to bribe and shows that this effect may dominate a corruption detection effect for small changes in transparency. Moreover, institutions of horizontal accountability are often appointed or funded by the government, which may reduce incentives and capacities to address government corruption. In the worst case, these institutions may be used to persecute political opponents of the government, rather than hold the government accountable. Finally, if normative perceptions or the risk of getting caught in corrupt acts depend on the number of corrupt officials in a society, this means that there may be multiple equilibria with different levels of corruption, and small changes in norms or behaviour brought about by democracy may be insufficient to dislodge a high corruption equilibrium. In total, these arguments imply that democracy may have no effect on corruption, or could in principle also increase corruption.

Level of education

Beets (2005) uses the CPI's country level rankings to investigate the relationship between country level education aggregates and corruption. He shows that lower education levels, measured by literacy rates, enrollment rates and student-teacher ratios, are associated with higher levels of corruption. For example, countries with "low corruption" averaged a 90 percent enrollment rate, while countries in the "high corruption" category averaged only a 56 percent enrollment rate for school aged children. These findings align with Mauro's (1997) finding above; in Mauro's paper corruption is associated with lower levels of education inputs (expenditures), and in Beets' paper corruption is associated with lower levels of education outcomes.

Theoretically, education's effect on corruption participation is ambiguous. Education has been shown to reduce illegal behavior, decrease arrest rates, improve social cohesion, and increase civic responsibility (Heyneman, 2002/2003; Heyneman, 2008; Oreopoulos & Salvanes, 2009). All of these outcomes suggest that education attainment should lead to less corruption participation.

However, more educated individuals are more likely to interact with public officials, providing more bribery opportunities. They also are more likely to have better paying jobs, increasing the value of the shorter wait time for public services that bribery can bring. Additionally, in many developing countries the education systems themselves are corrupt. School children who must bribe for good grades, bribe to move to the next grade level, and bribe for admission into college may learn that corruption is the way to get ahead in their society. Spending more time in such an education system may increase an individual's propensity to bribe later in life.

When education is discussed in the context of corruption, it is most commonly examined at the country level. Cross-country studies have well-established that higher levels of aggregate education in a country are associated with lower levels of corruption as measured by aggregate rankings (Lederman et al., 2005; Cheung & Chan, 2008).

Competitiveness on the market

Another important variable of current paper is national competition in terms of total productivity.

Competition is commonly assumed to lower supplier's prices. In public procurement, e.g., the resulting rents for private firms decrease. As a consequence, public servants and politicians have less to "sell" in exchange for bribes, reducing their motivation to start with a corrupt career. To the contrary, where competition is restricted profits increase and politicians can grasp the opportunity to assign these profits – in exchange for a share. In other words, low levels of competition lead to higher rents, the potential returns from, and hence the incentive to engage in, corruption are increased. Economic rent as a return is a Ricardian definition. The standard neo-classical definition of 'economic rent' is that portion of income paid to a factor of production in excess of that which is needed to keep it employed in its current use.

The correlation between low levels of competition and high levels of corruption is confirmed using a range of measures of each variable. Hence Ades and Di Tella (1999) find that competition, measured using indices such as competition from foreign firms, is inversely related to corruption. Brunetti and Weder (1998c) find similar results using a cross-section of 122 countries. Others have therefore measured the extent of competition by the number of years a country has been open to trade (Sachs and Warner, 1995; Treisman, 1999a and Leite and Weidmann, 1999) and have found similar correlations. Thus, the inverse relationship between competition and corruption appears to be fairly robust.

Krueger (1974), Rose-Ackerman (1978), Shleifer and Vishny (1993) were studying corruption focused on understanding the incentives of the corrupt agent and rent seeking behavior. These early models posited a government agent who controls permits, access to markets, etc., as a kind of monopolist who is likely to charge rents. It was hypothesized that a government agent that controls access to a formal market has a self-interest in demanding a bribe payment that serves to limit the number of firms. The introduction of competition and/or regulation therefore could help curtail corruption.

1.4 Consequences of corruption

Foreign Direct Investments and Capital Inflows

Corruption may not only be an obstacle to domestic investors, but also render a country unattractive to foreign investors. Recent studies provide evidence in favor of corruption deterring foreign investors. For example, Wei (2000) detects a significant negative impact of corruption on FDI. Lambsdorff and Cornelius (2000) , Abed and Davoodi (2002) concluded the same result.

Wei and Wu (2001) also argued that corruption reducing foreign direct investments. Interestingly enough, they state that an impact of corruption on incoming bank loans cannot be obtained. Thus, corruption distorts capital inflows in corrupt countries towards bank loans. Similar findings are reported by Straub (2003). This distortion might reduce economic welfare, because loans can be withdrawn more easily in case of economic problems. This makes corrupt countries more vulnerable to currency crises. This effect might be amplified, because corruption increases bond spreads and thus makes loans dearer.

On the other hand, several studies like Wheeler and Mody (1992), Alesina and Weder (1999) did not find any significant correlation between those two variables.

Gross Domestic Product and Inequality

There is a strong correlation between GDP per head and corruption reported in many empirical studies. But there is equal agreement that no unambiguous causality can be derived from this. While corruption is likely to lower GDP per head, poorer countries lack the resources to effectively fight corruption (Husted, 1999) and (Paldam, 2002).

Gupta, Davoodi and Alonso-Terme (2002) argued that corruption increases income inequality, as measured by the Gini coefficient. The benefits from corruption are likely to accrue to the well-connected at the expense of the poor. In other words, in many countries today and in the past, people choose to be active as bureaucrats, as army officers or in other rent seeking activities instead of working in the potentially more productive or entrepreneurial activities (Nabla-Norris and Wade, 2002). Better connected people in society have increased opportunity and incentives to bribe and belong mainly to the high-income groups within a country (Tanzi, 1995). This could lead to a reduction in the level of social services available to the poor (Rose-Ackerman, 1999).

Definitely, there are other variables that are considered to be a consequence of corruption such as inflation, because the larger the size of the unofficial economy, the easier it is to raise government revenue by increasing the money stock (seignorage) rather than by distortionary taxation (Al- Marhubi, 2000). Among others are crime levels (Azfar and Gurgur, 2004) or environmental quality (Welsch, 2004). However, I detailed described the ones, whcich are important and related to my model.

1.5 Corruption is a cause or a consequence?

As it was already briefly mentioned before, it is very difficult to assess whether corruption causes other variables or is itself a consequence of certain characteristics. Most of the researchers point out that some variables are so highly intertwined with corruption that they might just as well be the cause, and not only the result, hence the direction of causality of these indicators is controversial. This suggests that countries can be trapped in a vicious circles, where corruption lowers income, increases inequality, inflation, crime, policy distortions and helps monopolies at the expense of competition. These developments in turn escalate corruption. There is a heavy burden placed on instrumental variable technique in trying to disentangle these mutual dependencies.

For instanse, corrupt public official will not be content to passively extract an 'entrance fee' from firms wanting to participate in a market to which access is limited by the necessity to cross a range of regulatory hurdles. He will be aware that the less competitive the market, the greater the rent generated and the greater the opportunity for rent seeking. Therefore, the causality explaining the inverse correlation between rent-seeking and corruption is plausibly theorised to run both ways – that is, both from low levels of competition to high levels of corruption and from high levels of corruption to low levels of competition. This rises the problem of endogenity from methodological point of view, which I will deal with in my research model in the following chapter.

1.6 Applications to Russian economy

The next section is drawn upon discussion on corruption from perspective of Russian economy. That is, which factors influencing corruption are peculiar for Russia in particular. Or is it just the same as global tendency? This is rather an empirical question,

nevertheless, here I will focus on answering this question from conceptual and statistical perspective.

Unfortunately, corruption was and remains the biggest problem in Russian society. There are many different estimates of the actual cost of corruption. Some independent experts claim, that corruption consumes as much of 25% of Russia's GDP for year 2011. A World Bank report puts this figure at 48%. Doubtless, it is very high figure.

There is also an interesting shift in the main focus of bribery: whereas previously officials took bribes to shut their eyes to legal infractions, they now take them simply to perform their duties. Many experts admit that in recent years corruption in Russia has become a business. In the 1990s, businessmen had to pay different criminal groups to provide a “protection” for his business. Nowadays, this "protective" function is performed by officials.

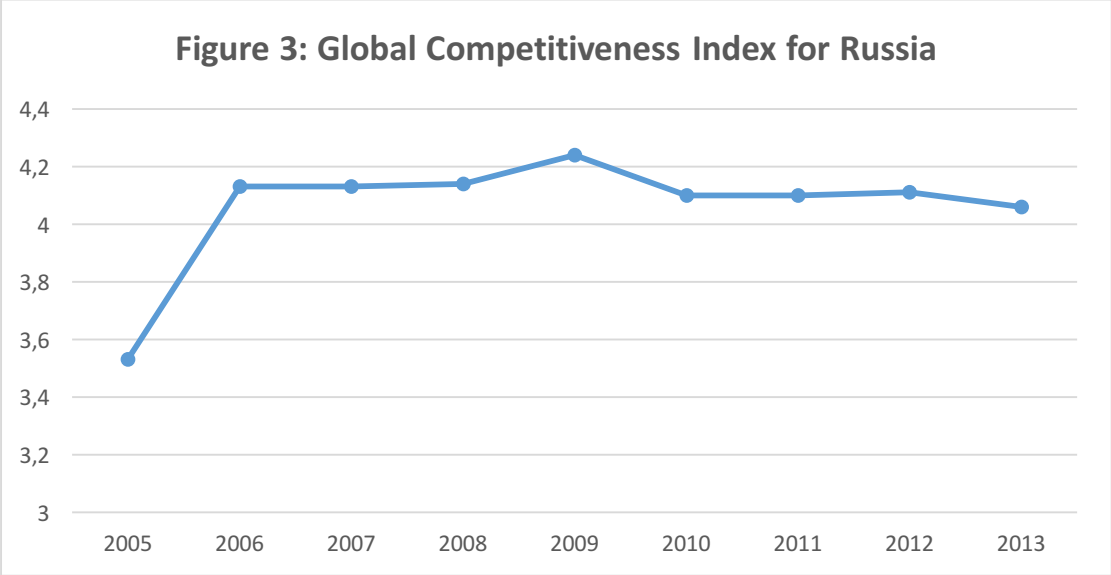
According to independent experts of RBC magazine, law-enforcement agencies (including the State Traffic Safety Inspectorate) as the most corrupt sphere in Russia, which is followed by healthcare, education, housing and communal services, and social security services.

Corruption is often cited as a key factor behind Russia’s economic problems. For instanse, high levels of corruption are likely to have been an especially important factor behind Russia’s extremely low level of foreign direct investment. There are several reasons for that. Firstly, the relatively large size of foreign investments, and the special regulations applying to them, are particularly conducive to rent-seeking. Secondly, local companies may use corruption to shut foreign competitors out. Finally, foreigners lack specific knowledge of how to operate in a particular corrupt environment. That is, modest performance of Russia in attracting FDI is particularly evident in comparison with other transition economies in Europe, which have received far more FDI, adjusted for population. By the end of 2003 Russia had recorded a cumulative inflow of USD 26.1 billion, less than half China’s annual inflow for 2003 alone, and far below comparable absolute figures for the Czech Republic and Poland (OECD, 2004). In other words, lack of protection for private investment results in worsening of investment climate, since people fear for their own savings and seek to find safer opportunities for their capital abroad.

As far as correlation between market competitiveness and level of governmental corruption is concerned, here I would like to compare following two figures: Figure 2 and Figure 3. Figure 2 shows the Corruption Perception Index for Russia from years 2005 till 2013 and Figure 3 shows Global Competitiveness Index (GCI), representing the level of market competitiveness in Russia for same years. For this Figure 2 I have inverted the CPI index (for the reason of easier interpretation) so that the higer score would represent the higher level of corruption and vice versa. Comparing Figure 2 and Figure 3, I can observe the pattern, where the decreasing level of corruption corresponds to the increasing level of competitiveness. That is, from 2005 till 2006 there is significant increase in level of Russia's competitivness, at the same time level of corruption is declining. On the other hand, from 2006 till 2008 competitivness remains relatively constant, however corruption is dramatically increasing. It can be explained by influence of other important factors on bribes demand.

Corruption leads to a less efficient competition: the eneterprises that succeed are not necessarily those that are the most effective ones, but those that have agreements with officials based on bribes or personal influence and thereby gain certain favours and advantages. A very small group of people is able to reap enormous profits from its corrupt relations with officials, while the rest of population must bear the costs.

Source: Author's computations

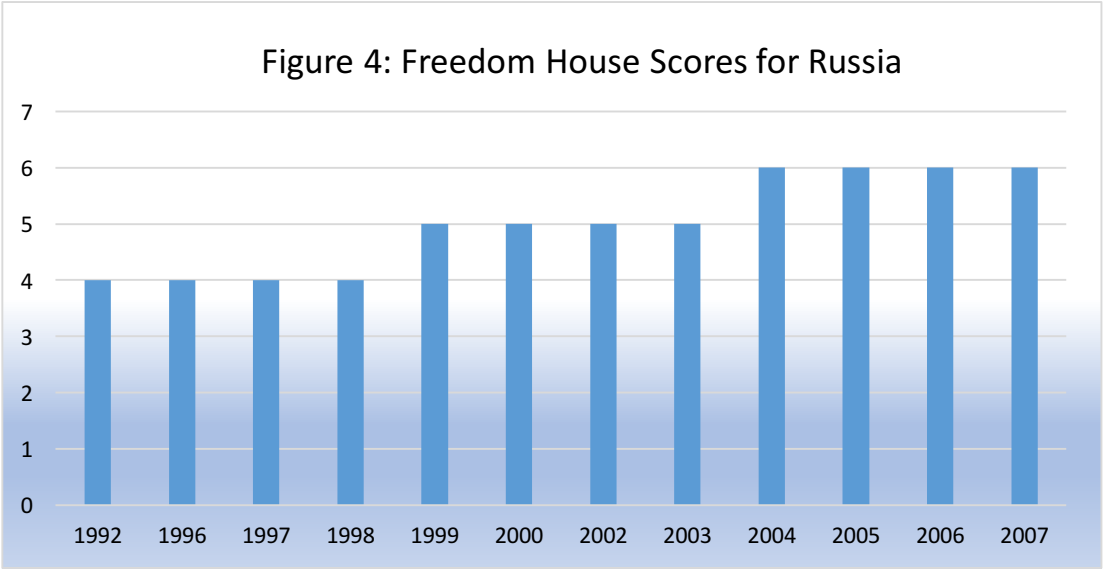


Source: Author's computations

Another specific factors that could cause corruption in Russia are: the absence of independent mass media, juduciary that are highly dependent on government and political competition. Moreover, there is a lack of civil society that could monitor and control the executives leads to government playing a particularly active and interventionist role in the industrial sector.

Russia's remaining defects are typical of countries at its level of economic development. In fact, International Monetary Fund (IMF) includes Russia in the list of still developing countries. Both in 1990 and 2003, Russia was a middle-income country, with GDP per capita around $8,000 at purchasing power parity according to the UN International Comparison Project, a level comparable to that of Argentina in 1991 and Mexico in 1999. Countries in this income range have democracies that are rough around the edges, if they are democratic at all. Their governments suffer from corruption, and their press is almost never entirely free. This fact is supported when comparing Figure 4 and Figure 5 below. Figure 4 shows the level of democracy in Russia, represented as composed index introduced by Freedom House organization[1] and Figure 5 shows the CPI index for Russia for extended period of time.

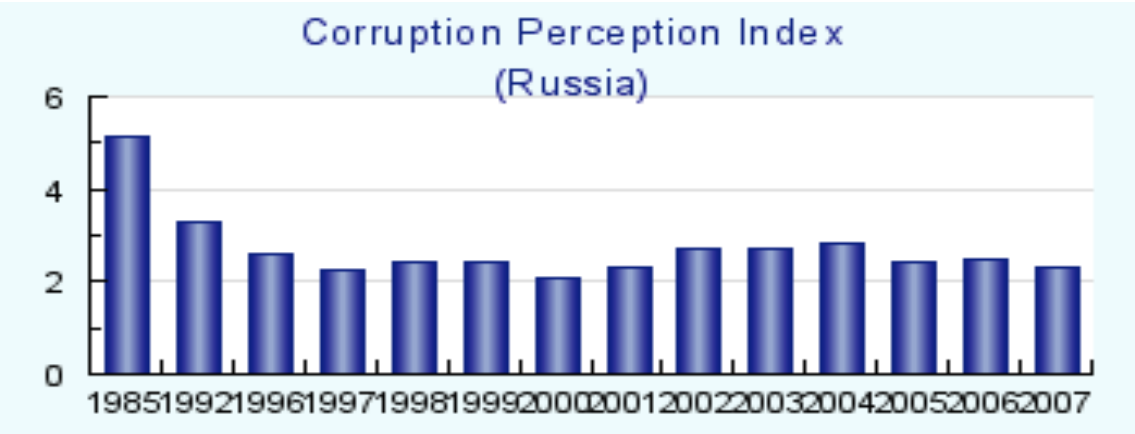
[1] freedomhouse.org



Note: Rating scale is from 1 to 7: 1-2,5 is free; 3-5 is partly free; 5,5-7 is not free

Source: Author's computations

Figure 5



Source: Transparency International

Note: Here CPI is not inverted as on Figure 2 (again for the reason of easier interpretaion and comparing the Figures, it is more obvious that trends go diffrent directions). Higher score means less corruption, lower score means more corruption.

Comparing statistics, demonstrated in Figures 4 and 5 above during same years, I can conclude, that the periods of low democratic freedom corresponds to the high level of corruption. Moreover, the tendency of corruption moving opposite direction than democracy is clearly visible.

2. The model

So far the general correlations between research variables were explained from theoretical and conceptual perspective, however, the empirical evidence is needed to support the existing hypotheses.

The model that is used in this paper incorporates several studies, mentioned in the previous chapter, where the selection of particular variables is justified. The authors to be mentioned are: Krueger (1974), Rose-Ackerman (1978), Shleifer and Vishny 1993), Bliss and Di Tella (1997), Ades and Di Tella (1999).

The main inspiration for the model specification I acquired from the work of Patrick M. Emerson (2005) published by Journal of Development Economics "ELSEVIER". However, the author uses cross-sectional analysis for 1999 year, which is quite limited and subjective given selected variables. Thus, the comprehensive test of the model is not possible. That is why my model is based on the panel data structure, which allows for observable and unobservable individual heterogeneity test and hence, more sophisticated model is implemented. Another question arising from this model is a high collinearity between GNP and GNP per capita, which could be a threat of biased and inconsistent results; my model eliminates this problem.

The adjusted econometric model, using panel updated data structure, with corrected and altered independent variables, taken from different data sources, is following:

$$comp_{it} = \beta_0 + \beta_1 corr_{it} + \beta_2 gdp/cap_{it} + \beta_3 fdi_{it} + \beta_4 area_i + \varepsilon_{it}$$, where

- $comp_{it}$ –level of competition in the economy (index variable);
- $corr_{it}$– level of corruption in the economy (index variable);
- gdp/cap_{it}– Gross Domestic Product per capita in a country (in US dollars);
- fdi_{it} – Net Foreign Direct Investments (in billion US dollars);
- $area_i$– physical size of a country (km^2);
- ε_{it} – random error which combine all unobserved factors, which also influence the dependent variable.

The given model views corruption as a cause of change in the level of competitiveness in particular country. The logic behind is that, if corrupt government agents are in charge of licensing and regulation in the industrial or any other production sector, it is quite easy to understand that limiting the number of firms may be in their own interest.

However, the theory assumes the level of competitiveness in an economy and the level of corruption to be jointly determined causing endogeneity problem, as it was explained in the previous chapter. That is, instrumental variables for corruption are needed (the explanation of methodology is presented in Chapter 3). The level of democracy and education could serve as a good instruments for corruption. Together, these variables help determine the extent to which the citizens of a country have the right to speak out and act against government corruption. As well as the extent to which the citizens are educated and thus can be more effective in such actions. Additionally, since democracy is a form of governance and social organization, and so inherently places some sort of restriction and boundaries upon certain types of liberty. Consequently, a democracy may deprive to different extent the individual citizen of civil liberties which he or she might have under another form of government. Some civil liberties can be understood as necessary conditions for the meaningful functioning of self-government, because they are immanent to a democratic process. Hence, the second regression equation is following:

$$corr_{it} = \alpha_0 + \alpha_1 civlib_{it} + \alpha_2 primed_{it} + \alpha_3 \sec ed_{it} + \alpha_4 tered_{it} + \varepsilon_{it}$$, where

- $civlib_{it}$ – a proxy for democratic freedoms, level of civil liberties citizens enjoy in a country (index variable);
- $primed_{it}$ –percentage of labour force, that completed primary education as a highest level of education (% of total labour force);
- $seced_{it}$ – percentage of labour force, that completed secondary education as a highest level of education (% of total labour force);
- $tered_{it}$ – percentage of labour force, that completed tertiary education as a highest level of education (% of total labour force).
- ε_{it} – random error which combine all unobserved factors which also influence the dependent variable.

Three main hypotheses I would like to test in this research are as follows:

1) The higher the level of corruption is (or amount of bribe payment demanded from formal firms), the lower is the competitiveness of the economy.
2) Increased democratization is associated with lower corruption and thus would be expected to increase competition.
3) The more educated the citizens of a particular country are, the less corruption exist in this country.

Moreover, I would like to check if those implications hold for different samples of countries; if a tendencies are the same e.g for developed and developing countries and for Russia particularly, as a representative of still developing countries.

3. Data and Methodology

3.1 Data description

The sample of countries analyzed in this study consists of 37 countries all over the world observed throughout 9 consecutive years (from 2005 till 2013). That means that the panel data structure is implemented. The selection of these countries is on the basis of availability of data for all concerned variables. As for some countries few variables are not provided for whole period, the final dataset is unbalanced, that is N observations on individuals are observed at different number of times T_i. The countries are: Australia, Brazil, Bulgaria, Canada, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, India, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russian Federation, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom. This list was much longer in the beginning, however, I had to reduce it due to data inavailability.

Further in my analysis, to check the robustness of results I will divide the chosen countries for developing and developed one (the list of developing and developed countries is provided in Appendix 4). In addition, I will make inference for Russia in particular.

The data employed in this study are from a number of sources:

The measurement of corruption is taken from Transparency International database (TI), which is represented as Corruption Perception Index (CPI). I chose this measurement for several reasons. Firstly, it fulfills the requirements of the definition of corruption used in this study (the misuse of public office for private gain). Secondly, CPI is the most complete corruption quantitative index in countries. This index is “poll of polls”, combing the results of different polls and surveys done by various independent institutions. This index classifies countries from zero to ten. Ten is for clean economy and zero is for corrupted economy.

Market competitiveness in country is represented as Global Competitiveness Index (GCI) collected from World Economic Forum (WEF). The reason for such choice is that the Global Competitivess report produced by given organization remains the most comprehensive assessment of national competitiveness worldwide.[2] Competitiveness here is defined as the set of institutions, policies and factors that determine the level of productivity of a country. The range of the index is from one to seven, where higher score means higher degree of competitiveness.

The data on macroeconomic indicators such as gross domestic product per capita (GDP per capita), foreign direct investmesnts (FDI), education and area are taken from World Bank[3] organization. GDP per capita is measured in current US dollars and FDI is represeted as balance of payments of a particular country also measured in current US dollars (in billions). This series show total net, that is, net FDI in the reporting economy from foreign sources less net FDI by the reporting economy to the rest of the world, thus it can have either positive or negative sign. These are instances of reverse investment or disinvestment. Area is a physical size of the country measured in sq. km. Primary education (% of total) stands for the the labour force with primary education as the share of the total labor force that attained or completed primary education as the highest level of education. The same logic holds for secondary and teriary education.

A proxy for democratic freedoms, the level of civil liberties, is taken from Freedom House a U.S based non-governmental organization. It is measured on a one-to-seven scale, with one representing the highest degree of freedom and seven the lowest.

The descriptive statistics obtained from Stata software for all of the data employed in this study are given in the Table 1.

For instance, the countries that attained the minimum value of 2.1 for CPI index are the most corrupted ones in the given sample. Conversely, the maximum of 9.4 represents the cleanest economies of a sample, from 0-10 scale. Additionally, on average around 24% of labour force have primary education as the higest level of education achieved. On the contrary, on average 47% and around 27% have secondary and tertiary education respectively, as a highest completed level. Additionally, the minimum of civil liberties

[2] http://www.weforum.org
[3] http://data.worldbank.org

equals to 1 corresponds to the countries with highest degree of democratic freedom within given sample, whereas 6 correponds to lowest level of democracy.

Table 1: Summary statistics

Variable	Mean	Std.Dev.	Min	Max
Competitiveness (GCI index)	4.696597	0.5518633	3.71	5.8
Corruption (CPI index)	6.325654	1.967612	2.1	9.4
GDP per capita (US dollars)	33272.96	23830.33	1417.07	112028.6
FDI (billions US$)	1230	10600	-71	126000
Area (sq.km)	680240.4	2106361	320	16400000
Primary education (%)	24.11937	15.71636	5.2	70.4
Secondary education (%)	47.44555	14.95082	15.3	78.5
Tertiary education (%)	26.73351	8.339483	9.3	54
Civil liberties (Index)	1.235602	0.689767	1	6
Number of observations=191				

Source: Author's computations

3.2 Methodology

This section provides an insight into the methods and procedures that are used to obtain and analyze the gathered data. I will also state why the below explained methods were chosen, furthermore, I also go through the assumptions and issues that might occur.

The model used in this study is based on panel or longitudinal data structure. This typically refer to data of at least two dimensions: a cross-sectional dimension, indicated by subscript *i*, and a time series dimension, indicated by subscript *t*. However, panel data could have a more complicated clustering structure. Thus, the application of regression models to fit econometric models are more complex than those for simple cross-section or time-series data sets. Nevertheless, they are increasingly being used in applied work. The comprehensive treatments are employed by Hsiao (2003), Baltagi (2001) and Wooldridge (2002). According to Hsiao (2006) and Greene (2012) the panel data structure has following advantages:

- More accurate inference of model parameters. Panel data usually contains more degrees of freedom and more sample variability.
- The use of panel data reveals dynamics, that are difficult to detect with cross- section data.
- It controls the impact of omitted variables. Panel data contain information on both the inter-temporal dynamics and the individuality of the entities may allow one to control the effects of missing or unobserved variables.
- Greater capacity for capturing the complexity of human behavior than a single cross-section or time series data.

3.2.1 OLS, 2SLS and IV

The classical linear regression model describes how the dependent variable is related to the independent variables and the error term, where the goal is to estimate the unknown parameters betas. Hence, one need to choose such an estimator b of β, which minimizes the sum of squared residuals . That is how an Ordinary Least Squares (OLS) estimator is obtained (assuming it exists): $\hat{\beta} = (X'X)^{-1} X'Y$.

Gauss-Markov Theorem justifies the use of the OLS method based on following assumptions:

- **Assumption 1**: Linearity in unknown parameters β-s .
- **Assumption 2**: Full rank: The n × K sample data matrix X has full column rank (no exact linear dependencies in data).
- **Assumption 3**: Exogeneity: $E(U \mid X) = 0$, that is, there is no correlation between the disturbances and independent variables.
- **Assumption 4**: Homoscedasticity and no autocorrelation: each error term has the same finite variance.
- **Assumption 5**: Random sample of n observations.
- **Assumption 6:** The disturbances are normally distributed.

Under Assumptions 1 through 5, the OLS estimator is the best linear unbiased estimator (BLUE), where "best" is defined as the one with smallest variance. With 6-th assumption the estimator becomes best unbiased estimator (BUE).

However, in many real cases above mentioned assumptions are too restrictive. As in the model of the current paper, the assumption of uncorrelated regressors with error term is is violated. This violation leads to the endogeneity problem. Hence, OLS estimator is not consistent and it is biased. The solution to it is an Instrumental Variables (IV) technique.

There are two conditions for existence of valid instrument. First, it should be relevant (correlated with endogenous regressor X). Secondly, it should itself be exogenous (uncorrelated with disturbances). Instrumental variable estimator can be viewed as:

$$\hat{\beta}_{iv} = \frac{Cov(z,y)}{Cov(z,x)}.$$

One of the assumptions that were made is : L=K (number of instruments is the same as the number of regressors), in this case model is said to be just-identified. Order condition requires L≥K, therefore there must be at least as many instruments as endogenous components. If L>K this case is said to be an over-identified case. K<L refers to the under-identified case, this means it does not have inverse matrix and it is not possible to find the solution.

It is better to use all available data, in such case the projection of columns of X in the columns of Z is implemented. This logic lies behind the two-stage least squares procedure (2SLS). With such choice of „instrumentál variables“ , the formula for 2SLS estimator is obtained:

$$\hat{\beta}_{2SLS} = \hat{\beta}_{IV} = [X'Z(Z'Z)^{-1}Z'X]^{-1}X'Z(Z'Z)^{-1}Z'y \,.$$

2SLS name comes from the fact that we are obtaining the estimate in two steps. First, OLS regression of X on Z, where the predictions for X are obtained. Secondly, OLS regression of those obtained predictions on Y.

However, before dealing with endogeneity one needs to assure it is really an issue. One way to test for endogeneity is to use a Hausman test, based on the idea that there is a difference between OLS and 2SLS estimators. Under the null hypothesis of no endogeneity both OLS and 2SLS are consistent, though 2SLS is less efficient. Under the alternative hypothesis the efficient one becomes inconsistent, and the inefficient remains consistent.

3.2.2 Random effect and Fixed effect models

There are three main approaches to fitting the panel data are know as Fixed Effect, Random Effects and Pooled OLS models.

Since panel or longitudinal data then involves repeated observation on a cross-section of individuals over time, hence, one is interested in heterogeneity across individuals, keeping time dynamics. In other words, it is crucial to understand the differences in behaviour across individuals.

The basic framework is as follows:

$$y_{it} = X_{it}'\beta + Z_i'\alpha + \varepsilon_{it} = X_{it}'\beta + c_i + \varepsilon_{it} \,.$$

Heterogeneity or individual effect is captured by $z_i'\alpha$. If individual or group-specific z_i is observed for all individuals, contains only constant term, model is an Pooled OLS (OLS provides consistent and efficient estimates). Complication arises if z_i is unobserved, which is the case in many real-word applications.

Fixed effects model is used if z_i is unobserved, but correlated with X_{it} (LS is biased and inconsistent). That is, the model with $E[c_i | X_i] \neq 0$, where $c_i = z_i' \alpha$ contains all observable effects; c_i is a group-specific constant term in a fixed effects approach.

Random effects model is used if z_i is unobsereved and uncorrelated with included variables X_{it}. Then it may be appropriate to model individual constant terms as randomly distributed across cross-sectional units. For example, in case the cross-sectional units are from large sample, this is appropriate.

On the contrary, Pooled OLS does not take into account this heterogeneity between individuals, thus the estimated results are not precise, missing valuable information.

The reason why it is desirable to control for such unobservables is evident. For instance, in some countries there might be a culture of never telling on people, even if they broke the law. Clearly, if people do not talk about what others are doing, it fosters corruption by reducing the chances of getting caught.

In my model, I need to combine endogeneity problem with panel data modelling. Hence, my goal is to incorporate Fixed effects and Random effects models with Instrumental Variables technique. In particular, those methods are called G2SLS Random effects IV regression and Fixed effects (within) IV regression. Obviously, they combine all properties and assumptions disscussed above in one model, thus one should be careful to meet them.

4. Results and Interpretations

4.1 Full sample of countries

I start my analysis with testing if the assumption of coruuption being endogenous variable is valid. For that purpose I perform a Hausman test for endogenity. The structure of the test with null and alternative hypotheses is presented in Table 2 below.

Table 2: Hausman test for endogenity

	OLS	2SLS
H_0	Consistent Effecient	Consistent Inefficient
H_A	Inconsistent	Consistent

Source: Author's computations

I obtained a p-value of 0,0168, which is less than 0,05, hence I reject the null hypothesis of no endogeneity (the output from Stata software is shown in Appendix 1). That is, coruuption is proved to be endogenous in my model. These results, however, contradict the results of the original model of Patrick M. Emerson (2005), where the the null was not rejected.

The next step is to run first stage of 2SLS to assure, that my choice of instrumental variables is justified. I checked all assumptions ordinary least squares must satisfy and heteroscedasticity issue has occurred, where the variance of the error term is not constant across observations (the residuals plot is presented in Appendix 2). Moreover, I conducted a White test to confirm my results: p-value is 0,00084 meaning the null hypothesis of homoscedasticity is rejected. Therefore, I used heteroscedasticity and autocorrelation consistent (HAC) robust standard errors to deal with that issue. Additionally, plot and test for normality of residuals is also in Appendix 3. The results of the first-stage regression are demonstrated in Table 3.

According to Table 3, the coefficient estimate on civil liberties, tertiary education and

constant are statistically significant at 1% level, meanwhile secondary education is significant on 5% level. Such highly statistically significant variables mean that the results have a 99%, 95% probability of being true. On the other hand, primary education is not significant at all, even on 10% level.

Table 3: First stage of 2SLS on full sample

Corruption (CPI index)	**Coefficient**	**Robust Std. Err**	**P > | t |**
Civil liberties	-1.345324	0.200800	0.000***
Primary education (% of total)	0.0154609	0.0192427	0.423
Secondary education (% of total)	0.0457824	0.0191665	0.018**
Tertiary education (% of total)	-0.1008036	0.0199011	0.000***
Constant	7.838186	1.868885	0.000***
Number of observations = 191			
R-squared = 0.540785			

** Indicates significance on 5% level

*** Indicates significance on 1% level

Source: Author's computations

From economic point of view, there are three main determinants of the level of corruption: the amount of civil liberties (the proxy for democracy), ratio of labour force with secondary education and ratio of labour force with tertiary education. The coefficient estimate on civil liberties is negative meaning that the higher the level of civil liberties (democracy) in a country, the lower the level of corruption. In particular, if the level of civil liberties increases by 1 unit (in my case it is just a movement from 1 to 7 scale in the index range), ceteris paribus, the corruption will decrease by 1,3 units (movement from 0 to 10 scale in index range). The coefficient estimate on the secondary education ratio is positive, suggesting that the more educated (at the high school level) are the citizens of a country, the less corruption exists in that country (note: positive relation here means movement in opposite directions- due to the structure of CPI index).

On the other hand, I can observe a negative coefficient for tertiary education, whcich is quite unexpected. This outcome contradicts most of the studies, but still found a support in several works like Attile (2008). The explanation for it could be that the most educated individuals on the university level are more likely to interact with public officials, providing more bribery opportunities.

Many researchers conclude from their work that if the first-stage F- statistic exceeds 10, their instruments are sufficiently strong. This „rule of thumb“ is rather informal, though. In my case, F- statistics equals to 83,81, which suggests a good choice of instruments.

To estimate the first and the main equation of my model I employ two panel data techniques: Fixed effect estimation (FE) and Random effects estimation (RE). Those two models are combined with Instrumental Variables technique. Hence, the employed methods of estimations are: G2SLS random-effects IV regression and Fixed-effects (within) IV regression. I include those methods of estimation for the reason of checking and comparing the results, and only after doing that I will select the best model that fits my data in a proper way.

FE model examines the link between predictor and outcome variables within a country. Each country, as it is easy to suppose, has its own specific characteristics, that can or cannot affect largely the predictor variables. FE eliminates the impact of those time-invariant features from the independent variables in such a way that I can estimate and analyze the predictor variables net effect.

Another crucial premise of the FE model is that those time-invariant features are particular and distinctive for each country apart and should not be correlated with other specific characteristics.

The second tested model is RE model. The logic behind this model is that, in comparison to the FE model, the variation across countries is assumed to be random and uncorrelated with the predictor variables included in the present regression: "…the crucial distinction between fixed and random effects is whether the unobserved individual effect embodies elements that are correlated with the regressors in the model, not whether these effects are stochastic or not" (Greene, 2008).

Mentioned above characteristics of FE and RE is also the reason why I did not choose the Pooled OLS method, which can be as well applied for panel data modelling. Pooled OLS technique does not take into account those unobserved or country effects.

Table 4 summarizes the obtained results from both regressions. Since the ranges of measurements of diffrent variables vary a lot, I used the natural logarithms of GDP per capita and Area variables to make interpretation of results more clear. I could not apply logarithms to FDI, as some observations have negative signs, implying those countries import more than export. The coefficient estimate for Area in FE model is missing, because Area is constant across time dimentions of each country.

Table 4: G2SLS random-effect IV and Fixed-effects (within) IV estimations for full sample of countires

Competitiveness (GCI)	**FE model**	**RE model**
Corruption (CPI inverted)	-0.2625393** (0.1203651)	-0.166581*** (0.0534884)
Log (GDP per capita)	0.2009361 (0.1235273)	0.1932569* (0.1073611)
FDI (billions US dollars)	-2.16×10^{-16} (9.74e-16)	3.88×10^{-16} (7.73e-16)
Log(Area)	0 (ommited)	0.0475274*** (0.0152357)
Constant	3.620332** (1.559632)	2.780517** (1.308091)
R-squared overall	0.8330	0.8531
Number of observations = 191		

Standard errors in parentheses

*** Indicates significance on 1% level (p<0.01)

** Indicates significance on 5% level (p<0.05)

* Indicates significance on 10% level (p<0.1)

CPI index is inverted here just to make interpretation more intuitive

Source: Author's computations

For choosing the best fitting model, I conducted Hausman test, which can be also used to differentiate between FE model and RE model in panel data. RE is preferred under the null hypothesis due to higher efficiency; while under the alternative FE is at least consistent and thus preferred. This test is also presented in the Table 5.

Table 5: Hasman test for FE and RE

	FE estimator	RE estimator
H_0	Consistent Inefficient	Consistent Efficient
H_A	Conssitent	Inconsistent

Source: Author's computations

In my case, p-value equals to 0,530, which is more than 0,05, thus the null hypothesis of those two estimators being different is not rejected and the RE is chosen, since it is more efficient.

Consequently, I am going to analyze the RE model in Table 4. Coefficient estimates of the main variable of my interest (corruption) is negative and significant on 1% level. Area, constant and GDP per capita are also significant on 1%, 5%, 10% respectively.

From economic point of view I can interpret my results as follows: corruption appeared to be an important factor in determination of level of competitiveness. One unit increase in corruption index leads to 0.166581 decrease in the GCI index range. Also, if GDP per capita increases by 1%, competitiveness in the country will also increase by 0.1932569/100=0,001932569 units in GCI idex range. The value of a coefficient for Area suggests a 1% increase in area size will lead to a 0.0475274/100=0.000475274 units increase in the GCI index. FDI appeared to have no effect on competitiveness at all.

Another important statistic that is worth mentioning here is based on a Wald test, which chooses between RE and Pooled OLS models: p-value is less than 0,05, hence, I reject the null hypothesis of Pooled OLS is being better than RE, resulting in choosing a RE as a best model. This, in fact, confirms that some unobserved country effects are present in my model specification and justifies the implemented methodology.

4.2 Inference for developed countries, developing countries and Russia.

The last question that remains to be examined in my current study is whether the findings from previous section are still robust when applying them to a different data set, for diffrent country samples. Each country has its own specific characteristics, which may or may not pursue the common tendencies all over the world. Hence, this section is dedicated to evaluating the relevance of those common trends, comparing the already obtained results with results obtained from estimating reduced samples, namely developing and developed countries. According to International Monetary Fund (IMF) Russia belongs to the list of still developing countries, so I will make inference for Russia in particular based on this fact.

Firstly, I replicate the procedure of first stage of 2SLS for defining the determinants of corruption in developing and developed countires. For that purpose, the dummy variable was created, where dummy equals to 1 if the country is developed and 0 otherwise. F-test showed that there is a possible heteroscedasticity issue (p-value equals to 0,000 meaning we reject the null hypothesis of homoscedasticity), thus the robust standard errors (HAC) were employed again. The results are presented in Table 6 (the list of developing and developed countries according to IMF is in Appendix 4).

From Table 6, it is quite noticeable that results differ a lot across samples. While all variables are significant for developing countries sample, for developed countries sample those general correlations do not hold. From economic point of view, I can conclude that factors determining the level of corruption in the country in fact vary across samples. For developing countries and Russia in particular the level of democracy and education are showed to be important determinants, even the tendencies remained the same as in unrestricted model. However, I can not state the same about developed countries sample, since all variables are insignificant. Evidentially, developed countries have other more substantial determinants of corruption that affect it in larger proportions rather than the ones specified in my model. Indeed, this could be a subject of further study.

Table 6: First stage of 2SLS for restricted samples

Corruption (CPI index)	Developed countries	Developing countries
Civil liberties	-0.0154023 (0.0092121)	-0.6971882*** (0.0958974)
Primary eduction (%)	0.0716844 (0.0476232)	0.0308459*** (0.0084118)
Secondary education (%)	-0.0685967 (0.0472974)	0.0164744* (0.0091534)
Tertiary education (%)	-0.0554855 (0.0514388)	-0.0484553*** (0.01022)
Constant	10.53487** (4.732669)	3.074965*** (0.7861003)
Number of obsevations	108	83
R-squared	0.3366	0.4515

Standard errors in parentheses

*** Indicates significance on 1% level (p<0.01)

** Indicates significance on 5% level (p<0.05)

* Indicates significance on 10% level (p<0.1)

Source: Author's computations

The next step is to replicate the main equation of my model adjusted for sample restrictions. The results are demonstareted in Table 7. Again, to choose between FE and RE I used Hausman test specification, where: for developing countries the p-value is 0.0024, meaning FE is better model, because it is at least consistent under H_A; for developed counties the p-value is 0.7353, meaning RE is a better model due to higher efficiency.

According to Table 7, there is no evidence of corruption being an important factor in determining the level of competitiveness in developing countries and hence in Russia. In contrast, negative correlation between corruption and competitiveness is confirmed in the regression for developed countries. Moreover, the effect has almost doubled compared to a full data set (0.166581 versus 0.300196). The other variables, however, all turned to be insignificant, but this problem is beyond the scope of my thesis.

Table 7: G2SLS random-effect IV and Fixed-effects (within) IV estimations for restricted samples

GCI index	Developed countires		Developing countries	
	FE model	RE model	FE model	RE model
Corruption(CPI inverted)	-0.2439266 (0.1885256)	-0.300196** (0.1627471)	-0.0353697 (0.1120553)	-0.1365025 (0.098964)
Log (GDP per capita)	0.2300825 (0.1807759)	0.0937174 (0.2507108)	0.2698174** (0.1332727)	0.0276173 (0.0779824)
FDI	-1.56×10^{-16} (1.10×10^{-16})	0.0216366 (0.034557)	-3.37×10^{-12} (5.07×10^{-12})	-3.87×10^{-12} (3.82×10^{-12})
Log(Area)	0 (omitted)	-2.17×10^{-16} (9.54×10^{-16})	0 (omitted)	0.0137583 (0.0420236)
Constatant	3.181006 (2.332691)	4.493534 (3.276377)	1.46918 (2.154272)	4.521596*** (0.9405719)
R-squared overall	0.7700	0.7957	0.1125	0.4284
Number of observations	108		83	

Standard errors in parentheses

*** Indicates significance on 1% level (p<0.01)

** Indicates significance on 5% level (p<0.05)

* Indicates significance on 10% level (p<0.1)

Source: Author's computations

Conclusion

This paper examines the causes and consequnces of public corruption (bribe demands of government officials), using a panel data modelling. After reviewing the existing studies on possible causes and consequences of corruption, an econometric model was built, based on theoretical and conceptual framework related to corruption. Hence, the topic is covered from both points of view: theoretical and empirical. In addition, to check the robustness of obtained results the model is applied for different samples of countries: developing and developed. Furthermore, an inference for Russia, as a representative of still developing countries is made.

The model of current work posits the lack of market competitiveness as a consequence of corruption prevailing in particular country, while the level of education and the level of democratization as a key determinants of a degree of corruption. However, the theory assumes the level of competitiveness and the level of corruption to be jointly determined causing endogeneity problem. From methodological point of view this means that the Instrumental Variables technique should be employed to tackle this problem.

The results of this paper obtained using the available dataset show that there is significant and negative relationship between corruption and competitiveness variables. Furthermore, higher percentage of people with complete secondary education and more democracy have a depressing effect on corruption in a country. This is consistent with already existing estimates of other authors. On the other hand, the coefficient estimate for tertiary education suggests that higher percentage of people with tertiary education corresponds to increasing level of public corruption, which contradicts most of the studies. Nevertheless, the explanation for it could be that the most educated individuals on the university level are more likely to interact with public officials, providing more bribery opportunities.

However, the results are not the same, when applying the model to different samples of countries (developing and developed). For sample of developed countries I managed to show only negative and significant relationship between corruption and competitiveness variables, whereas other correlations do not hold. Interestingly enough, the effect has almost doubled compared to a full data set (0.166581 versus 0.300196).

On the contrary, for developing countries sample, corruption had no effect on the level of competitiveness, since it was insignificant in the given regression. That means I can not make a proper inference neither for Russia. On the other hand, education and democracy turned to be an important factors determining the level of corruption, even the tendencies remained the same as in full dataset.

The findings for both samples suggest that in fact each group of countries has its own specific characteristics, which may influence the choice of determinants for the level of corruption. Evidentially, developed countries have other more substantial determinants of corruption that affect it in larger proportions rather than the ones specified in my model. Indeed, this could be a subject of further study.

The main contributions of my work were to extend and update the existing model, where new studies were incorporated and new approaches for empirical evidence were used (see Chapter 2). Moreover, the research is supposed to be more accurate and comprehensive than the existing one, since cross-sectional analysis is substituted by panel data analysis, which captures unobserved heterogeneity or country specific effects.

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Appendices

Appendix 1: Hausman test for endogenity

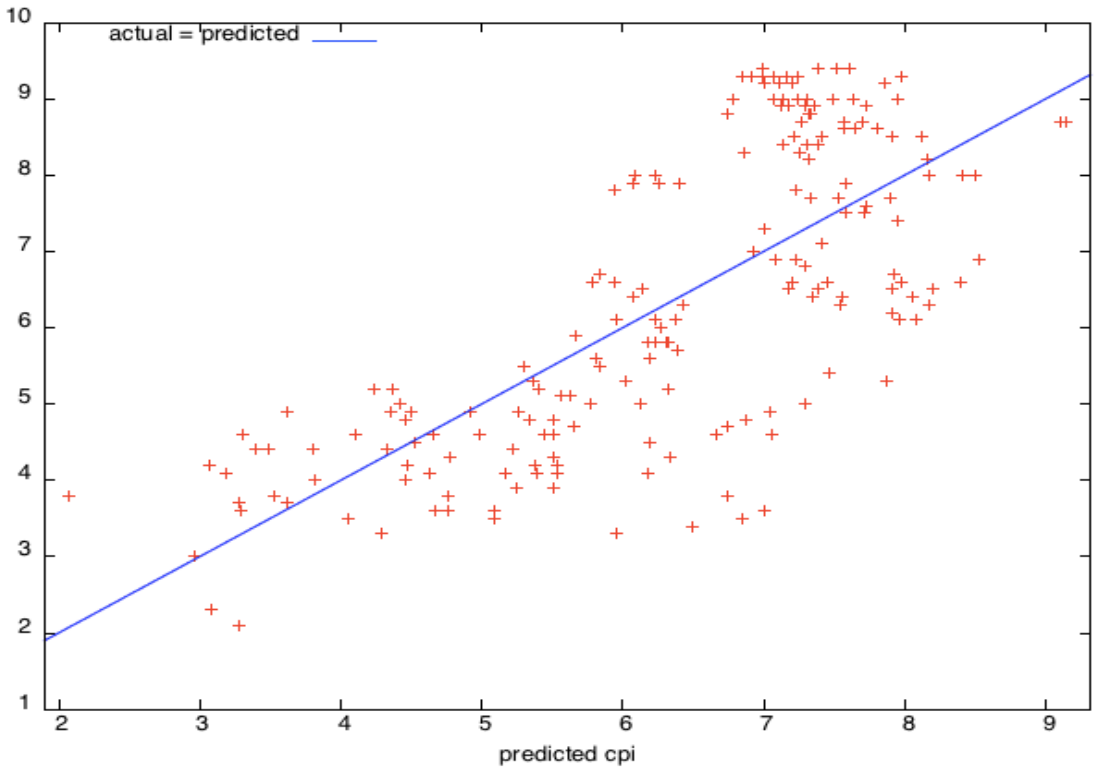
	Coefficients (b) iv	(B) ols	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
cpiinvert	-.1973582	-.2405817	.0432234	.0180836
gdp	1.48e-13	1.43e-13	5.02e-15	4.95e-15
gdp_p_c	3.65e-06	9.39e-07	2.71e-06	1.15e-06
area	4.11e-10	3.76e-09	-3.35e-09	2.41e-09
fdi	2.37e-16	3.00e-17	2.07e-16	3.86e-16

b = consistent under Ho and Ha; obtained from ivreg
B = inconsistent under Ha, efficient under Ho; obtained from regress

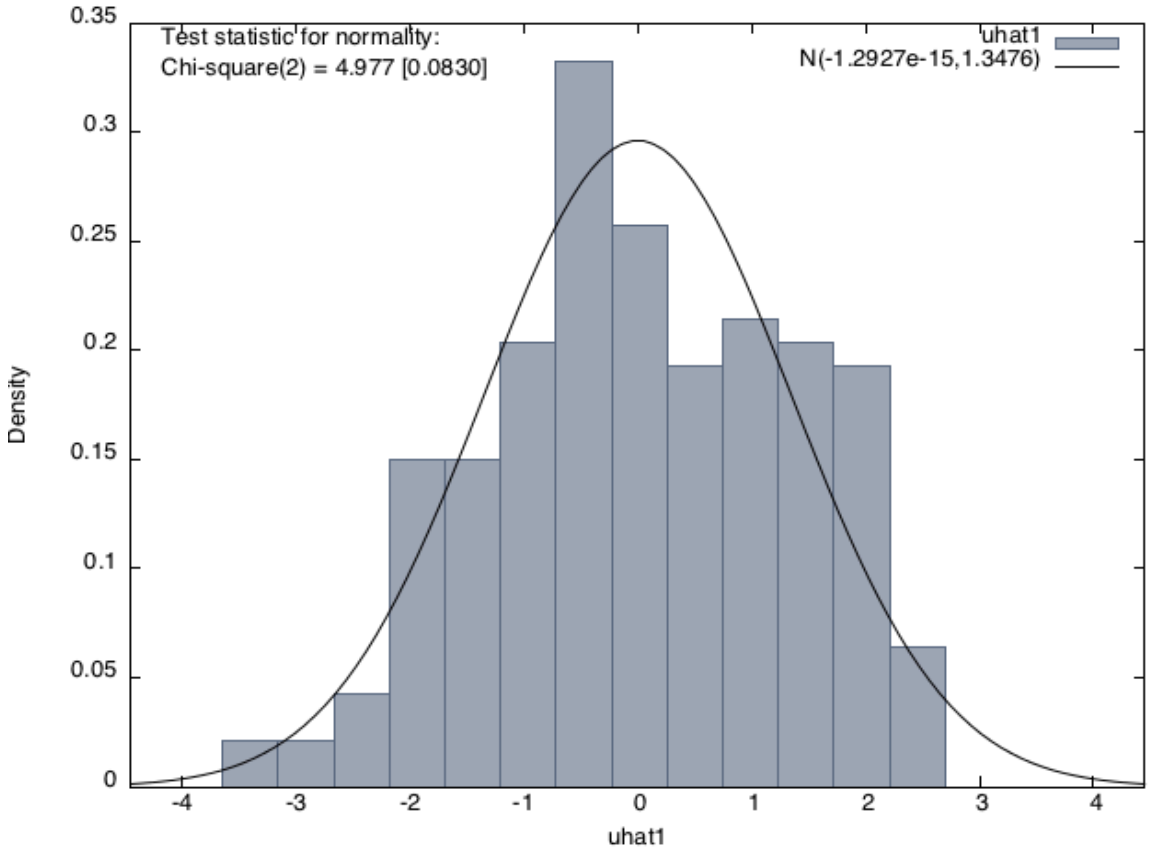
Test: Ho: difference in coefficients not systematic

chi2(1) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 5.71
Prob>chi2 = 0.0168

Appendix 2: Actual versus Fitted values plot of CPI



Appendix 3: Plot of normality of residuals



Appendix 4: List of developing and developed countries according to IMF

Developed countries: Australia, Canada, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweeden, Switzerland, United Kingdom, New Zealand.

Developing countries: Brazil, Bulgaria, Croatia, Hungary, India, Latvia, Lithuania, Mexico, Poland, Romania, Russian Federation, Slovak Republic, Slovenia, Turkey, Estonia.