Does corruption matter?

An empiric study on how informal institutions and FDI affect economic growth in developing countries

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Bachelor's thesis spring 2014

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Abstract

Globalization and more open economies has over the last two decades led to an increase of FDI which has been argued to lead to economic growth. So far economists are not unanimous on to what extent or fully agreed upon if certain other conditions have to be fulfilled for this to be true. In newer research on economic development scientists emphasize the importance of institutions for economic growth. The interaction between institutions and other variables affecting economic growth has become more important to understand, especially in developing countries.

This thesis is examining if FDI affect economic growth in developing countries and if there is an interaction between FDI and corruption affecting economic growth. Knowing how institutions affect development will make it easier to know which measures that needs to be taken to achieve better conditions for economic growth. The focus and research questions are following:

- Does FDI affect economic growth in developing countries?
- Is there an interaction effect between FDI and informal institutions affecting economic growth?

One key finding is that FDI have a positive effect on economic growth. Additionally, when a possible interaction effect between FDI inflow and corruption is taken into consideration, no significant results are found. As this thesis however only covers developing countries a higher significance level can be argued to be tolerated, and two trends have been found: higher levels of corruption make FDI have a less positive effect on economic growth, and the more FDI a country receive, the worse corruption is for economic growth. The area can and should be explored further and more research is needed before any stronger conclusions can be made.

Key words:

Economic growth, FDI, informal institutions, corruption

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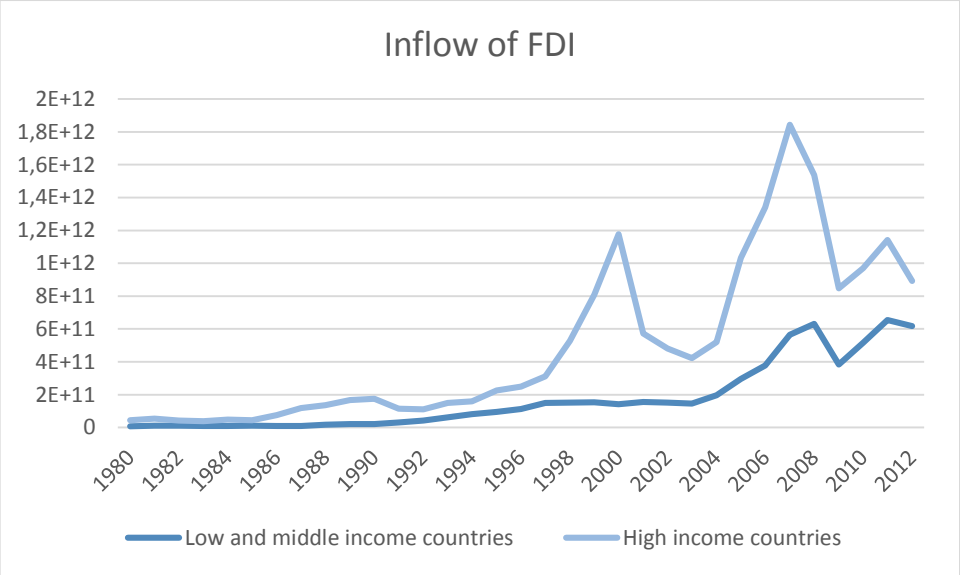
1. Introduction

Globalization and more open economies has over the last two decades led to an increase of foreign direct investment (FDI) and research that has shown that FDI can to lead to economic growth, it is however important to mention that economists are not unanimous on to what extent or fully agreed upon if certain conditions within a country have to be fulfilled for this to be true. The majority of FDI inflows are today received by developed countries.

Graph 1. Inflow of FDI



Source: The World Bank (2014)

Economists have tried to connect successful FDI to certain determinants within countries, which appears to be easier to do in developed countries where data is both more accessible and more reliable. This has also contributed to the fact that there is more research on the area regarding just developed countries. In developing countries the determinants are harder to find, but in recent studies on economic growth scientists have emphasized the importance of institutions. The process where formal institutions, such as an enforced legal system, and informal institutions, such as social norms and values, work together towards creating a good climate for economic development has become more important to understand, especially in developing countries where the need to achieve higher living standards is greater. So far many different results have been reached but agreed upon is that more research is needed.

The connection between FDI and institutions is interesting to examine as there is a relatively small amount of research on the area, especially handling a larger number of developing countries. FDI is in many developing countries seen as a good and generally safe option to finance investments when the national savings are insufficient, if a negative link between weak institutions and FDI inflow could be found it would create an incentive for governments worldwide to work towards good governance policies.

1.1 Purpose

The purpose of this bachelor thesis is to examine if FDI affect economic growth in developing countries and if informal institutions have an effect on the outcome. Knowing how institutions affect economic growth and how they interact with other variables affecting economic growth will make it easier to know which measures that needs to be taken to achieve better conditions for development.

The focus and research questions are thus following:

- Does FDI affect economic growth in developing countries?
- Is there an interaction effect between FDI and informal institutions affecting economic growth?

1.2 Method and delimitation

The thesis will start with a theoretical part explaining economic growth and then move on to previous research related to the area. The method chosen to examine the research questions is to econometrically analyze different regressions on economic growth using panel data covering a larger number of developing countries over a period of 12 years. Informal institutions is a wide area, this thesis will focus on the institution of corruption as it is a big problem in many developing countries and an obstacle for efficient international interactions.

1.3 Chapters

Chapter 2 defines the concepts of *developing countries, FDI, institutions, and corruption,* which are important throughout the thesis. Chapter 3 covers economic growth theory and the outlines of the Solow model to help motivate variables in the regression analysis. Chapter 4 covers previous research to increase the understanding and the complexity of the area. Chapter 5 goes through the method and material used in the study as well as discuss difficulties with certain variables. Chapter 6 presents results and chapter 7 discusses the findings and presents conclusions.

2. Definitions

2.1 Developing country

Generally a developing country is a country with lower living standards and an outdated technology. There is no universally agreed upon definition of a developing country, in this thesis developing countries will be defined by the World Bank where some of the characteristics are:

- outdated technology
- poor health- and education systems
- a big part of the population in rural areas
- weak infrastructure
- fragile government due to an unsustainable debt, armed conflicts, or weak institutions. (The World Bank, 2014)

2.2 Foreign direct investment

The Organization for Economic Co-operation and Development's (OECD) definition of FDI will be used throughout this thesis, thus a cross-border investment where the investor's intention is to maintain the relationship with the enterprise over a longer period of time while having significant influence over management, production, and decision making. The standard criteria is that the investor has ownership of at least 10% of the company. FDI is an important component for international integration as it generates long lasting and stable links between countries. It also encourages transfer of technology and know-how which makes it easier for developing countries to reach international markets. (OECD, 2014).

2.3 Institution

Institutions is a broad concept, it has many definitions and takes place through established organizations, buildings, costumes, practices, and rules. An institution is any structure of social order governing the behavior of individuals of a certain group. Institutions varies between countries and are commonly divided into formal and informal institutions, although they are often intertwined. The definition for formal institutions is observable rules, e.g. written documents, contracts, or rules. The definition of informal institutions is rules based on implicit understanding. They are not treated in written documents but part of the society through social norms, routines, traditions, political processes, and culture. Institutions hold an important role in societies as they make economic interactions more predictable. Formal institutions have historically been used to make markets function better, scientists have

however recently gotten more interested in the interaction between formal and informal institutions and institutional economics has become a big area of research. Institutional economics explains how individuals interact and coordinate their transactions through institutions (Groenewegen et al. 2010, 13).

Each country has its own institutional environment that consists of a set of rules that can be either values, norms, conventions, or laws. *Values* in a society explains what is considered to be good or bad and is embedded in the culture and shared by all, or almost all, citizens. All aspects of human behavior that are generally held are considered values, e.g. opinions about freedom, justice, security, peace, or life goals. *Norms* explains how individuals behave in order to achieve their values, they are thus generally held opinions on how to act in a society. Many norms are however not thought about actively. *Conventions* structure behavior through practical rules in more complex and specific situations. A good example is that if a value in a society is safety, this is partly achieved through the norms of driving safely, which will be regulated in the convention of driving on the right or left side of the road. Values, norms, and conventions are informal institution and even though generally held, opposing opinions can exist. In those cases informal institutions do not structure the behavior of individuals sufficiently and formal institutions are needed. *Laws* are rules set by the government. The breaking of a law have consequences in form of sanctions such as fines or jail sentences. Laws often gets enacted to support a norm or convention. The norm of solidarity, even though commonly agreed upon, often needs to be supported through example tax laws (Groenewegen et al. 2010, 25).

2.4 Corruption

Corruption, in the meaning of abuse of entrusted power for personal gain is a type of informal institution. Corruption has over recent years been more frequently discussed. Media focuses attention on corruption scandals, governments and other institutions have taken action to fight corruption, and the amount of academic research on the area has increased rapidly. The major concerns of corruption are the lack of trust in politicians and political structures, that it creates barriers in international trade, and problems to support developing countries. In larger forums, such as the World Bank, corruption is seen as one of the biggest obstacles to both economic and social development (Andersson and Heywood, 2009).

Fighting corruption is a difficult process as there are many different types of corruption activities occurring in many different sectors of a society. It is clear that small scale

corruption, such as the bribing of a police officer for a minor traffic offence, cannot be fought the same way as big scale corruption crimes, such as a politician's embezzlement of public funds. Many governments have followed the World Bank's strategies to fight corruption, i.e. implementing an institutional design called good governance. The World Bank means that anticorruption strategies should reduce opportunities for corruption and increase consequences of the crime. Good governance, in the meaning of being transparent, consensus oriented, accountable, participatory, efficient, inclusive, and law-following, has also been shown to have great importance for development. Good governance tackle corruption mainly through improving political accountability and strengthening the civil society. (Andersson and Heywood, 2009).

3. Theory

3.1 Economic growth

Economic growth, as an increase of an economy's capacity to produce goods and services from one period to another, is a big area for research and there are many theories and models related to the area. The gross domestic product (GDP) or GDP per capita is used to measure economic growth, which makes it easy to compare economic activity between countries.

The long run economic growth is the most important when measuring an economy's performance and economic development. According to Bradford DeLong (1999), successful economic growth leads to a higher material standard of living for the population as well as higher economic productivity. The primary determinants of economic growth are technology advances and capital intensity, different policies and initial conditions within countries can however take part in accelerating or slowing down the process. (Bradford DeLong 1999, ch. 4.)

Technology advances makes labor more efficient, in the meaning of labor force attaining better education, higher skills, and the ability to handle new technology. An economy that becomes more efficient will consequently also become more productive. Capital intensity, as the second major determinant of economic growth, is a measure of how much capital goods the average worker have at his or her disposal. Capital goods are among others buildings, freeways, docks, vehicles, cranes, machines, tools, and computers. When an economy

becomes more capital intense it will also become more productive. (Bradford DeLong 1999, ch. 4.)

Policies for economic growth within a country can affect how much both the technology and the capital intensity affect economic growth. Foremost two factors determines the capital intensity's effect on economic development. The first one is the *investment effort*, thus the share of the total production in an economy that is being saved and invested for the purpose of increasing the capital stock of buildings, infrastructure, machines, and tools to increase the productivity of the workers. Policies within a country that generate a higher level of investment effort lead to a faster long run economic growth. The second factor is the *investment requirements*, thus the amount of investment that goes to preparing new workers or replacing old buildings, machines, or other tools. (Bradford DeLong 1999, ch. 4.)

3.2 The Solow model

The information in following section is based on Jones and Vollrath's Introduction to economic growth (2013) chapter 2.

The standard model for economic growth is the Solow model. Using the model economists find an equilibrium to which the model will converge over time, looking at economic growth the equilibrium economists are interested in are the *steady-state balanced-growth* equilibrium. The equilibrium is determined by analyzing five factors: the efficiency level of labor, the economy's population growth rate, the efficiency of labor's growth rate, the economy's savings rate, and the depreciation rate of the capital stock.

The production function explains the relationship between the resources in an economy and how they can be used, which determines the economy's output. The economy's resources are the labor force, the capital stock, and the level of technology. Together they determine the economy's efficiency of labor. The output of an economy can be used for either investment, which accumulates capital and moves the steady state, or consumption. The Cobb-Douglas production function is commonly used to explain the relationship:

Equation 1.

$$Y/L = (K/L)^{\alpha} \bullet E^{1-\alpha}$$

Where the real GDP divided by the number of workers, (Y/L), is equal to the capital stock per worker, (K/L), raised to the exponential power of a number, (α), multiplied with the labor efficiency, (E), determined by the economy's technology level raised to the exponential

power of a number, (1- α), where $0 \leq \alpha \leq 1$. The Cobb-Douglas production function is useful as it can model many different scenarios. It is however like any economic model abstract, but economists agree that it is correct enough to provide approximately correct conclusions on how the economy will behave.

After the production function the Solow model consists of three assumptions where all variables in the functions are time subscripted as they are assumed to change over time. The model's assumption about the growth of the labor force is that the labor force, *L*, is growing at a constant proportional rate, *n*, which is shown in the equation below.

Equation 2.

$$L_{t+1} = (1 + n) \bullet L_t$$

The model's assumption about the efficiency of labor, *E*, is that it is growing at a constant proportional rate, *g*.

Equation 3.

$$E_{t+1} = (1 + g) \bullet E_t$$

The last assumption in the model is that a savings rate *s* of the real GDP will be saved and invested every year, which makes the accumulation of capital endogenous. Savings is the difference between income and consumption and add to the capital stock through investments. The capital stock does however not grow by the full size of the investment as the capital stock depreciate by the rate of δ every year. Thus to calculate next year's capital stock following equation is used:

Equation 4.

$$K_{t+1} = K_1 + (s \bullet Y_t) - (\delta \bullet K_t)$$

When the amount of investment is bigger than the amount of depreciated capital, the capital stock will increase, thus moving the steady state. The capital stock will rise until investments are equal to depreciated capital and the change in capital from year to year is 0, at this point the economy is on its steady state. When the economy is not on its steady state it will move towards it. In equilibrium the economy's capital stock and level of real GDP are growing at the same proportional rate making the capital-output ratio constant.

To summarize it, there are two key concepts in the Solow model. The first one states that countries with a high investment rate have a higher capital-output ratio and thus grows as the steady state increases. The second concept states that countries further away from its steady state grow faster, and explains why countries have different growth rates.

Countries continue to grow over time which suggest that capital accumulation not is, or at least not in itself, a key determinant for long run economic growth. The Solow model has empirically been shown to better model short term economic growth.

4. Previous research

4.1 FDI and economic growth

The connection between economic integration and economic development is a big area of research. Globalization and more open economies has over the last decades led to an increase of FDI, and the link between received FDI and economic growth has interested many. Over the last two decades a lot of research has shown that FDI can lead to economic growth, scientists are however not unanimous on to what extent or fully agreed upon if certain conditions within countries have to be fulfilled for this to be true (Hofmann 2013).

In the early approaches to explain FDI and its consequences FDI was only seen as a second capital input factor. Shortly however, scientists additionally found it to be an important source for development under the right policy environment, this through the understanding and incorporation of new technology and know-how such as applying modern management and organizational practices. The effects that are not purely financial are called spillover effects. When a multinational company (MNC) build factories or set up production plants spillover effects are likely to come along as the MNC will use the most efficient ways to structure production. As MNCs often aim to be integrated in the local environment, needing transportation or access to key infrastructure to be able to operate in the new country, linkages with local firms are common and thus know-how and technology transfers reach whole sectors and not just workers within the MNC (Hofmann 2013).

Although no general consensus has been reached on how FDI affect economic growth, the growing interpretation is that FDI is positively correlated with growth, with the major support that FDI through improvement in technology, efficiency, and productivity is stimulating

economic growth. FDI also leads to higher level of competition through the presence of MNC's, forcing local businesses to plan and to use their resources more carefully or focus more on education to remain on the market (Lall 1980). Empirical evidence of these FDI efficiency spillovers has been found, but no strong consensus on to what degree (Blomstrom, et al. 2000).

4.1.1. Determinants of FDI inflow and FDI spillover effects

The biggest problem in deciding which the true determinants are regarding successful FDI and its spillover effects is that data can be hard to acquire and that it often is more deteminants working together that achieve a positive result. Some of the more commonly mentioned determinants on however FDI will be successful are the host country's level of openness, market size, labor costs, tax rates, inflation rates, and political climate.

A higher level of openness is more likely to attract export oriented foreign investors. This has been shown by Blomstrom and Kokko (1997) who suggest that a country with more liberal trade regulation and better connections to global markets is more preferable for investors. They additionally mean that countries with more limitations to trade meet higher transaction costs regarding export to international markets which discourage export oriented investors.

For investors more interested in working within the host country however, the domestic market size and the GDP per capita will be more important than the level of openness, Artige and Nicolini (2006) mean that the domestic market size is the main determinant of FDI inflow in a country. The positive relationship between a bigger domestic market, higher GDP per capita, and FDI inflow has been easier to show in developed countries. Asiedu (2002) agrees and means that markets with higher purchasing power consequently becomes more attractive as the possibility for higher revenues increases.

A country's production and labor costs also affect the inflow of FDI. Wages, technology level, infrastructure, and raw material prices are carefully evaluated by possible investors. Low wages and low raw material prices lower production costs and consequently makes investing more attractive. That lower wages leads to a bigger inflow of FDI has been showed by Botric and Škuflic (2006).

A country's tax rates has also been argued to affect the inflow of FDI. The lowering of corporate taxes is a popular incentive for countries to attract foreign investors. There are numerous studies with results showing both positive and negative results on this relationship and no consensus has been reached. (Demirhan and Masca, 2008).

A country's inflation rate is a good indicator on how the country works on a macro level, high levels of inflation could mean instable conditions for an investor. High inflation rates has a negative effect on FDI inflow as it reduces the size of an investment, which has been showed by Azam (2010).

The political environment in a country also affects FDI inflows. High political risks has in recent studies been shown to have a negative impact on FDI inflows. Investors will hesitate to invest in a country with high political risk as it is realistic to assume that such conditions would affect production negatively (Krifa-Schneider and Matei, 2010).

Regarding the size of the FDI spillover effects the biggest determinant appears to be how big the technology gap between the countries are and what ability the host country have to use the new technology. There are studies showing that local firms will become more productive with the presence of foreign business, when the technology of the host country is not be too far behind. When the technology gap is too big spillover effects are harder to identify. This has been shown for example with FDI connected to oil or natural resources, where in some extreme cases the only effect from FDI is the generating of more income for a small part of the population through the new work opportunities (Imbriani and Reganati 1997 , and Kokko et al. 1996).

4.1.2 FDI in developing countries

Attracting FDI can be argued to be more important for developing countries than for developed countries as national savings in developing countries are not as big and sometimes not big enough to finance essential investments. FDI is seen as a good option for additional finance connected with low risks. (Demirhan and Masca, 2008.)

Developing countries have different obstacles to overcome in order to get the attention of foreign investors. Weak infrastructure, political risks, and the absence of working institutions are some of the more frequently discussed problems. (ODI, 2014.)

A stable and working infrastructure is essential for companies to operate within a country. The infrastructure includes many dimensions and is a wide term, the Overseas Development Institute (ODI) (2014) defines infrastructure as basic physical and organizational structures that provides a framework required for a country to function. Functioning airports, ports, water supplies, roads, electricity, and communication devices are essential for foreign investors. Scott and Prachi (2012) means that the lack of a stable infrastructure is the biggest obstacle in developing countries for foreign investments and economic growth.

Another problem brought to surface by the Financial Action Task Force (FATF-GATI) (2014) is that developing countries who seek investors not always have the opportunity to choose where the money come from. Advances in electronic communication and the increase of international money transfers create together with weak financial regulations, undependable law enforcements, and weak institutions an attractive location for criminal organizations, something that is undesirable and in the long run could have negative impacts on economic growth. (FATF-GATI, 2014.)

The political risk in a country has been shown to affect FDI inflows especially in developing countries as it is connected with a risk of change in the conditions for companies to operate (Butler and Joaquin, 1998). Investments behavior is partly controlled by the risk connected to the investment. This relationship has been shown by Jun and Singh (1996) who conclude that developing countries with higher political risk attract less FDI. Internal and external conflict, such as civil unrest, riots, high criminality, cross-border conflicts, trade sanctions, and wars have been shown to reduce the inflow of FDI. The political risks consists of components closely linked to the quality of political institutions and good governance. The institutional strength of a country affects everything from the quality of the bureaucracy to law and order enforcement (Kaufmann et al., 1999).

4.2 Institutions and economic growth

Growth literature has changed substantially over the last two decades. The relationship between institutions and economic growth has become a big area of research. The renewed interest in explaining economic growth has in some extent been politically driven, where some economists, like North (1989), argue that the traditional models do not incorporate all contributing growth factors. He further criticize that no space within the models is given to the role of institutions. Bassanini et al. (2001) have also discussed the importance of institutions and developed new models that allow the level of efficiency to be related to the institutional settings within a country, but because of the intertwined effects the models are less suited for empirical studies.

North (1989) started emphasizing the importance of institutions in the late 1980's. Institutions set the conditions for contracts to be followed, for property rights to be enforced, and creates a willingness to decline opportunities to engage in opportunistic behavior. Norms play a central role in the decision making process, something that is not often incorporated in the normal neoclassical wealth maximizing assumption.

North (1989) also concludes that there is a difference between developed and developing countries. Government's embodying of legal institutions is a process which has proceeded longer in developed countries, which is connected to social values and norms. Studies have shown that the price individuals are willing to pay for convictions and the breaking of rules is a negatively sloped function, institutions and ideological attitudes matter less as the gains increase. For people in developing countries the gains of breaking a law and not getting caught are higher than for people in developed countries breaking the same law. (North, 1989.)

North (1989) suggests that the neoclassical model is misleading. He means that the output of an economy is a function of the traditional inputs, seen in for instance the Solow model, as well as the cost of transacting, thus how institutions work together. One argument he uses to support this is to refer to institutions such as enforcements of property rights which has been shown to lead to economic growth through an increase of productivity. The measuring of transaction costs is difficult, some aspects can be measured in the market economy while other, such as costs from waiting in queue or costs from bribery, remain unmeasured even though they hold an important role in societies. It is however easy to understand that there are costs connected to these norms, e.g. when an investor tries to do business in another country and has to learn how things are done there. The interaction between people are different in different countries, once the norms are understood exchanges of social, political, and economic kind can be made more efficiently. One of the main function of institutions is to provide certainty to human interaction (North, 1989).

4.2.1 The effects of institutions

Economists have had problems confirming and quantifying relationships between institutional settings and economic growth with normal economic growth regressions. A key factor for growth has during recent years been explained by the adaptation of new technology, where policies and institutions set the conditions by influencing the markets ability to adapt. The markets ability to change, thus reallocate resources, reforming existing firms, and discovering new business opportunities, is essential for development. Institutional settings has been shown to be a big reason as to why some countries adapt quicker while other fall behind. (Bassanini et al., 2001.)

Regarding investments Bassanini et al. (2001) suggest that different policies and institutions affect both the size of investments and the size of the impact investments have on economic

growth. By setting the conditions for investments institutions consequently control investments in many areas. Human capital and education is one area contributing to higher efficiency and thus economic growth. Investments in human capital, such as education systems, are often seen as contributor to efficiency of production through higher skills and knowledge of the labor force. The education level has however also a strong relationship with the technological progress within a country, thus, in addition to education's effect on the labor force work skills, it will also contribute to economic growth through technological progress and innovation in the right institutional settings. Institutions also set the conditions for research within a country. Governmental involvement through both direct funding and indirect measures such as tax incentives and protection of intellectual property rights has been shown to affect economic growth positively. (Bassanini et al., 2001.)

Many OECD countries have since the 1990's benefitted from a more stable inflation rate, thus lower uncertainty, and it has been argued that the institutional environment is a major reason for this. Many developed countries have had an increasing growth rate, which has been shown to be due to a more stable inflation rate. (Bassanini et al., 2001.)

4.3 Institutions and FDI

Regarding FDI only a relatively small amount of attention has been given to the area of institutions. In the beginning of the 1990's economists started doing international cross-country studies where they tried to determine the influence of policy related variables on FDI inflows. Positive relationships between FDI inflow and countries with strong intellectual property protection (Lee and Mansfield, 1996) as well as countries with a tradition of contract enforcement (Gastanaga et al. 1998) were found. Negative relationship between investments and weak administrative institutions were also found (Brunetti and Weder, 1998).

Jensen (2003) has analyzed the relationship between fundamental democratic rights and the inflow of FDI. He found support for a higher level of FDI inflow in democratic countries. He also argues that there is another linkage to be considered, namely that democratic rights lead to improved property protection which in turn has been shown to affect FDI. The way institutions interact and affect each other is complex and due to casualty it is hard to determine the real cause of an effect and even harder to quantify it.

4.4 Corruption and FDI

Corruption is generally associated with negative effects on a society. Gastanaga et al. (1998) showed a negative relationship between corruption and FDI inflows. Their study did however

only cover 22 developing countries which makes it hard to draw any general conclusions, and they state that their finding may not always apply.

Newer research have also found a positive linkage between corruption and FDI inflow (Egger and Winner, 2005). The study was done on 73 countries over 5 years of time, with the majority being developed countries. The key finding was that corruption, in countries with excessive regulations and administrative controls, could encourage FDI inflow as investors through bribes or similar activities quicker got permissions and access to markets.

4.5 Summarizing central research

The increase of FDI has led to many new areas of research. It has been shown that FDI can lead to economic growth, and focus has been on finding determinants for inflow and for when it is successful. In developing countries the biggest obstacles for attracting FDI are weak infrastructure, political risks, and the absence of working institutions. The traditional growth model has been argued to be insufficient as it does not incorporate institutional settings within countries. Regarding FDI and institutions, research has shown a positive relationship between FDI inflow and strong intellectual property protection as well as a negative relationship between FDI inflow and weak administrative institutions.

There is not much research on corruption and FDI, and none on their combined impact on economic growth. It has been shown that corruption can be negative for FDI inflows, but also the opposite relationship has been found. Economists have not examined the interaction between FDI and corruption, and connecting areas lack results on a larger number of developing countries which makes the research questions in this thesis highly relevant.

5. Method and material

5.1 Model development

Using econometrics to examine the research questions the first step is to find the true model for the economic growth regressions. The problem with finding the true model is that economists have not yet agreed upon a model and which variables that actually affect economic growth. There are however variables that are more often used than others, the variables *initial GDP per capita, population growth, savings and investments, inflation, human capital, level of openness,* and *infrastructure* have been subject to many studies regarding economic growth. Below follows support as to why these variables have been chosen to model economic growth in this thesis.

5.1.1 The variables

Initial GDP per capita is commonly used in studies on economic growth. According to Solow the growth rate of poor countries, thus having a low initial GDP per capita, is quicker because they are further away from their steady state. Barro (2003) found the variable valuable in economic growth regressions and empiric evidence supporting Solow's theory. The expected sign for this variable is thus negative.

Population growth has in early economic growth literature been argued to have little effect on economic growth. In the 1980's however many scientists concluded that population growth has a significant positive effect on economic growth. Economists have also found empiric evidence saying that a declining population growth in OECD countries appears to slow economic growth. Later research however states that the relationship could be the opposite in developing countries depending on demographic conditions within a country (Headey and Hodge, 2009). As studies have shown different results it is hard to expect a certain sign, it should however be controlled for.

Studies on the relationship between saving and investment rates and economic growth has shown that higher saving rates lead to faster economic growth (Carroll and Weil, 1994). The findings are consistent with Solow's model where higher savings lead to a higher level of GDP per capita in the steady state and thus to economic growth. The expected sign for this variable is thus positive.

Barro (1995) found that the relationship between economic growth and inflation is important to take into consideration in economic growth regressions, he found significant results

showing that high rates of inflation reduce real economic growth which also is consistent with the Solow model. Expected sign is thus negative.

Human capital is also part of the Solow model and frequently mentioned in economic growth studies. Barro (1991) has found empiric evidence that human capital has a positive effect on economic growth. With this realization many countries have tried to efficiently measure their human capital to be able to understand their current state and develop methods to improve it. For measuring human capital another tool is needed and commonly used is education. Education can be measured as everything from literacy rates to amount of population going to university, used in this thesis is secondary school enrollment. The choice was made to get the best reflection of the countries level of human capital where differences could be seen. School enrollment is in many countries mandatory which would overestimate a country's human capital while university studies would underestimate it, neither giving a fair reflection. The measure of secondary school enrollment has however also drawbacks as the effectiveness of one person cannot be determined only by the number of school years (Kwon, 2009). The expected sign for this variable is positive.

A country's degree of openness has been subject to many studies regarding economic growth where higher growth rates often are connected to more open countries with good linkages to international markets. Participation on international markets is often seen as a primary source of economic growth and countries that embrace the ongoing globalization grow faster (Andersen and Babula, 2008). In this thesis the Heritage Foundation's measurement *freedom to trade* will be used, it is a composite measure of the absence of tariff and non-tariff barriers affecting international trade. The index is based on data from reputable international institutions interested in trade (the Heritage Foundation, 2014). The sign is expected to be positive.

A country's level of infrastructure has been discussed as a reason for economic growth as the infrastructure in a country sets the condition for economic activities. Canning and Pedroni (2004) have found empiric evidence that infrastructure promotes long run economic growth in the absolute majority of countries. When measuring the level of infrastructure another tool is needed, used in this thesis is number of mobile phone subscriptions per 100 people. Research on economic growth often use number of mobile phones per 100 people, share of paved roads, or expansion of railway network to measure the level of infrastructure. The drawback of this approach is that many studies have a broad definition of infrastructure and the usage if a single tool will not give a perfect reflection (Calderón, 2009). One solution to give a better

reflection is to make a combination variable where more variables are included, but as infrastructure only is a control variable mobile phone subscriptions are used while being aware of its drawbacks. The expected sign is positive.

FDI and its connection to economic growth has been discussed earlier in the thesis. It is highly debated as a variable explaining economic growth but there are economists who have found support for it to have a significant positive effect on economic growth (Blomstrom et al. 1994 and Nair-Reichert & Weinhold, 2001). The expected sign is positive.

5.1.2 Corruption variables

Corruption is not easily measured, mainly because it includes illegal activities which are observed through criminal investigations or scandals. Successful corruption, in the meaning of not getting caught, will not be captured in these surveys. The definition of corruption is also creates a problem, as the definition is very broad the measuring of corruption would have to cover many different aspects. Additionally, the indexes are created by international agencies and tend to have a cultural bias in the way they are formulated as they are based on western norms and values. Differences in political and social structures makes comparisons between countries hard, an aspect that often is overlooked. (Andersson and Heywood, 2009.)

The halo effect has also been discussed as an obstacle of measuring corruption. The halo effect is a phenomenon that causes individuals to assume that because a person is good at doing activity A, this person will also be good at doing activity B and C (Collins, 2009). Related to corruption it has been argued that the measuring of corruption can be influenced by recent economic performance, where fast-growing and rich countries rank better as they appear less corrupt (Kaufmann et. al. 2007).

Different methods have been used to measure the level of corruption within countries. As this thesis aims to examine the effects of corruption two different indexes of corruption are used to make conclusions more accurate. The indexes used are the Transparency International's Corruption Perception Index (CPI) and the Worldwide Governance Indicator's measurement of corruption (WGI), where the CPI is the most reputable and frequently used index. Both variables are expected to have a negative sign.

5.1.2.1 TI's Corruption Perception Index

The Corruption Perception Index (CPI) was created in 1995 by the organization Transparency International (TI). The index measure relative corruption and is ranking countries around the

world on a scale from 0 to 10[1] based on how corrupt their public and political sector is perceived to be, where 0 is highly corrupt and 10 indicates very little corruption. The CPI is focused on the public sector, such as administrative and political corruption, and does not reflect the levels of corruption in the private sector or in the entire country. The index is based on empirical data, such as polls, reported cases of corruption, and reports from other institutions, but it also reflects the views of international analysts and experts living and working in the evaluated countries, thus measures *perceived* and not actual corruption. (TI, 2014).

There are a few bigger problems with the CPI that makes comparisons hard, the first one being that it is based on perceptions. If a sector is perceived to be highly corrupt agents who want to operate in that sector is more likely to engage in corruption activities themselves, creating a negative chain reaction. It is also important to be aware of whose perceptions that are being measured. The CPI is mainly aimed at western business leaders and thus often use perceptions of western business leaders, this can be a problem as many business leaders come across bribery. Perceptions of corruption that primarily reflect views and experience with bribery will not capture the level of corruption as a whole in an efficient way. Perceptions can also be influenced a lot by looking at similar research or results from other years, thus, if a country ranks high one year it is more likely to rank high the next year too. (Andersson and Heywood 2009.)

The CPI is a composite index and uses surveys from different institutions. Each institution has their own understanding of corruption and sometimes even different definitions of corruption. In most surveys a panel of experts is asked to rank corruption, but the perceptions of these experts may differ: what seems like low corruption to one person could appear to be moderate or even high corruption to another. (Andersson and Heywood 2009.)

Assuming that the index estimates the corruption level correctly, the last big problem is that one country's ranking one year cannot be compared to another year as the ranking not only is based on that country's score but also on how many countries that are measured that year. A country with the same score two years might not rank the same both years, also a small change between years, e.g. a difference from 3.4 to 3.2, could lead to a big drop in the ranking

[1] As of 2012 the scale is changed to 0 to 100 and the method to create the index is changed so comparisons over time is possible even over shorter periods (TI, 2014). The 2012 data in this thesis has been transformed to the old scale.

even though it might not have changed that much in the country as a whole, but making people perceive it as much more corrupt (Andersson and Heywood 2009).

5.1.2.2 Worldwide Governance Indicator's measurement of corruption

The Worldwide Governance Indicators (WGI) report 6 different dimensions of governance. The dimensions measured are; *voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption*. The WGI is composed with information from different sources reporting the views and experiences of citizens, business people, and experts in the public, private, and NGO sectors regarding the quality of different aspects of governance. Control of corruption is presented in a scale from -2.5 to 2.5 where more corrupt countries have a lower score than countries that are less corrupt (Worldwide Governance Indicators, 2014).

The scores are hard to compare on a year to year basis and the index is better suited for research over longer periods of time where it has been able to show significant trends. Changes in a country's score depend on different factors, except for actually improving or getting worse the biggest factor is changes in the underlying data material. A key aspect of the WGI is that all scores are accompanied with standard errors which can be thought of as a confidence interval where if they overlaps, the change from one year to another or between countries does not have statistically significant meaning. (Worldwide Governance Indicators, 2014.)

Over recent years the WGI has become more frequently used by a wide range of people from policy makers to academics. It is considered being a useful tool mainly because the broad coverage and the many different data sources, but it has also been criticized. The corruption indicator has especially been discussed as the number of covered countries has increased a lot, from 152 countries 1996 to 204 countries 2005. Adding new countries to the index can change the ranks of the existing countries. A second critique is that the sources are biased towards the views of western business people as several data sources comes from commercial risk rating agencies with a cliental mainly consisting of business people. (Kaufmann et. al. 2007.)

5.2 The data

The data used in this thesis is secondary data collected from reputable sources for 50 developing countries over 12 years of time (2001-2012), creating a balanced panel. The selection of developing countries comes from the World Bank classification of low to middle income countries.[2]

Table 1. Description of data

Economic growth	GDP growth based on US dollar, presented in percent. The dependent variable in the regression analysis. The data is collected from the World Bank.
FDI	Net inflow of FDI presented in US dollar. Natural logarithms are used to make the variable more linear so it can be used in the regressions. The data is collected from the World Bank.
Initial GDP per capita	Presented in US dollar. Natural logarithms are used to make the variable more linear so it can be used in the regressions. The data is collected from the World Bank.
Population growth	Population growth presented in percent. The data is collected from the World Bank
Savings and investments	Gross savings calculated as gross national income minus total consumption plus net transfers, presented in dollar. Natural logarithms are used to make the variable more linear so it can be used in the regressions. The data is collected from the World Bank.
Inflation	Presented as percentage change in the consumer price index and reflects the annual percentage change in the cost of the average basket of goods and services. The data is collected from the World Bank.
Secondary school enrollment	Gross enrollment ratio in secondary school expressed as percentage of the population. It can exceed 100% due to early or late school entrance and grade repetition. The data is collected from the World Bank.
Openness to trade	The measurement of openness used is the Heritage Foundation's measurement of freedom to trade, a scale from 0 to 100 where 0 is completely closed and 100 completely open without restrictions.
Mobile phone users	The amount of mobile phone subscriptions to a public phone service per 100 people. The data is collected from the World Bank.
Corruption CPI	Measured on a scale from 0 to 10 where 0 indicates highly corrupt and 10 indicates absence of corruption. The data is collected from Transparency International.
Corruption WGI	Measured on a scale from -2.5 to 2.5 where -2.5 indicates highly corrupt and 2.5 indicated absence of corruption. The data is collected from the World Bank.

[2] See appendix 1 for list of covered countries.

5.3 The model

What we get with these variables are the following model:

$$Ygr_{it} = \beta_1 + \beta_2 \ln fdi_{it} + \beta_3 \ln ycap_{it} + \beta_4 pgr_{it} + \beta_5 \ln si_{it} + \beta_6 infl_{it} + \beta_7 secs_{it} + \beta_8 open_{it} + \beta_9 mob_{it} + \beta_{10} corr_{it} + \mathcal{E}_{it}$$

Where table 2 explains the denotations, *i* and *t* stand for country respectively time period.

Table 2: Denotations of variables

Ygr	Economic growth
lnfdi	Received FDI
lnycap	Initial GDP per capita
pgr	Population growth
lnsi	Savings and investments
infl	Inflation
secs	Secondary school enrollment
open	Degree of trade openness
mob	Mobile phone users
corr	Corruption level

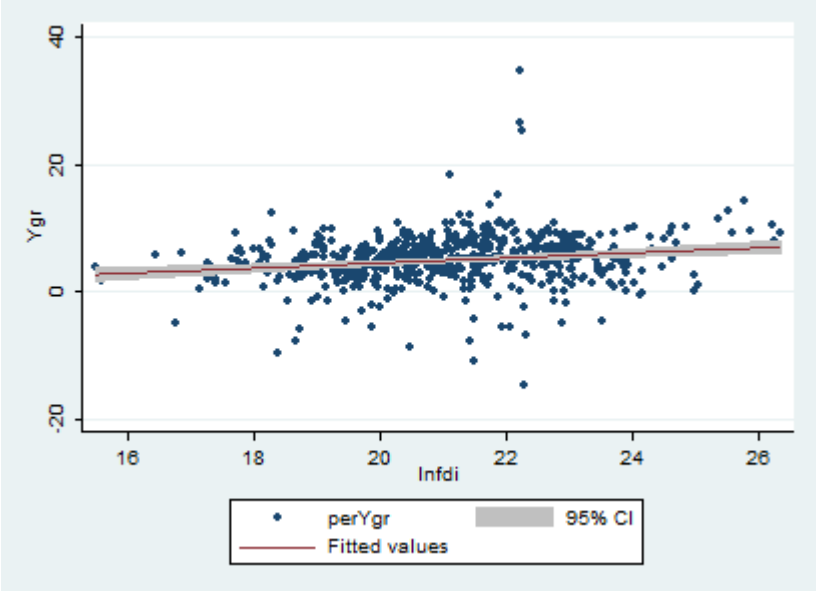
6. Results

For information regarding statistics and econometrics in this chapter the book Introduction to Econometrics by Dougherty (2011) is used.

6.1 Exploring relationships: Correlation

6.1.1 FDI and economic growth

Graph 2. Correlation between GDP growth and received FDI

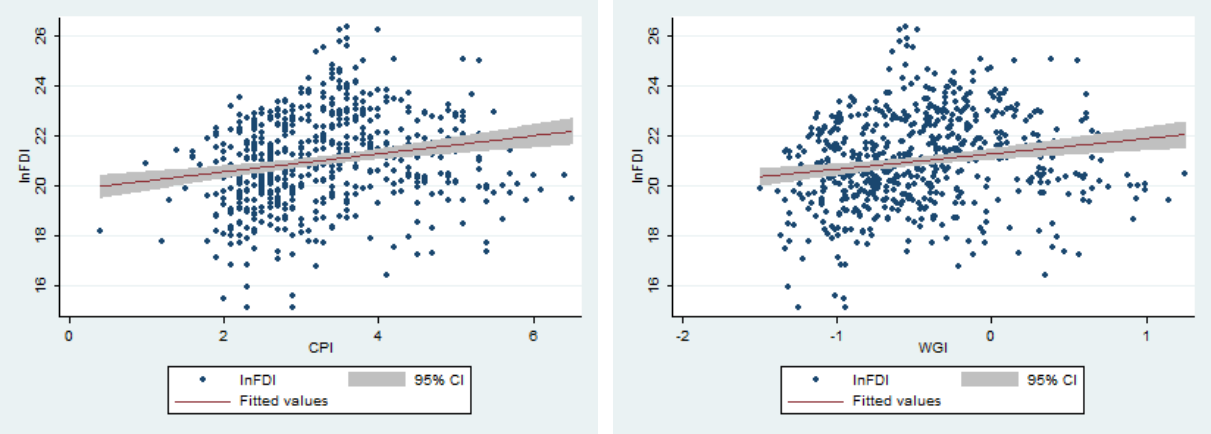


The relationship between FDI and economic growth can start being examined by looking at the correlation. Graph 3 shows a scatterplot with the correlation between GDP growth and received FDI for every year and country. The fitted values and a 95% confidence interval are also being shown. By looking at the graph a small positive correlation can be seen, when the coefficient is being calculated it is confirmed to be 0.183 which is relatively low in the meaning that it is hard to predict the movement of economic growth only by looking at amount of received FDI.

6.1.2 Corruption and FDI

Graph 3 and 4 shows scatterplots with the correlation between received FDI and the level of corruption for every year and country, graph 4 using CPI and graph 5 using WGI. The fitted values and a 95% confidence interval are also being shown. By looking at the graphs a small positive correlation can be seen, when the coefficients are being calculated it is confirmed to be 0.170 when using CPI and 0.122 when using WGI

Graph 3 and 4: Correlation between received FDI and level of corruption



It is important to notice that higher levels of corruption is represented with a higher rank on the scales. The correlation between FDI and both corruption variables are relatively low which suggest a weak relationship and no analytical interpretations should be made.

6.2 OLS regression analysis

Correlation indicates that two variables can have some sort of relationship, but it does not control for other variables and has only a small analytical value. Ordinary least squares (OLS) is a method used to estimate unknown parameters in a linear regression model and can be used to examine relationships between variables further. Normal OLS estimation is possible when working with panel data.

As 2001-2012 is a period of time with a quite unstable world economy with several economic crises it is fair to assume that there will be time specific effects affecting the results. To avoid that effects from business cycles affect the results the data is divided into 3 time periods (2001-2004, 2005-2008, 2009-2012) where the mean value for every variable that time period will be used instead of using data for each year. Robust standard errors are used because of heteroscedasticity[3,4].

Specification of model:

$$Ygr_{it} = \beta_1 + \beta_2 \ln fdi_{it} + \beta_3 \ln ycap_{it} + \beta_4 pgr_{it} + \beta_5 \ln si_{it} + \beta_6 infl_{it} + \beta_7 secs_{it} + \beta_8 open_{it} + \beta_9 mob_{it} + \mathcal{E}_{it}$$

[3] See appendix 3 for descriptive statistics and robustness tests.
[4] (*) = significant on a 10% level, (**) = significant on a 5% level, (***) significant on a 1% level

Table 3. Regression 1, 2, 3, and 4: Economic growth depending on different variables

Dependent variable	Economic gr. (1)		Economic gr. (2)		Economic gr. (3)		Economic gr. (4)	
Observations / R^2	148	0.049	144	0.251	125	0.273	125	0.305
Independent variables	Coefficient/Std. Err		Coefficient/Std. Err		Coefficient/Std. Err		Coefficient/Std. Err	
Intercept (β_1)	-2.946	2.600	-8.631 (***)	3.015	-10.258 (***)	3.522	-13.000 (***)	4.557
FDI	0.373 (***)	0.127	0.395 (***)	0.105	0.389 (***)	0.118	0.473 (***)	0.130
Initial GDP per capita			-0.599 (***)	0.196	-0.699 (**)	0.288	-0.491 (*)	0.275
Population growth			0.210	0.256	0.341	0.290	0.372	0.275
Savings & investments			3.114 (***)	0.875	3.230 (***)	1.019	3.023 (***)	1.080
Inflation					0.085	0.062	0.068	0.060
Sec. school enrollment					0.020	0.020	0.024	0.192
Openness							0.012	0.024
Mobile phone users							-0.018 (**)	0.009

Table 4: Interpretation of coefficients 1

β_1	Intercept
β_2	Marginal effect of lnfdi
β_3	Marginal effect of lnycap
β_4	Marginal effect of pgr
β_5	Marginal effect of lnsi
β_6	Marginal effect of infl
β_7	Marginal effect of secs
β_8	Marginal effect of open
β_9	Marginal effect of mob

Worth noticing in table 3 is that FDI has a significant positive effect on economic growth in all regressions. When initial GDP per capita is added it has a significant negative effect on economic growth while savings and investments have a significant positive effect on economic growth. As of regression 2 the intercept is also significant. In regression 4 the

infrastructure variable shows a significant negative effect on economic growth. Population growth, secondary school enrollment, level of openness, and inflation are all insignificant.

The R^2-value indicates how well the data fit the model, in regression 4 the variables captures 30.5%.

6.2.1 OLS estimation with an interaction variable

To examine if corruption has an effect on economic growth and if there is an interaction affect between FDI and corruption an interaction variable is needed in the model. Interaction variables can lead to a higher understanding of the variables relationships.

The following regressions are done to examine the effects of corruption.

Specification of model:

$$Ygr_{it} = \beta_1 + \beta_2 \ln fdi_{it} + \beta_3 \ln ycap_{it} + \beta_4 pgr_{it} + \beta_5 \ln si_{it} + \beta_6 infl_{it} + \beta_7 secs_{it} + \beta_8 open_{it} + \beta_9 mob_{it} + \beta_{10} corr_{it} + \beta_{11} \ln fdi*corr_{it} + \mathcal{E}_{it}$$

Table 5. Regression 5, 6, 7, and 8: Effects of corruption[5]

Dependent variable	Economic gr. (5) (using CPI)		Economic gr. (6) (using WGI)		Economic gr. (7) (using CPI)		Economic gr (8) (using WGI)	
Observations / R^2	125	0.308	125	0.309	125	0.314	125	0.312
Independent variables	Coefficient/Std Err		Coefficient/Std Err		Coefficient/Std Err		Coefficient/Std Err	
Intercept (β_1)	-12.570 (***)	4.220	-13.321 (***)	4.829	-24.583 (**)	10.845	-10.108 (**)	4.738
FDI	0.460 (***)	0.134	0.452 (***)	0.136	1.072 (**)	0.470	0.354 (***)	0.134
Initial GDP per capita	-0.398	0.398	-0.380	0.280	-0.455	0.283	-0.468	0.292
Population growth	0.384	0.283	0.381	0.282	0.399	0.288	0.387	0.287
Savings & investments	2.977 (***)	2.977	2.968 (***)	1.029	2.802 (***)	0.997	2.704 (***)	1.028
Inflation	0.059	0.055	0.060	0.055	0.052	0.053	0.055	0.054
Sec. school enrollment	0.059	0.020	0.023	0.020	0.025	0.020	0.023	0.020
Openness	0.012	0.024	0.011	0.024	0.015	0.025	0.012	0.024
Mobile phone users	-0.019 (**)	0.009	-0.020 (**)	0.009	-0.019 (**)	0.009	-0.020 (**)	0.010
CPI or *WGI*	-0.199	0.319	-0.415	0.665	3.353	2.335	7.624	4.736
FDICPI or *FDIWGI*					-0.170	0.118	-0.383	0.234

Table 6. Interpretation of coefficients 2

Regression 5 and 6	
β_1- β_9	See table 2
β_{10}	Marginal effect of corruption
Regression 7 and 8	
β_1, β_3- β_9	See table 2
β_2	Marginal effect of FDI when corruption=0
β_{10}	Marginal effect of CPI/WGI when FDI=0
$\beta_{10} + \beta_{11}$ • lnfdi	Marginal effect of corruption
$\beta_2 + \beta_{11}$ • corr	Marginal effect of FDI

[5] P-values: Regression 5: CPI 0.533, Regression 6: WGI: 0.528, Regression 7: CPI 0.154, CPI*FDI 0.153, Regression 8: WGI 0.110, WGI*FDI 0.105

Adding the corruption variable and the interaction variable changes the estimates but the variables keep the same signs, initial GDP per capita is however no longer significant. The corruption coefficients have expected signs but are not significant on a 10% significance level. As the study however only covers developing countries higher significance levels can be argued to be tolerated. As the coefficients all ranges below a 15.5% significance level the relationship between corruption and FDI towards economic growth can be interpreted by looking at the marginal effects in table 7 and 8.[6]

Table 7. Marginal effect of corruption 1

Using CPI	
Minimum value of lnFDI	3.353 + (-0.170 • 16.823) = 0.493
Mean value of lnFDI	3.353 + (-0.170 • 21.151) = -0.243
Maximum value of lnFDI	3.353 + (-0.170 • 26.100) = -1.084
Using WGI	
Minimum value of lnFDI	7.624 + (-0.383 • 16.823) = 1.181
Mean value of lnFDI	7.624 + (-0.383 • 21.151) = -0.477
Maximum value of lnFDI	7.624 + (-0.383 • 26.100) = -2.372

Table 8. Marginal effect of FDI 1

Using CPI	
Minimum value of CPI	1.072 + (-0.170 • 1.1) = 0.885
Mean value of CPI	1.072 + (-0.170 • 3.246) = 0.520
Maximum value of CPI	1.072 + (-0.170 • 6.025) = 0.048
Using WGI	
Minimum value of WGI	0.354 + (-0.383 • (-1.272)) = 0.841
Mean value of WGI	0.354 + (-0.383 • (-0.441)) = 0.523
Maximum value of WGI	0.354 + (-0.383 • (0.992)) = -0.026

The marginal effects of corruption show that with the minimum level of FDI inflow corruption has a positive effect on economic growth, but with the mean and maximum levels of FDI inflow corruption affect economic growth negatively. The marginal effects of FDI show that the higher level of corruption the less FDI affect economic growth positively, and with maximum level of corruption using WGI the effect on economic growth is negative.

[6] See appendix 2 for minimum, mean, and maximum values of FDI and corruption.

6.3 Fixed effect regression analysis

Although OLS estimation works to some extent, it does not use all available information from the panel data. It is possible that there are country specific effects that needs to be taken into consideration, and thus OLS estimation, which implies that all countries are the same, will not be an efficient method. If there are individual effects that are not being taken into consideration this could also lead to lower R^2-values. There are two methods that take into account for individual effects, fixed effect or random effect panel regressions. With fixed effect the assumption is that the individual effect is a different constant for every country which is calculated by adding a dummy variable for every country, while random effect assumes that the individual effect is a drawing from a random variable. Random effect does generally give better β-estimations as all information in the panel is being used only for this, the individual effect is thought of as part of the error term. It is however not reasonable to think that the country specific effect is a drawing from a random variable, it would more likely reflect specific conditions within the country and thus fixed effects will be used.

Another advantage with the fixed effect regression is that it is controlling for the average differences across countries and the differences within the same country are being admitted. This greatly reduces the problem with biased estimations due to omitted variables.

Specification of model:

$$Ygr_{it} = \beta_2 \ln fdi_{it} + \beta_3 \ln ycap_{it} + \beta_4 pgr_{it} + \beta_5 \ln si_{it} + \beta_6 infl_{it} + \beta_7 secs_{it} + \beta_8 open_{it} + \beta_9 mob_{it} + \beta_{10} corr_{it} + \beta_{11} \ln fdi*corr_{it} + \beta_{12} co1_t + \beta_{13} co2_t + \ldots + \beta_{61} co50_t + \varepsilon_{it}$$

One dummy variable is added for each country to be able to calculate the individual intercepts, the dummies are denoted *co* for country plus a number 1-50 specifying which one. The coefficients are interpreted as marginal effects the same way as for normal OLS estimation.

Table 9. Regression 9 and 10: Effects of corruption using CPI (Fixed effect)[7]

Dependent variable	Economic gr. (9)		Economic gr. (10)	
Observations / groups	125	46	125	46
R^2 within	0.392		0.397	
Independent variables	Coefficient/Std Err		Coefficient/Std Err	
Intercept (β_1)	-9.490	10.735	-25.485	23.539
FDI	2.214 (***)	0.494	3.053 (**)	1.205
Initial GDP per capita	-4.857 (***)	1.720	-5.025 (***)	1.739
Population growth	-2.776 (**)	1.307	-2.838 (**)	1.313
Savings & investments	3.322 (***)	1.229	3.282 (***)	1.234
Inflation	-0.020	0.066	-0.038	0.070
Sec. school enrollment	0.037	0.050	0.036	0.050
Openness	-0.005	0.049	0.005	0.052
Mobile phone users	-0.001	0.015	-0.002	0.015
CPI	-1.041	0.932	3.559	6.092
*FDI*CPI*			-0.228	0.298

Table 10. Marginal effect of corruption 2

Minimum value of lnFDI	3.559 + (-0.228 • 16.823) = -0.277
Mean value of lnFDI	3.559 + (-0.228 • 21.151) = -1.263
Maximum value of lnFDI	3.559 + (-0.228 • 26.100) = -2.392

Table 11. Marginal effect of FDI 2

Minimum value of CPI	3.053 + (-0.228 • 1.1) = 2.802
Mean value of CPI	3.053 + (-0.228 • 3.246) = 2.313
Maximum value of CPI	3.053 + (-0.228 • 6.025) = 1.679

[7] P-values: Regression 9: CPI 0.268, Regression 10: CPI 0.561, CPI*FDI 0.447

Table 12. Regression 11 and 12: Effects of corruption using WGI (Fixed effect)[8]

Dependent variable	Economic gr. (11)		Economic gr. (12)	
Observations / groups	125	46	125	46
R^2 within	0.396		0.402	
Independent variables	Coefficient/Sta Err		Coefficient/Std Err	
Intercept (β_1)	-4.187	11.132	-0.102	12.240
FDI	2.061 (***)	0.496	2.040 (***)	0.498
Initial GDP per capita	-5.518 (***)	1.685	-6.022 (***)	1.800
Population growth	-2.649 (**)	1.300	-2.754 (**)	1.309
Savings & investments	2.774 (**)	1.252	2.702 (**)	1.258
Inflation	0.021	0.067	0.001	0.071
Sec. school enrollment	0.050	0.051	0.049	0.052
Openness	0.006	0.050	0.015	0.051
Mobile phone users	0.004	0.015	0.005	0.015
WGI	3.112	2.346	14.016	13.622
*FDI*WGI*			-0.532	0.654

Table 13. Marginal effect of corruption 3

Minimum value of lnFDI	14.016 + (-0.532 • 16.823) = 5.066
Mean value of lnFDI	14.016 + (-0.532 • 21.151) = 2.764
Maximum value of lnFDI	14.016 + (-0.532 • 26.100) = 0.131

Table 14. Marginal effect of FDI 3

Minimum value of WGI	2.040 + (-0.532 • (-1.272)) = 2.717
Mean value of WGI	2.040 + (-0.532 • (-0.441)) = 2.275
Maximum value of WGI	2.040 + (-0.532 • 0.992) = 1.512

[8] P-values: Regression 11: WGI 0.189, Regression 12: WGI 0.307, WGI*FDI 0.419

The intercepts in the regressions are the average value of the individual intercepts. The fixed effect analysis produce a R^2-value called R^2 within which is interesting as it shows the fit of the model like an OLS but with the transformed data. The within R^2-values from all fixed effect regressions is higher than the R^2-values from the normal OLS regression in previous section which strongly implies that there are a country specific effects to take into consideration.

Using fixed effect regressions FDI and savings and investments have a significant positive effect on economic growth, consistent with previous results, while initial GDP per capita and population growth has a significant negative effect on economic growth. Inflation, secondary school enrollment, level of openness, and mobile phone users have no significant effect on economic growth.

Corruption shows no significant effect on economic growth alone or interacted with FDI, and the p-values are much higher in the fixed effect regressions than in the OLS regressions which gives interpretations of the marginal effects little analytical value, still however valuable in for this thesis.

Table 11, 12, 13, and 14 shows the relationship between corruption and FDI towards economic growth. Using CPI corruption always has a negative effect on economic growth, and the higher levels of FDI inflow the more negative corruption is for economic growth. Using WGI corruption affect economic growth positively, but the higher the levels of FDI inflow the smaller the effect. The marginal effect of FDI is always positive no matter what corruption measurement that is used and also shows that the higher the level of corruption is the less of a positive effect FDI has on economic growth.

7. Conclusions

7.1 Discussion

Population growth, secondary school enrollment, and level of openness all show expected sign in the OLS regressions but are insignificant. Inflation would be expected to have a negative effect on economic growth but has a positive sign, but as it is not significant it should not be interpreted too carefully.

In the OLS regressions infrastructure has a significant negative effect on economic growth, which is unexpected. It could depend on the fact that mobile phones per 100 people is not an optimal tool to use and does not reflect the infrastructure development in this selection of countries, and also on the fact that the selection of countries is just developing countries in many different stages of development. In the fixed effect regressions infrastructure is however no longer significant and as the fixed effect regressions are the better suited for this research the subject can be dismissed.

Initial GDP per capita becomes less significant the more variables that are added in the OLS analysis, in the regressions where corruption is added it is no longer significant but has still expected sign. In the fixed effect regressions the variable is significant again and has expected negative effect on economic growth. As the fixed effect regressions are better suited for this research and the effect is supported by theory it can be considered to increase the model's credibility.

That population growth has a significant negative effect on economic growth in the fixed effect regressions can be explained by the selection of examined developing countries where the conditions within the countries might not be optimal for a growing population.

Savings and investments have a significant positive effect on economic growth in all regressions, which also is supported by theory and can be considered to increase the model's credibility. FDI has a significant positive effect on economic growth in all regressions.

The interaction between FDI and corruption has not shown any significant results on a 10% significance level. It is however still interesting to discuss a possible cause for the relationships as the trends were the same in the OLS regressions and the fixed effect regressions. Corruption is more negative for economic growth as FDI inflows increase. One explanation could be that with low levels of FDI corruption could make processes quicker for companies to start operating and not be completely negative for economic growth, but as FDI inflows increase the effect subsides. As for FDI being less positive for economic growth as corruption increases, the relationship seems rather logical. For instance, an foreign investor who has to pay high bribes to access markets or get permits will have less resources to operate and thus smaller chances of succeeding and contributing to economic growth than a foreign investor who does not have to pay bribes.

7.2 Conclusions

The aim for this thesis was to examine if FDI have a positive effect on economic growth in developing countries and to see if an interaction between FDI and corruption affect economic growth. The subject is currently important as the understanding of institutional affects could help governments worldwide to create better conditions for economic growth and development.

The results show that FDI have a significant positive effect on economic growth, which strengthens the results from Blomstrom et al. (1994) and Nair-Reichert & Weinhold (2001) who also concluded that FDI has a positive effect on economic growth. The additional contribution from this study is the big selection of developing countries. As the selection of countries in this thesis is very diverse, both considering income levels and geographic location, the conclusions can be argued to represent developing countries in general.

Regarding the interaction between FDI and corruption no significant results regarding its effect on economic growth could be found, it is however not the same as concluding that the interaction does not exist. Additionally a higher significance level can be argued to be tolerated regarding developing countries, whereas the trends found are highly interesting and should be examined further. That no results could be found on a lower significance level could be due to weaknesses in the way corruption is measured, but also the fact that the covered countries are very different could be contributing. Developing countries are often harder to have general conclusions about as conditions within them often differ a lot which makes results harder to interpret.

7.3 Future research

Theory and other studies have concluded that institutional settings within a country are important for creating a good climate of development, which suggests that institutional settings within countries does matter for FDI inflows and the magnitude of its effects on economic growth. It is interesting and valuable to know exactly how these are connected and more research within this area is necessary. Developing countries often lack data which makes research harder, more accurate studies on institutional effects on FDI and economic growth will be able to be carried through as more data is collected.

It would be interesting to develop this study and examine countries divided into smaller groups after characteristics such as income level, geographic location, or demographic conditions. This could enable for more certain conclusions about the interaction between FDI

and corruption to be made, and to see if the interaction effect can be found on lower significance levels depending on surrounding conditions.

Another way to develop this study could be to divide FDI in different ways to see if one type of FDI is more affected by levels of corruption than other. A possible grouping could be more integrated FDI targeting domestic markets and FDI focusing on export.

The weaknesses in the ways corruption is measured is the biggest obstacle for this type of research. For all future research on corruption it would be preferable to use both CPI and WGI as it would lead to more certain conclusions.

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Appendix 1. Countries covered in the study

Table 15 is showing the countries covered in the study. The countries were selected by looking at income level were low to middle income countries were chosen, used were the World Banks classifications of low to middle income level. The selection were further limited to which countries the CPI and WGI covered in their indexes.

Zimbabwe is classified as a low income country by the World Bank but is not covered in the study although corruption data was available. Conditions within the country, such as hyperinflation, makes Zimbabwe less suited to be part of the study. The analytical value were further reduced as data over other variables also were missing.

Table 15. Countries covered in the study

Argentina	Malawi
Azerbaijan	Malaysia
Bangladesh	Mauritius
Bolivia	Mexico
Botswana	Moldova
Brazil	Namibia
Bulgaria	Nicaragua
Cameroon	Nigeria
China	Pakistan
Colombia	Panama
Costa Rica	Peru
Côte d´Ivoire	Philippines
Dominican Rep	Romania
Ecuador	Senegal
Egypt	South Africa
El Salvador	Tanzania
Ghana	Thailand
Guatemala	Tunisia
Honduras	Turkey
Hungary	Uganda
India	Ukraine
Indonesia	Uzbekistan
Jordan	Venezuela
Kazakhstan	Vietnam
Kenya	Zambia

Appendix 2 Descriptive statistics and robustness tests of data

Descriptive statistics

Table 16. Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
perYgr	150	4.893	2.908	-1.410	24.180
lnfdi	148	21.151	1.712	16.823	26.100
lnycap	150	7.592	1.232	2.271	9.467
perpgr	150	1.457	0.962	-1.220	3.374
lnsi	146	3.023	0.378	0.472	3.945
infl	145	7.389	5.059	-0.472	33.812
secs	132	71.162	21.987	18.020	104.508
open	150	68.496	11.451	23.5	87.275
mob	150	53.957	40.197	1.018	176.646
cpi	150	3.246	0.992	1.1	6.025
wgi	150	-0.441	0.513	-1.272	0.992

Heteroscedasticity

One of the main assumption for the ordinary least square (OLS) regression to be efficient is constant variance of the residuals, when this is not the case the residuals are heteroscedastic. If the residuals are heteroscedastic the OLS estimators are inefficient, the standard errors of the regression will be incorrect (Dougherty p. 283, 2011). To see if the data is heteroscedastic a Breush-Pagan test of following regression is done:

Model specification:

$$Ygr_{it} = \beta_1 + \beta_2 \ln fdi_{it} + \beta_3 \ln ycap_{it} + \beta_4 pgr_{it} + \beta_5 \ln si_{it} + \beta_6 infl_{it} + \beta_7 secs_{it} + \beta_8 open_{it} + \beta_9 mob_{it} + \beta_{10} cpi_{it} + \beta_{11} wgi_{it} + \mathcal{E}_{it}$$

H_0: Constant variance of residuals
P-value: 0.000

As the P-value is very small the hypothesis is rejected, the variance is heteroscedastic. In the regressions in this thesis robust standard errors are used to correct the estimations.

Multicollinearity

Perfect linear relationships among variables in a regression, multicollinearity, creates a problem when estimating the coefficients and their standard errors, the coefficients become unstable and appear to be highly significant (Dougherty p. 165, 2011). Doing a variance inflation factor (VIF) test on the variables (one regression for each measure of corruption) following results are shown:

Table 17: Results from the VIF-tests

Variable	VIF	1/VIF	Variable	VIF	1/VIF
ycap	2.68	0.373	*ycap*	2.82	0.355
secs	2.51	0.399	*secs*	2.49	0.401
mob	2.27	0.440	*mob*	2.38	0.419
perpgr	1.69	0.593	*perpgr*	1.69	0.593
lnfdi	1.63	0.614	*lnfdi*	1.66	0.603
open	1.58	0.633	*open*	1.58	0.633
cpi	1.47	0.679	*wgi*	1.48	0.676
lnsi	1.26	0.795	*lnsi*	1.26	0.794
infl	1.12	0.896	*infl*	1.10	0.908
mean VIF	1.80		*mean VIF*	1.83	

A thumb rule is that variables with a VIF-value lower than 10 and a tolerance level, defined as 1/VIF, higher than 0.1 are okay and should not cause a problem (Kennedy p. 199, 2008). As this is the case no further investigation is needed regarding multicollinearity.

Autocorrelation

As panel data is used and there is data over time there is a possibility for autocorrelation. A Wooldridge test for autocorrelation in panel data is done:

H_0: no autocorrelation
P-value: 0.507

Whereas the high P-value means that the null hypothesis cannot be rejected, meaning that there is no autocorrelation in the data.

Causality

Theory supports that the independent variables affect the dependent variable, it is however also reasonable to think that GDP growth affects some of the independent variables. Canning and Pedroni (2004) found a bi-directional relationship between GDP growth and infrastructure, where infrastructure development affects GDP growth but also that GDP

growth affects infrastructure development. Madsen (2002) concluded that economic growth is determined by a country's savings and investment rate, but also that certain investments are caused by economic growth. This causality loop between the independent and dependent variables can lead to endogeneity. The problem with endogeneity is that if an endogenous, or an omitted, variable, thus a variable that is determined by other variables in the system, is correlated with the error term the coefficients in an OLS regression become biased and the method is no longer efficient. The solution for the problem is to use another variable as a tool. In the case of FDI a significant endogenous relationship between it and economic growth has been identified in several studies since the mid 1980's (Xiaoying and Xiaming, 2005). If the model is subject to endogeneity the estimated coefficients will be biased, the problem in this case is that there are no ideal tool available to solve the problem. A second solution is to use fixed effect regressions which greatly reduce this risk.