CORRUPTION AND GROWTH

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ABSTRACT

Peter Vanderhart, Advisor

In this study, the effect of corruption on economic growth is evaluated by considering econometric analysis of panel models. The data sets in this study are obtained from Transparency International Organization, World Bank Data and Penn World Table for a sample of 38 developing countries between 2000 and 2008. The emphasis of this work will be on various transmission channels through which corruption affects economic growth. In alignment with these research objectives, the following research questions can be identified. What are the effects of corruption on economic growth? What are the effects of other explanatory variables (control variables) including openness (OPENK), the rate of investment (KI) and foreign direct investment (FDI) through corruption on economic growth? To answer these questions, this study introduces the impact of corruption on economic growth through direct and indirect methods. The indirect effects of corruption on economic growth emphasizes on the role of transmission channels. The transmission channels in this study are the share of investment of GDP, foreign direct investment and openness through which economic growth is influenced by corruption. According to regression analysis, the direct effect of a 1% increase in the corruption leads to reduction of the growth rate by about 1.64%. In addition, the indirect effects of corruption on economic growth through KI, FDI and OPENK are negligible. The reason might be due to the lack of predictability of corruption (uncertainty) in these developing countries. This illustrates that growth is influenced by corruption directly and the transmission channels have no role on the effects of corruption on economic growth in this sample under investigation.
ACKNOWLEDGEMENTS

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CHAPTER I. GENERAL RESEARCH

Introduction

Both economic growth and corruption are words that have been frequently used in public debates over the last few years. Based on the definition of the World Transparency International Organization, corruption is the misuse of public power for personal interests. This phenomenon is the result of weaknesses in the economic, political, and institutional performance of government. The major obstacles to the comparative studies of corruption have been the lack of a general definition of corruption and the absence of objective cross-national data on corrupt behavior. Although corruption is more common in poorer economies, it does exist in all countries.

As words go, economic growth is a fairly new phenomenon while corruption is, of course, an ancient one. In the past, corruption was just known as an immoral and criminal behavior of government officials. In a treatise on public administration dating back to the fourth century B.C., in India, Kautilya writes in his Arthasastra: “just as it is impossible not to taste the honey or the poison that finds itself at the tip of the tongue, so it is impossible for a government servant not to eat up, at least, a bit of the king's revenue “, (Bardhan, 1997: 1320). The message from the Arthasastra is that corruption is innate in the government’s activities. Corruption is not unique to the governmental sectors. Regulation and control can be clearly seen in both large private enterprises and private sector activities. Thus, it has been the focus of much scientific research for its undesired welfare effects (Lorenzo Pellegrini, 2008, 1).

Economic growth is the percent increase of gross domestic product, or the total produced goods and services including consumption, investment, government expenditure, and net exports, within a country for a specific time period. Economic growth is influenced by corruption either directly or indirectly through the transmission channels described in this study.
Purpose and Hypotheses of Research

In this research, the effects of corruption on economic growth will be described and analyzed using a sample of 38 developing countries over the period of 2000-2007. This is accomplished by utilizing the econometrics technique of Panel data. Emphasis of this work will be demonstrated on various transmission channels through which corruption affects economic growth. Common variables used to quantify transmission channels are the rate of investment, human capital, poverty, rate of tax, foreign direct investment, limitation of opportunities, political instability, and the diversion of the talent of innovators and producers toward rent seeking activities. The independent variables used in this study are investment, foreign direct investment, and openness. This study’s purpose is to determine the effects of corruption using both direct and indirect channels.

This indirect method emphasizes the role of each independent variable through the effects of corruption on economic growth. In this case, corruption first affects those independent variables which in turn influence economic growth. However, in the direct method, all the independent variables are included and estimated on one model. In alignment with these research objectives, the following research questions can be identified. What are the effects of corruption on economic growth? What are the effects of other explanatory variables (control variables) including openness and the rate of investment and FDI on the effects of corruption on economic growth? Moreover, three specific questions explored in this study are:
1) Is there positive or negative link between corruption and economic growth in countries under investigation?
2) What is the overarching importance of the transmission channels through which corruption affects economic growth?
3) Which of the aforementioned channels is the most important factor in the influence of corruption on economic growth?
In order to answer these questions, some theoretical and econometric analyses are required. The following sections will present a set of explanations of corruption and highlight the main characteristics and consequences of it as an issue of international policy. The organization of this thesis is in 4 chapters. In the first chapter the general research setting is described, while the second chapter contains the literature review. In the third chapter, methodology and data analysis are explained. Finally, the fourth chapter contains a summary and recommendations.
CHAPTER II. THEORETICAL BACKGROUND AND LITERATURE REVIEW

Introduction

In this chapter, the previous investigations associated with this subject are described. In order to understand the effects of corruption, it is essential to use the findings of economists who have examined the issues previously.

Theoretical Literature

Theoretical Model

There are some theoretical models which investigate the effects of corruption on economic growth using a neoclassical model. The model of Everhart, Vazquez and McNab (2005) was used as an example in this study because they emphasized the indirect effects of corruption on growth through transmission channels. In addition, the growth in Everhart, Vazquez, and McNab’s model is based on GDP level, which makes it very similar to the model chosen for this study.

Everhart, Vazquez, and McNab Model

In this investigation, corruption has both direct and indirect negative effects on economic growth. The indirect effect of corruption on economic growth is via private investment, public investment and human capital. In this study, a Cobb-Douglas production function is introduced as follows:

1) \[ Y_t = V_t K_t^\alpha G_t^\beta H_t L_t^\sigma \]  
(Martinez-Vazquez and M. McNab, 2005, p.7)

In the above model, production is \( Y_t \), \( L \) is labor, \( V_t \) is the level of technology, and \( K_t, G_t \) and \( H_t \) are private, public and human capital at time \( t \) respectively.

2) \[ V_t = A_t C_t Z_t \]
Next, Everhart (2005) defines \( A_t \) as a matrix of exogenous variables which affect growth, \( C_t \), and \( Z_t \) as the level of corruption and row vector of exogenous variables respectively:

By inserting the equation 2 into equation 1, equation 3 is obtained.

3) \( Y_t = A_t C_t Z_t K_t^\alpha G_t^\beta H_t L_t^\sigma \)

In the equation 3, the indirect effect of corruption on the level of GDP through independent variables can be obtained. In the following equation, \( i_t \) is the combination of human, private, and public capital to separate the direct and indirect effect.

4) \( H_t K_t^\alpha G_t^\beta = i_t \)

By inserting equation 4 into equation 3, equation 5 is obtained.

5) \( Y_t = A_t C_t Z_t i_t L_t^\sigma \)

6) \( \delta i_t / \delta H = i_h \quad \delta i_t / \delta K = i_k \quad \delta i_t / \delta G = i_g \)

\( i_k, i_g \) and \( i_h \) are the portion of output spent on private, public and human capital.

By taking logarithm and derivation from above equations, the following equations are derived.

7) \( Y_t = A_t C_t Z_t i_t L_t^\sigma = A_t C_t Z_t L_t (K_t G_t)^{\alpha + \beta} i_t = A_t [C_t Z_t L_t (K_t G_t)]^{(\alpha + \beta)} i_t \)

8) \( (\text{Ln}(dY/dt)) = \text{Ln}[d(C_t Z_t L_t (K_t G_t))^{(\alpha + \beta)}/dt] + \text{Ln}[d(i_t/dt)] \)

To obtain \( \text{Ln}(dY/dt) \), one must derive \( \text{Ln}(di_t/dt) \) and then \( \text{Ln}[d(C_t Z_t L_t (K_t G_t))^{(\alpha + \beta)}/dt] \) as follows:

9) \( di_t/dt = (di/dt)K + (di/dt)G + (di/dt)H \)

10) \( (di/dt)_K = (di/dK) (dK/dt) = \alpha (K_t)^{\alpha - 1} (H_t)^{1-H} (G_t)^{\beta} = \alpha (K_t H_t G_t)^{(\alpha + \beta) - 1} = \alpha (i_k)^{(\alpha + \beta) - 1} \); →

11) \( \text{Ln}(di/dt)_K = (\alpha)(1-(\alpha + \beta))^{-1} = (\alpha/1-\alpha-\beta) \text{Ln}(i_k) \)

12) \( (di/dt)_G = (di/dG) (dG/dt) = \beta (G_t)^{\beta - 1} (H_t)^{1-H} (i_g)^{\alpha} = \beta (K_t H_t G_t)^{(\alpha + \beta) - 1} = \beta (i_g)^{(\alpha + \beta) - 1} \); →

13) \( \text{Ln}(di/dt)_G = (\beta)(1-(\alpha + \beta))^{-1} \text{Ln}(i_g) = (\beta/1-\alpha-\beta) \text{Ln}(i_g) \)
\( \frac{d(i/dt)}{dH} = \frac{d(i/dH)dH/dt}{(GiK_i)(\alpha+\beta)(H_t)^{1-1}} = (KtHtGt)((\alpha+\beta)-1) = (i_h) \frac{((\alpha+\beta)-1)}{}; \quad \rightarrow \\
\]

\( \ln\left(\frac{d(i/dt)}{dH}\right) = (1-(\alpha+\beta))^{-1} \ln(i_h) = (1/1-\alpha-\beta) \ln(i_h) \quad \rightarrow \\
\)

By inserting \( \ln(d(i/dt))_K \), \( \ln(d(i/dt))_G \) and \( (d(i/dt)_H) \) from equations 11, 13 and 15, equation 16 is derived as follows:

\[ 16) \ln(d(i/dt)) = (\alpha/1-\alpha-\beta) \ln(i_k) + (\beta/1-\alpha-\beta) \ln(i_g) + (1/1-\alpha-\beta) \ln(i_h) \]

The rate of exogenous growth for labor (L), technology (Z), and corruption are \( n, g, \) and \( c \) respectively, which are in the following equation 18. However, capital \( (K_tG_t) \) has a depreciation rate of \( \gamma \). Therefore, \( \left[ d(C_tZ_tL_t(K_tG_t)(\alpha+\beta)/dt) \right] \) is derived as follows:

\[ 17) \frac{d(C_tZ_tL_t(K_tG_t)(\alpha+\beta))/dt}{(\alpha+\beta) \left( cg\gamma n \right) \left( (\alpha+\beta)-1 \right)}(-1) \]

\[ 18) \ln\left[ d(C_tZ_tL_t(K_tG_t)(\alpha+\beta)/dt) \right] = - (\alpha+\beta)(1-(\alpha+\beta))^{-1} \ln(c+g+\gamma+n) = - (\alpha+\beta)/ (1-(\alpha+\beta)) \ln(c+g+\gamma+n) \]

\[ 19) d(\ln(dY/dt)) = \ln(y',t) \]

By inserting equations 15, 18 and 19 in equation 8, equation 20 is derived as follows:

\[ 20) \ln(y',t) = (\alpha/1-\alpha-\beta)\ln(i_k) + (\beta/1-\alpha-\beta)\ln(i_g) + (1/1-\alpha-\beta) \ln(i_h) - (\alpha+\beta/1-\alpha-\beta) \ln(n+g+\gamma+c) \]

In the above equation, the direct and indirect effect of corruption on the rate of growth can be derived. According to the terms of model above, the increase unit of corruption \( (c) \) leads to the reduction of growth rate \( (y_t) \) directly. In addition, the indirect negative effect of corruption on growth rate via transmission channels is determined by \( G_t \) public, \( K_t \) private, and \( H_t \) human capital, which are shown by \( \ln(i_g), \ln(i_k), \) and \( \ln(i_h) \).

**The Theory of Greasy Money**

Although the majority of economists emphasize the negative effects of corruption on economic growth, there are some economists who claim that corruption has beneficial effects on economic growth.
For instance, Leff (1964), Nye (1967), and Huntington (1968), presented the theory of "greasy money" that the buying and selling of political privileges has certain political and social advantages. From their view, bribes improve the efficiency of the economy of each country, by cutting red tape. In other words, corruption is like a “lubricant” which simplifies some inefficient regulations. Therefore, the indirect effects of corruption on growth would be through the reduction of delays and time spent on bureaucratic regulations, which ease the economic growth. There is no mathematical model found for greasy money in previous studies.

**Empirical Work**

*The Transmission Channels*

In corrupt countries, economic dishonesty makes productive investment costly and risky, compared to rent seeking and bribery which are very profitable. Therefore, innovators, producers, and investors have less incentive to participate in investment activities. Thus, the skill and innovative capacities of these sophisticated people will be wasted, which in turn leads to the undermining of the economic growth of countries. Mo (2001) came across the harmful effects of corruption on economic growth on 54 countries from 1970 to 1985 through transmission channels. The transmission channels used in Mo’s study are human capital, political instability, and investment. He found that among all transmission channels, political instability has the most important role in the process of the effects of corruption on economic growth. Mo discovered that if corruption measure is increased by 1 unit measure, economic growth is reduced by 0.54 percent. In addition, a 1 unit increase in corruption results in the rise of political instability as much as 53 percent.

Aidt (2009) claimed that there is no strong correlation between corruption and economic growth in the studies of Leff, Nye, and Huntington. Mauro (1995) found evidence of the negative
effect of corruption on economic growth through the channel of investment in his cross-section studies from 1970 to 1985. According to his investigation, if Bangladesh were to raise its bureaucratic honesty by 1 unit measurement, investment would go up by 5 percent, and then GDP would improve by half a percentage. Pellegrini and Gerlagh (2004) studied the effect of corruption on economic growth in 33 African countries from 1982 to 2001. These economists found that corruption influences economic growth adversely through the channel of investment—both domestic and foreign direct investment. They concluded that corruption acts as a tax on investment which discourages investors and producers from investing.

There are several economists such as Ades and Di Tella (1999), Treisman (1998), and Paldam (1999) who examined the effects of corruption on economic growth through the channel of openness in 55 cross-section countries. They used the data set obtained from BI (Business International) and an openness variable as an indicator of competition. Corruption is an intervening variable creating trade barriers and bribes which leads to the restriction of economic freedom. As a result, they concluded that the rise of corruption of politicians and public servants leads to the reduction of the competition and then likewise economic activities of countries. This lowers the economic growth of these corrupt countries. Wei (1999) also emphasized the government’s role in the economy and the role of openness on the effects of corruption on economic growth. The authors mentioned above unanimously found that countries having a more open economy tend to be less corrupt.

Li, H., Xu, L.C. and Zou, H.F. (2000) explored the effects of corruption on income inequality and growth. They described the negative effects of corruption on growth through government expenditure and black market premiums. A black market premium is the amount paid to black (illegal) markets in excess of official exchange rate to purchase foreign exchange.
They did their investigation in Latin American, Asian, and OECD (Organisation for Economic Co-operation and Development) countries. They found that economic growth is influenced adversely by corruption to a large extent in Latin American and OECD countries, especially when the government expenditure and black market are involved. Therefore, in their investigation, in Latin American and OECD countries, a 1 unit increase of corruption reduces economic growth by 1.8% through government expenditure and black market premium. However, growth in Asia is almost unaffected by the increase of corruption. As a result, corruption plays a greasy money role in Asia, and so growth is reduced just 0.14% from a one unit increase of corruption.

Rijckeghem and Weder (1997) also accentuated the importance of open economy and fair wage on the process of the effect of corruption on growth. They conveyed that employers in open economy countries tend to pay more to their employees compared to other countries. This can play a role in the improvement of corruption and the performance of employees. They found that if the salary of civil servants is raised from 100 to 200 percent of manufacturing payment, it leads to an improvement of corruption index from 0.7 to 1 point. This in turn leads to an improvement on economic growth.

*Exceptional Transmission Channels*

The theories of correlation between corruption, investment, and openness are complex. Most of these theories indicate that the correlation between corruption, investment, and openness is not absolute and there are different results in countries with different levels of economic dishonesty. Some of these ideas from different economists are as follows:
Corruption and Investment

Wei (1997) investigated the sensitivity of investors in the OECD countries to taxes and corruption. He asserted that the investors of some source countries are more sensitive to the corruption of host countries compared to others; however, some investors are unaffected by their respective corrupt governments. Therefore, there is no general conclusion about the effects of corruption on foreign direct investment of host countries. This is because it depends on the sensitivity of investors to corruption in host countries. In an investigation done by Wedman (1997), corruption leads to the increase of investment and growth in Zaire, South Korea, and the Philippines. Corruption in Zaire is based on “looting,” in the Philippines, it is “rent-scraping,” and in South Korea, it is “dividend-collecting” which have several definitions. Suppose that a country has gold mine, and the one way it could steal natural resources is taking them directly; this is called looting. In rent-scraping the government takes profit indirectly through state-owned companies. That’s because said government set up companies that mine the gold. State-owned companies pay the worker but the profit of those companies belongs to government. Therefore, looting is the explicit taking of all economic good which is worse when compared to the rent-scraping and dividend-collecting methods of corruption.

Wedman also distinguishes good corruption from bad corruption. Good corruption was applicable in South Korea in 1960 and caused economic development under President Park. Bad corruption is observed in Zaire under the power of Mobutu, and the Philippines under the power of Marcos. In contrast to good corruption, bad corruption leads to recession and poor infrastructure of the economy. In good corruption, the money stays in country to create a positive investment climate, preserve property rights, and promote growth. In good corruption, officials do not use the corrupt monies for their personal gain; therefore, it can grease the frictions of
regulations. Park in South Korea used corrupt money to support his political party and business activities. He not merely renationalized Korean banks but also lowered the interest rate below the market levels. Because of this, he increased capital stock by borrowing from international markets, seizing properties belonging to the Japanese, and receiving loans from foreign banks. Thus, the good corruption in South Korea caused economic interest and political interest to merge.

Although Zaire has natural resources such as coffee, copper, and cobalt and was wealthier than South Korea in the 20th century, it is now one of the poorest countries in the world due to bad corruption. Mobutu in Zaire looted the natural resources of the country and deposited that theft in foreign banks. The flight of capital and cash caused this country to be faced with the shortage of capital stock.

In the Philippines, which experienced both good and bad corruption, there was positive growth between 1970 and 1983. Wedman thinks that is because between 1970 and 1983, there was good corruption in the Philippines. Income obtained by natural resources of the Philippines (coconuts, sugar, palm oil, copra, etc.) did not transfer to foreign banks and part of the income was invested in the country and spent for other countries’ foreign debt. But after 1983, corruption in the Philippines switched to bad corruption, which led to a recession crisis. That is because, in 1983, the Philippines encountered some troubles, which led to the political and economic instability and then economic collapse. The roots of these troubles are the assassination of the Philippines senator, Benigno Aquino, who was the former political opponent of Marcos, and a debt crisis that happened at the same time. The assassination led to national movement demonstrations, which accused the president of ordering the assassination. In addition, the financial crisis, caused by unexpected great budget deficits equal to 800 million
dollars, led to lowering of the exchange rate. The consequences of these crises led to the uprising of businessmen and investors who accused the president of mismanagement. This caused the high rates of layoff in businesses and industries, which resulted in high inflation and recession. Therefore, these political and economic crises caused the Philippines to encounter widespread cash flight, creating bad corruption and then recession. Therefore, it is concluded in Wedmans’ study that good corruption caused capital to remain in the country, which led to growth. Subsequently, bad corruption contributed to the flight of cash and capital from a country, leading to a debt crisis and recession.

In several other works, Wedman’s ideas were examined by other authors. For example, Campos et al. (2000) examined a sample of 69 countries with different levels of corruption. In addition to corruption, they incorporate the predictability of corruption in their model. That is because according to that investigation, it is not only the level of corruption that affects investment, but also its predictability that plays an important role. The predictability of corruption is the level of certainty of corruption. However, the unpredictability of corruption would create uncertainty by the bribe payers about what they will have to pay in the future. In that research, countries where the level of corruption is more predictable, have less adverse effects on investment compared to countries with less predictable corruption. In order to demonstrate this, countries are classified in to three groups, which are represented in table 1 as follows:
Table 1. Grouping Countries by Predictability and CPI

<table>
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<th>Group</th>
<th>Countries</th>
<th>Predictability</th>
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<tr>
<td>First</td>
<td>Advanced economies</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Second</td>
<td>Third world (except East Asia)</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Third</td>
<td>East Asian</td>
<td>High</td>
<td>High</td>
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According to Table 1, the first group countries include the advanced economies countries, which have a low percentage of corruption and a high level of predictability of corruption. This group has the most suitable countries in terms of attracting foreign direct investment. The theories of Mauro, Brunetti, Wei and other investigators, who consider that corruption reduces the rate of investment, is confirmed in this group of countries containing advanced economies. The second group is composed of the third world countries (except East Asia), which have a high level of corruption and low level of predictability. The countries in this group have the worst outcomes in terms of attracting foreign direct investment. This is because these countries are less predictable, so lenders and foreign investors have less expectation about the level of corruption. Therefore, uncertainty about future corruption and high percentage of existing corruption causes FDI to be risky. This is because investors are unsure about the risk premium and infrastructure of those host countries. Finally, the last group including East Asian countries has a high level of corruption and high level of predictability. These countries have a higher level of foreign direct investment and also a higher growth rate compared to other developing countries introduced in the previous groups. This is because despite having a high level of corruption, it has a high certainty and predictability for foreign investors to do investment in those host countries. Therefore, corruption has no impact on foreign direct investment in East Asian countries.
because, despite the high level of corruption in these countries, they still attract a high level of foreign direct investment. As a result, according to the above theories, there is no absolute conclusion to indicate that corruption undermines investment in all countries. This is because the classification of countries under investigation and circumstances in which these countries are engaged play an important role.

Corruption and Openness

Earlier we observed that there is no consistent relationship between corruption and investment. Similarly, we observe that there is no definite correlation between corruption and openness. Wei (2000) did an investigation on natural openness and good and bad governance. Good governance is defined with transparent government of countries where people from all walks can be part of the process of a government’s decisions. In Wei’s paper, bad governance is associated with high levels of distortion and corruption. This means that in good governance countries, which have open economies, corruption leads to some barriers in trade and business opportunities. However, the trade and business opportunities in bad governance countries are not influenced by corruption and mismanagement because in a closed economy there is little trade to begin with. Wei in his paper indicates that corruption and bad governance hampers international investment and trade. However, he points out that globalization causes a decrease in the cost and barriers of trade to pave the way for the increase of openness. The increase of openness causes every country to allocate more resources to build better institutions, which leads to the reduction of corruption. However, there is no evidence that less corruption (good governance) causes more openness.

Gatti (2000) also examined the role of trade tariffs and corruption in different countries. He established a relationship between trade tariff rates, bribes, and the interaction between
custom officials and importers across countries. It is demonstrated that custom officials receive a large contribution of bribes when goods are imported to their countries. Gatti claimed that in corrupt countries the quantity of imported goods deviates from their normal behavior because of trade tariffs. As a result, corrupt custom officials exploit this situation. These custom officials threaten importers through the imposition of heavy tax rates and the misclassification of goods unless importers pay bribes to them. Therefore, government revenue increases and the demand of imported goods are increased. As a result, that corruption fails to have a negative effect on trade across countries.

These authors assert that corruption does not restrict trade, imports, and business opportunities in corrupt countries, despite the evidence that countries’ economies are influenced adversely. Therefore, the effect of corruption on openness and trade across countries is neutral to different measures of corruption.
CHAPTER III. METHODOLOGY, MODELING AND DATA ANALYSIS

Introduction
In the first section of this chapter, the methodology, including the attached labels and definitions for each variable and the samples under investigation within this study, are introduced. Then, the appropriate method to evaluate the variables in the sample of this study will be examined.

Data Description

Sample Selection
This study is primarily interested in the effects of corruption on growth in some developing countries. According to the World Bank classification, all developing countries are classified based on level of GDP per capita, which has a threshold between $1,035 and $12,615. This procedure classifies 138 countries as middle-income economies. However, the number of these countries is reduced in this study from 138 to 38 due to missing data. There was an absence of data on growth of GDP per capita, corruption, openness, foreign direct investment and investment share of GDP for 100 of these countries during the relevant time period. Therefore, a sample of 38 developing countries has been selected and the data over the period from 2000 to 2007 will be analyzed.
Definition of Key Variables

The indicators for all variables used in this study are defined in the following table.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Label</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corruption Perception Index</td>
<td>CPI</td>
</tr>
<tr>
<td>Growth rate of real GDP per capita</td>
<td></td>
</tr>
<tr>
<td>GGDP (constant prices)</td>
<td></td>
</tr>
<tr>
<td>Openness</td>
<td>OPEN</td>
</tr>
<tr>
<td>Foreign Direct Investment (constant FDI prices)</td>
<td></td>
</tr>
<tr>
<td>Investment share of real GDP per capita</td>
<td>KI</td>
</tr>
</tbody>
</table>

Corruption Perception Index (CPI)

Since 1995, the Transparency International Organization has been publishing a corruption perception index (CPI). The CPI generally defines corruption as the misuse of entrusted public power for private benefits when their decision is not made to benefit the public. As there is no measurement to determine corruption in private sectors, the CPI emphasizes corruption in public sectors, including self-interest attitudes of public servants and officials. Therefore, the data sets include the illegal activities, such as bribery and embezzlement of public funds, made by public officials.

Despite all the difficulties to measure the absolute value of corruption, the CPI measures the perception of corruption. Johann Graf Lambsdorff from Passau University was authorized by
the Transparency International Organization to measure an index for perceived level of corruption in 1960. The CPI determined the perceived level of corruption made by 13 different public opinion surveys and assessments. The public surveys were made by business people and performance assessments were made by experts in 12 different institutions. These institutions are the “African Development Bank, the Bertelsmann Foundation, the Economist Intelligence Unit, Freedom House, Global Insight, International Institute for Management Development, Political and Economic Risk Consultancy, Political Risk Services, the World Economic Forum, the World Bank and the World Justice Project” (Wei, 2001, p.13). This index ranks perceived level of corruption of countries from 0 to 10. Zero means the highest level of corruption and 10 means the lowest level. There is no perfect level of 10 and 0 for any countries in this analysis.

**Investment**

Net investment share in Gross Domestic Product (GDP), measured by percent, is the percentage of output used by factories and firms to create future output. Thus, this amount of investment is used to increase the capital stock of factories for future production. The measurement unit of this investment is percentage calculated by Gross Domestic Investment divided by Gross Domestic Product. Both Gross Domestic Investment and Gross Domestic Product are calculated at purchase prices. The data associated with share of capital investment is obtained from Penn World Table, (Penn World Table, 6.3).
Foreign Direct Investment

John Black (1997) defined foreign direct investment as the number of assets of which foreign companies and industrialists invest in host countries. When foreign residents do investment in real or financial assets, it is called inward foreign assets. These real assets are foreign direct investments carried by state or private sectors abroad, and financial assets are foreign securities and bank deposits invested by private or government debt (John Black, 1997). In fact, foreign direct investment is part of GDP (national income of country) obtained by net of investment inflows (investment inflows minus investment outflows). The data are obtained from World Bank Data (WDI, 2008).

Openness (Open Economy)

Black (1997) defined an open economy as having global transactions included in trade of goods and services, movement of capital, transferring technical information, and skills and migration of labor. Thus, an open economy has free trade in terms of the absence of barriers or obstacles in international trade, which leads to the expansion of imports and exports of goods and services (John Black, 1997). The openness measure is calculated by the ratio of the sum of imports and exports (trade exchanges) of countries to GDP. According to this index, when the ratio of trade to GDP of a country is higher, the economy of this country is more open in terms of trading goods and services. The openness data is extracted from Penn World Table (Penn World Table, 6.3).

Economic Growth

Economic growth is measured as the percentage increase of real economic output change over successive time periods. These economic variables are usually measured in either absolute or per capita adjusted with inflation. We choose the GDP per capita growth as measurement of
economic growth, which accounts for population differences of different countries from one year to another. The data associated with economic growth are obtained from World Bank Data (WDI, 2008).

**Analysis with Panel and Pool Data**

Pool and Panel observations are both applied to countries in cross sectional series. Pool data sets have a limited number of cross sectional variables while Panel data possess a great number of cross sectional variables (Badi H. Baltagi, 2001).

**Pooled OLS**

Pooled time series corresponds to random sampled cross-section individuals (countries) from a large population in different time periods. There are some omitted variables (Unobserved heterogeneity) for each country every year that are time-invariant. Time series and pooled cross-sectional studies cannot control these unobserved time-invariant variables.

**Panel Data**

Panel time series refers to sample individuals (countries) that are selected from large populations in different time periods. Panel data contains the same individuals (countries) in each cross-section which, therefore, causes the repetition of countries in different time periods. There are some benefits to Panel data for cross section studies, which are explained as follows. According to Baltagi (2008), there are some omitted (unobserved heterogeneity) variables for each country every year that are time-invariant. Panel data is able to control the unobserved time-invariant variables in cross section studies, whereas time series and pooled cross section studies cannot control these variables. The correlation of these unobserved heterogenous variables with error terms cause fixed and random effects explained as follows.
Panel-Fixed Effects

In fixed effect models, it is assumed that individual fixed effects (dummy variables) are correlated with other explanatory variables. These dummy variables, which are indicative of the economic behavior of countries, are used to control each country being different from another. If individual fixed effects (dummy variables) are omitted, it will cause biased results for the coefficients of explanatory variables.

There are two types of specifications for fixed effects, which are one-way fixed effects and two-way fixed effects. A Chow test indicates that the two-way fixed effects model is the appropriate model.

Empirical Fixed Effect Model

\[ Y_{it} = \alpha_i + \beta x_{it} + (\gamma_i + V_t), \text{ } i=1, 2 \ldots N=38 \text{ and } t=1, 2 \ldots T=8 \]  

model (3.1)"

\( E(X_{it}, \epsilon_{it}) \neq 0 \) (OLS is unbiased and inconsistent)

In this model, the error term \((\epsilon_{it})\) is divided into two components, which are \(V_t\) and \(\gamma_i\). In fact: \((\epsilon_{it}) = (\gamma_i + V_t)\). The \((\gamma_i)\) is the individual fixed effects (dummy variables) that are part of the error term. This parameter \((\gamma_i)\) is unobservable, heterogeneous, and varies from one country to another. In the above equation, \((i)\) denotes the individual countries and \((t)\) shows the number of observations. In this study, each individual represents countries, which are repeated 8 times from 2000-2007. Therefore, \(N=38\) and \(t = 8\)

\((Y_{it})\) is a dependent variable, which measures the growth of GDP per capita. \(X_t\) is explanatory variables as corruption, investment and openness and \(\beta\) is the parameter under investigation. Both \(Y_{it}\) and \(X_t\) are observable individual effects, which vary over time. In this model, individual fixed effects are schooling, property rights, political stability, bureaucratic

\[ F-Statistics \text{ of } 8.47, \text{ with a } p-value<0.001, \text{ indicates that the two-way fixed effect is the appropriate model.} \]
efficiency, etc, which create unobservable heterogeneity. These individual fixed effects are factors of growth and have strong correlations with corruption, openness, and FDI. That is because a particular country might have better schooling or human capital, which increase or decrease the investment and openness. In model (3.1), fixed effect would allow $\gamma_i$ (dummy variables) to be correlated with other explanatory variables (X) and in fact control these dummy variables. Since $(\varepsilon_{it}) = (\gamma_i + V_t)$, the correlation of $X_{it}$ and $\gamma_i$ causes $E(X_{it} \varepsilon_{it}) \neq 0$. This causes OLS to not be able to estimate dummy variables.

Panel-Random Effects

According to Baltagi (2008), it is assumed that individual fixed effects (dummy variables) are uncorrelated with other explanatory variables. For that reason, those dummy variables that control the differences for countries are omitted. This elimination will not cause any biases in the coefficients of explanatory variables. However, when the individual effects are not controlled, the serial correlation will be raised in the random-effect model that is needed to be revised.

Empirical Random Effect Model

$$Y_{it} = \beta x_{it} + (\alpha_i + \varepsilon_{it}) \quad \text{for } i=1, 2 \ldots N=38 \text{ and } t=1, 2 \ldots T=8$$

(3-5)

In the above equation, $(\alpha_i)$ is unobserved heterogeneous variables (individual fixed effects), which is uncorrelated with explanatory variables.

$E(X_{it} \varepsilon_{it}) = 0$ for all individuals. (3-6)

According to Woodridge (2002), the individual fixed effects $(\alpha_i)$ become part of the error term, meaning that the error terms are not independent and is not distributed with the mean of zero. Therefore, the following equation is obtained. The individual fixed effects in this study’s model are human rights violations, including different kinds of discrimination. It is evident that
these mentioned individual effects, which vary over countries are not related to corruption, investment and openness.

\[ Y_{it} = \beta x_{it} + (\alpha_i + \epsilon_{it}) \rightarrow Y_{it} = \beta x_{it} + V_{it} \]  
(3-7)”  
(Jeffrey. Woodridge, 2002, p.7)

\[ V_{it} = (\alpha_i + \epsilon_{it}) \]  
(3-8)”

The serial correlations occur in the equation (3-8)”. Since there is a serial between error terms, the GLS (Generalized Least Square) is applied to consider the error structure in the equation (3-8)”.

\[ Y_i = \beta x_i + V_i \]  
(3-9)” for all T time periods

\[ V_{it} = \alpha_i K_T + e_i \]  
(3-10)”

\( K_T \) is the \( T \times 1 \) vector. Variance matrix of \( V_i \) is as follows.

\[ \Theta = E(V_i V_i') \], which is \( T \times T \) matrix.

**Tests to Distinguish the Appropriate Model**

This study has data on multiple countries repeated multiple time periods. However, this description is not satisfactory to determine Panel data or pool data for our data sets. Therefore, some econometrics tests like chow tests, to be explained later, are required. These tests are necessary in order to determine if the model for the data sets is Panel data or pool data.

**Chow (Fixed Effect) Test**

This test is applied to distinguish between pooled versus Panel data. The null hypothesis of this test is constrained by regression model of insignificant Panel data (pooled OLS is appropriate). According to Baltagi (2001), in model, \( Y_{it} = \alpha_i + \beta x_i + \gamma_i + v_i \), the assumption is \( \gamma_i \), which shows that there is no individual fixed effect in the model; as a result, individuals vary over time.

\[ H_0: \; \gamma_1 = \gamma_2 = \gamma_3 = \ldots \ldots \; \gamma_{T-1} = 0 \]
Chow=$\frac{(RRSS - URSS) / (N - 1)}{URSS / (NT - N - K)}$

In the above equation, RRSS is a restricted residuals sum of squares (RRSS), which is URSS (i.e., unrestricted residuals sum of squares, which is fixed). If F is less than computed F, then H0 is rejected; thus, the model is Panel data.

**Hausman Test**

This test is applied to test fixed effect models versus random effect models. The null hypothesis of this test is constrained by regression model of insignificant fixed effects. Therefore, in model: \( Y_{it} = \alpha_i + \beta x_t + \gamma_i + v_t \), the null hypothesis of Hausman test signifies that there is no correlation between \( \gamma_i \) and variables in \( x_{it} \), which is as follows: \( H_0: E (u_{it} / x_{it}) = 0 \). If Chi-Sq. df is less than Chi-Sq Statistic, the null hypothesis (random effect) is rejected. Therefore, the fixed effect model is the choice; otherwise, random effects occur.

**Questions of the Study**

The primary purpose of this study is to investigate the effects of corruption on growth. In order to meet this question for countries under investigation in this study, we need to specify the model considered. In this model, GGDP is Economic Growth, CPI is corruption index, KI is investment share of GDP, and OPEN is openness index.

\[
GGDP_{it} = \beta_0 + \beta_1 CPI_{it} + \beta_2 FDI_{it} + \beta_3 KI_{it} + \beta_4 OPEN_{it} \quad \text{Model (3-1)}
\]

In the above model, \( i \) illustrates the number of countries varying: \( i=1, 2, \ldots, N \); \( t \) illustrates the number of years: \( t=1, 2, \ldots, T \). The estimation of this model is done with three methods, including combined data (pool data), Panel data with fixed effects, and Panel data with random effects.

**Results**

The results appear in the following table 3.
Table 3. The Estimation of Model (3-1) With Three Methods Including Pooled OLS and Fixed and Random Effects Models

Dependent Variable: GGDP

<table>
<thead>
<tr>
<th>Variables</th>
<th>Pooled</th>
<th>Fixed Effects</th>
<th>Random Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>6.75</td>
<td>1.05</td>
<td>2.04</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.657)</td>
<td>(0.007)</td>
</tr>
<tr>
<td>CPI</td>
<td>-1.28</td>
<td>-1.64</td>
<td>-1.694</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.003)</td>
<td>(0.0004)</td>
</tr>
<tr>
<td>FDI</td>
<td>-0.10</td>
<td>-0.1906</td>
<td>-0.145</td>
</tr>
<tr>
<td></td>
<td>(0.059)</td>
<td>(0.0003)</td>
<td>(0.003)</td>
</tr>
<tr>
<td>KI</td>
<td>0.13</td>
<td>0.212</td>
<td>0.176</td>
</tr>
<tr>
<td></td>
<td>(0.022)</td>
<td>(0.0005)</td>
<td>(0.006)</td>
</tr>
<tr>
<td>OPENK</td>
<td>0.021</td>
<td>0.08</td>
<td>0.049</td>
</tr>
<tr>
<td></td>
<td>(0.023)</td>
<td>(0.0007)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>R Square</td>
<td>0.14</td>
<td>0.53</td>
<td>0.132</td>
</tr>
<tr>
<td>R Adjusted Square</td>
<td>0.13</td>
<td>0.46</td>
<td>0.12</td>
</tr>
</tbody>
</table>

Note. The value in parentheses in above table shows the probability. Hence, all coefficients are statistically significant at 5% level.
Distinguishing Between Pooled or Panel

In order to determine whether model (3-1) is pooled data (combined data) or Panel data, the Chow test is used as follows. If \( H_0 \) (the absence of time in-variant heterogeneous variables) is rejected, the model is Panel data.

Table 4. Chow Test for Model (3-1)

<table>
<thead>
<tr>
<th>Effect test</th>
<th>Calculated value</th>
<th>Freedom degree</th>
<th>Error level of test</th>
<th>Judgment about test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross-Section</td>
<td>185.71</td>
<td>(37,262)</td>
<td>0.0001</td>
<td>( H_0 ) is rejected.</td>
</tr>
</tbody>
</table>

According to the results of the Chow test in the above table, it can be observed that null hypothesis is rejected. This is because \( \chi^2 \) (185) is greater than critical value with \((N-1, (N (T-1)-K))\) which is 37. Therefore, \( H_0 \) is rejected and the appropriate model is Panel data.

Distinguishing Between Panel-Fixed or Panel-Random

In order to distinguish between the fixed and random effect model, the Hausman Test is used, which is as follows.

Table 5. Hausman Test for Model (3-1)

<table>
<thead>
<tr>
<th>Dependent Variable: GGDP</th>
<th>Fixed Effect test</th>
<th>Calculated value ( \chi^2 )</th>
<th>Freedom degree</th>
<th>Error level of test</th>
<th>Judgment about test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross-Section random</td>
<td>19.66</td>
<td>4</td>
<td>0.0006</td>
<td>( H_0 ) is rejected</td>
<td></td>
</tr>
</tbody>
</table>
Since p value is less than 0.05, H0 is statistically rejected; consequently, the appropriate model for this study is fixed effects. As a result, the results of the coefficient of the fixed effects in accordance with above table are determined. Therefore, the model (3-1) for the fixed Panel data, which are based on all coefficients of table 3 is as follows:

Model (3-1)

\[
\text{GGDP} = 1.05 - 1.64 \text{ CPI} - 0.1906 \text{ FDI} + 0.212 \text{KI} + 0.08 \text{ OPENK} + \varepsilon \\
T=(0.44) \quad (-2.49) \quad (3.75) \quad (3.56) \quad (6.17) \\
P=(0.65) \quad (0.003) \quad (0.0003) \quad (0.0005) \quad (0.0007)
\]

The value in parentheses above indicates the values of t and the level of significance of coefficients (p value). We found that a one unit increase in the corruption level reduces the growth rate by about 1.64 percentage points.

Discussion of Preliminary Analysis

It can be observed in the above equation that the effect of corruption on economic growth is negative. Therefore, this model (3-1) meets the first question of this study, which is about what the effects of corruption on growth are. The coefficients of the above model are consistently significant and they have expected values, which go along with the mentioned theories of Everhart, Vaquez and Mcnal and Shleifer and Vishny Models, which are described in Chapter 2. In addition, in the above model, R^2, (the explanatory power of model) is 53 percent. This means that 53 percent of variation of economic growth is explained by the model.
Examining the Effects of Corruption on Economic Growth Through Direct and Indirect Effects

The effects of corruption can be both direct and indirect. To be precise, suppose that the outcome equation is:

\[ Y = X(C)\beta + C\gamma + \varepsilon \]

where \( Y \) is the outcome (per capita growth rate), \( X \) is a vector of other controls, and \( C \) is corruption. Since other explanatory variables also depend on \( C \), \( X \) can be written as \( XC \). Thus, let

(1) \[ X(C) = X_0 + C\alpha + \varepsilon \]

where \( \varepsilon \) is the error term (Hongyi Li, Lixin Colin Xu, Heng-fu Zou, 2000). Therefore:

(2) \[ Y = X(C)\beta + C\gamma + \varepsilon \]

By inserting equation (1)' into equation (2)', equation (3)' is obtained.

(3) \[ Y = X_0\beta + C(\alpha\beta + \gamma) + (\beta\varepsilon + \varepsilon) \]

\( \gamma \) = Direct Effect

\( \alpha\beta \) = Indirect Effect

Given that each element is derived from the theoretical literature in economics, as noted above, the signs of the coefficients \( \beta_2, \beta_3 \) and \( \beta_4 \) in equation (3-1) on page 27 are expected to be positive, whereas the sign of \( \beta_1 \) is expected to be negative. The direct effect does not determine the roles of the transmission channels specifically. Thus, the significance of each channel through which corruption affects economic growth is not clearly obtained. In order to determine the impact of each independent variable in the transmission process, the regression through indirect effect is essential. This suggests that the preliminary model (3-1) may be insufficient to capture all the effects of corruption on economic growth.
Transmission Channels

In this section, the role of each channel is estimated individually and then the effect of that channel is analyzed when all variables are in the regression.

\[
(3-1) \quad GGDP = \beta_0 + \beta_1 CPI + \beta_2 FDI + \beta_3 KI + \beta_4 OPEN
\]

\[
(3-2) \quad KI = \alpha_0 + \alpha_1 CPI + \epsilon
\]

\[
(3-3) \quad FDI = \theta_0 + \theta_1 CPI + \epsilon
\]

\[
(3-4) \quad OPENK = \mu_0 + \mu_1 CPI + \epsilon
\]

The equations (3-2), (3-3) and (3-4) are attempting to find the indirect effects of corruption on growth through the channels of investment, foreign direct investment, and openness. In order to find the indirect effect through the channels, we use the chain derivation explained in the following.

\[
(3-5) \quad \frac{d(GDP)}{d(Corrupt)} = \frac{\partial GDP}{\partial Corrupt} + \left( \frac{\partial GDP}{\partial FDI} \frac{\partial FDI}{\partial CPI} \right) + \left( \frac{\partial GDP}{\partial KI} \frac{\partial KI}{\partial CPI} \right) + \left( \frac{\partial GDP}{\partial OPENK} \frac{\partial OPENK}{\partial CPI} \right)
\]

\[
(3-6) \quad \frac{d(GDP)}{d(Corrupt)} = \beta_1 + \beta_2 \theta_1 + \beta_3 \alpha_1 + \beta_4 \mu_1
\]

This equation indicates the direct effect of corruption on economic growth through \(\beta_2, \beta_3,\) and \(\beta_4.\) Therefore, indirect effect of corruption on economic growth through the channel of FDI is \(-\theta_1 \beta_2.\) In addition, the indirect effect of corruption on economic growth through the channel of KI and OPENK are \(\beta_3 \alpha_1\) and \(\beta_4 \mu.\) All the aforementioned models will be estimated by three methods including combined data (pool data), Panel data with fixed effects and Panel data with random effects, which are in following tables. Although there are some omitted variables for
models (3.2), (3.3) and (3.4), the data limitations that I face prevent me to do anything better than univariate regression.

**TABLE 6. The Estimation of Models (3-2), (3-3) and (3-4) With 3 Methods Including Pool, and Panel Data With Fixed Effects and Random Effects**

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>Pooled OLS</th>
<th>Fixed Effects</th>
<th>Random Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>KI</td>
<td>Constant</td>
<td>25.19</td>
<td>18.61</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>CPI</td>
<td></td>
<td>-0.29</td>
<td>0.26</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.58)</td>
<td>(0.67)</td>
</tr>
<tr>
<td>FDI</td>
<td>Constant</td>
<td>2.04</td>
<td>6.27</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.22)</td>
<td>(0.06)</td>
</tr>
<tr>
<td>CPI</td>
<td></td>
<td>0.64</td>
<td>-0.53</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.10)</td>
<td>(0.54)</td>
</tr>
<tr>
<td>OPENK</td>
<td>Constant</td>
<td>-18.06</td>
<td>99.40</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.56)</td>
<td>(0.003)</td>
</tr>
<tr>
<td>CPI</td>
<td></td>
<td>1.16</td>
<td>1.19</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.42)</td>
<td>(0.45)</td>
</tr>
</tbody>
</table>

Note. The value in parentheses in above table shows the probability.

To determine whether the appropriate model for equations (3-2), (3-3) and (3-4) are Pooled OLS or Panel data, the Chow test is used as follows.
TABLE 7. Chow Test for Model (3-2), (3-3) and (3-4)

<table>
<thead>
<tr>
<th>Chow Test</th>
<th>Calculated value $\chi^2$</th>
<th>Freedom Degree</th>
<th>Error Level of Test</th>
<th>Judgment about test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model (3-2)</td>
<td>621</td>
<td>(39,263)</td>
<td>(0.000)</td>
<td>H0 is rejected</td>
</tr>
<tr>
<td>Model (3-3)</td>
<td>224</td>
<td>(39,263)</td>
<td>(0.000)</td>
<td>H0 is rejected</td>
</tr>
<tr>
<td>Model (3-4)</td>
<td>925</td>
<td>(39,263)</td>
<td>(0.000)</td>
<td>H0 is rejected</td>
</tr>
</tbody>
</table>

Since $\chi^2$ is greater than critical value with (N-1, (N (T-1) - K)), the null hypotheses are rejected for all three equations (3-2), (3-3) and (3-4). For this reason, the appropriate model of these three equations is Panel data.

To distinguish between fixed effects and random effects, the Hausman test is used. The results of the Hausman test are in the following table.

Table 8. Hausman Test for Model (3-2), (3-3) and (3-4)

<table>
<thead>
<tr>
<th>Hausman Test</th>
<th>The calculated Value of $\chi^2$</th>
<th>Degree of $\chi^2$</th>
<th>P Values</th>
<th>Judgment for this test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model (3-2)</td>
<td>3.14</td>
<td>1</td>
<td>0.07</td>
<td>H0 is rejected</td>
</tr>
<tr>
<td>Model (3-3)</td>
<td>3.64</td>
<td>1</td>
<td>0.05</td>
<td>H0 is rejected</td>
</tr>
<tr>
<td>Model (3-4)</td>
<td>78.93</td>
<td>1</td>
<td>0.000</td>
<td>H0 is rejected</td>
</tr>
</tbody>
</table>

According to the above tables, the $\chi^2$ value is less than $\chi^2$ statistics for all three models; as a result, the null hypothesis is rejected for all models. Therefore, the appropriate model for all three models is the fixed-effect model.
In addition, the results of the coefficients $\alpha_1$, $\theta_1$, and $\mu_1$ are insignificant as the probabilities are 0.67, 0.54 and 0.45, respectively. The p values demonstrate that the effects of corruption on explanatory variables, including foreign direct investment, investment share of GDP and openness, are negligible. This mentioned result aligns with the theoretical principles in chapter 2 presented by Wedman, Campos, Wei, and Gatti. In Chapter 2, I note that Wedman (1997) and Campos (2000) present that there is no evidence that corruption diminishes investment. They conclude the effect of corruption on investment depends on the kinds of corruption (good and bad), which are applied in different countries. It also depends on the predictability of corruption, which has a different level of three groups of countries, including advanced economies, less advanced economies, and East Asian countries. In some countries, corruption might increase investment, undermine investment, or have no effect on investment. In countries under the investigation in this study, corruption has no effect on investment, which is in line with the theories of Wedman and Campos.

Similarly, corruption has no effect on openness in countries under investigation in this study, which supports the theory of Wei and Gatti (2000). In chapter 2, it was explained that Wei concluded that the impact of corruption on open trade (openness) depends on the good and bad governance across countries. Gatti (2000) also examined the role of trade tariffs, bribery, and interaction between custom officials and importers on the process of effects of corruption on trade (openness) across countries. Thus, they concluded that open trade is influenced by corruption positively, adversely or naturally due to the good and bad governance, trade tariffs, and bribery, which play different role across countries. Therefore, since in this study openness is not affected by corruption, it is consistent with the result of investigations, done by Wei and Gatti (2000).
Potential Endogeneity Issue

The above mentioned results are consistent with corruption, causing low growth via direct effects. However, there is an alternative explanation for these results that goes in a reverse way, i.e., high growth causes low corruption. The following reasons address different ways that cause the reverse causality could occur. Firstly, those countries that grow quickly may be rich enough to provide opportunities to their people, allowing them to avoid corruption. Additionally, these developed countries may afford a professional that forces corruption to have a lower level. If there is the case of reverse causality, then there would be the possible endogeneity problem. Furthermore, in terms of econometrics consideration, the omitted variables on the right side of our models (3-1), (3-2), (3-3), and (3-4) may cause endogeneity issue.

There are some techniques, such as instrument variables and two stages least squares that are used to cope with the possible endogeneity problem. The good instrument variables should be correlated with corruption and not have any direct effect on dependent variable (economic growth) to fix the endogeneity problem. The time-invariant instrument variables often used for growth cross-sectional studies are regional, colony and Ethnic Linguistic Fractionalization (ELF) dummy variables.

Since the Panel data fixed effect is obtained by Hausman test in this study, the mentioned time-invariant dummy variables are not applied in our model. The reason is that these above mentioned dummy variables are eliminated by the cross-section fixed effects model to avoid biased and inconsistent results. For that reason, the time-invariant instrument variables are not possible to run in this study. Moreover, the time variant instrument variables were also not able to be applied due to the paucity of data sets for 38 countries. In the future, I hope to incorporate
more data sets and countries to address the shortcomings of this study regarding the endogeneity issue.

**Conclusion**

The findings obtained from the above models indicate that in countries under investigation in this study, economic growth is adversely and directly influenced by corruption. This satisfies the first question of this study: namely, the effects of corruption on growth. However, the indirect effects of corruption on economic growth through channels of investment (FDI and KI) and openness (OPENK) in the sample under study are negligible. As a result, their role in affecting growth is trivial. This answers the second question of the role of transmission channels in indirectly influencing corruption’s effect on growth. Overall, corruption affects growth directly and the channels in this study play no role.

In addition, the results indicate that the appropriate model for both direct and indirect effects of corruption on growth is a fixed-effect model. These models have very informative results: corruption has a strong direct negative effect on growth, but does not appear to have any indirect effect on growth via openness, FDI, and KI.
CHAPTER IV. SUMMARY AND RECOMMENDATIONS

Summary

In Chapter 1, the purpose of this paper was explained as follows: 1) what are the effects of corruption on growth? 2) What are the effects of other explanatory variables (control variables), including openness and the rate of investment and FDI on the effects of corruption on economic growth?

Chapter 2, explored the previous studies. That chapter demonstrated that most economists assert that corruption can lead to either an increase or a decrease of economic growth. For example, Mo (2001) and Mauro (1995) emphasized a negative role on investment from corruption. However, Wedman (1997) and Campos (2000) noted the positive, negative or neutral role of investment due to the different types and the predictability of corruption. In addition, some economists like Ades and Di Tella (1999), Treisman (1998), and Paldam (1999) highlighted the negative role of corruption on an open trade economy (openness), which then negatively influences growth. However, Wei and Gatti (2000) pointed out that openness might play positively, negatively or neutrally on the correlation between corruption and growth. They emphasized that good and bad governance, the level of trade tariffs and bribery are significant factors that contribute to these three different reactions (positive, negative or neutral).

In Chapter 3, the effect of corruption on growth was analyzed through both direct and indirect approaches to answer the questions of this study. The direct method indicated that corruption has an adverse effect on growth. In this study, one unit increase of corruption led to a 1.64% decrease of growth in countries under investigation. The answer to the first question of this study is consistent with theoretical models of Everhart, Martinez-Vazquez, and M. McNab, (2005) and Shleifer and Vishny (1993): economic growth is adversely influenced by corruption.
The chapter continued to answer the second question of this study, which was initiated in the works of Wedman (1997), Campos (2000), and Gatti and Wei (2000). My research demonstrated that these explanatory variables play no role because they are almost zero and statistically insignificant.

The initial research which makes this study distinct from other studies is that its main points are direct and indirect effects, shown through explanatory variables like investment, openness, and foreign direct investment. In addition, this is a cross sectional study, done by econometrics fixed effect Panel data models. These models have some remarkable results, which can be beneficial to present better policy recommendations. However, the results of the fixed effect in this study show that economic behavior of this selected sample cannot be generalized to all developing countries.

**Recommendations**

*Policy Recommendations*

It is shown that growth is negatively influenced by corruption directly and adversely for those countries considered in this study. Reformers should expect the benefits that are limited to this direct effect. However, indirect effects of corruption reduction via investment spending and open trade are not expected to help because these transmission channels are shown to play no role. Thus, reformers should reduce corruption through some other explanatory variables, which are human capital investment, competition, property rights, and political stability. These variables have a high correlation with corruption, FDI, KI, and openness, which is another main characteristic of Panel data.

Moreover, governmental systems can reduce corruption by giving incentives for positive points like morality instead of only paying attention to reducing negative points like immorality.
When virtuous behaviors are rewarded, this can help to encourage people to be more honest. To increase the individuals’ incentives to be more moral, it is better to emphasize motivating factors and control some disincentive factors, which cause the opportunity for corruption. The motivating factors are as follows: human capital channels like education, the level of public trust, and support for disclosure violations, have a high relationship with corruption. For instance, education leads the public to demand more transparent and explicit information about the procedure and purpose of governmental organizations, which leads to lower motivations for corruption. Privatization and trade competition are other motivating factors. Ades and Di Tella (1995) suggest increased competition is beneficial in hampering corruption in terms of bribery. They emphasized that less competition causes firms to have a monopoly, which enables them to gain more profits through bribery. For instance, oil resources in Nigeria have lead to an increase of bribery.

On the other hand, the demotivating factors, according to the World Bank (2012), are classified as follows: low salaries of civil servants, dysfunctional budget of government, delay in payment of employees, a closed governmental system, and the lack of transparency in rules and procedures of organizations. For instance, Rijckegehm and Weder (1997) found that low salary of civil servants provided the appropriate grounds for corruption. That is because the low wages of civil employees increased their motivations to accept bribes. However, sometimes the civil employees even with fair wages might be tempted by bribery. Therefore, Rijckegehm and Weder emphasized the detection and punishment associated with high levels of corruption by supervision systems and institutions that control their performance. Therefore, it is recommended to establish dependable institutions to provide some trustworthy information, resulting in economic reforms in society. These institutions can also establish competent and accountable
manager positions within organizational systems (i.e. firms) to reveal any improper and unauthorized behavior of incompetent employees; therefore, help the competent civil society to perform more effectively.

**Future Study**

Although the lack of data sets for human capital, property rights, and competition measurement are the major problems, I suggest that these policies are taken into account for future studies. Accordingly, this would help determine which policy has a more important role in monitoring corruption in these countries under investigation in this study.
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### APPENDIX A. TABLES FOR VARIABLES USED IN THIS STUDY

Mean Value of 38 countries from 2000-2007

<table>
<thead>
<tr>
<th>Country</th>
<th>CPI</th>
<th>GGDP</th>
<th>FDI</th>
<th>K1</th>
<th>OPENK</th>
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