Effects of Wages of Government Officials on Corruption in Developing Countries

Vansh Muttreja

Professor Kent P. Kimbrough, Thesis Advisor

Professor Ed Tower, Faculty Advisor

Honors Thesis submitted in partial fulfillment of the requirements for Graduation with Distinction in Economics in Trinity College of Duke University.
Duke University Durham, North Carolina 2012

Acknowledgements

I would like to sincerely thank Professor Kent P. Kimbrough for constantly guiding me through every step of writing an effective honors thesis. I would also like to thank Professor Ed Tower and Professor Joseph Connors for providing me valuable suggestions and guidance on the thesis.

Abstract

In a world where a majority of countries are suffering from corruption, it is important to study the causes of corruption and how it can be removed. There are many factors that affect corruption, and the one that this thesis focuses on is wages. The goal of this thesis is to understand the effects of wages of government officials on corruption levels in developing countries over time. The reason for looking particularly at developing countries is that corruption is higher and a bigger concern in such countries. The results of the analysis show that in order for developing countries to decrease corruption levels to those of the least 50 corrupt nations, there needs to be an increase of 422.51% in their government wages. The results are not suggestive for all developing countries because only a limited amount of developing countries were analyzed in this thesis. However, they do give us a glimpse into the negative relationship between corruption and wages.

I. Introduction

According to Transparency International, 80% of humans live under corrupt government conditions. It is noteworthy that corruption is not a new phenomenon, and has been plaguing many developed and developing societies for a long time. Corruption hampers economic growth and development in a country through unfair allocation of resources, as observed in Meon and Sekkot (2005). Mauro (2002) and Rose-Ackerman (2004) show that corruption is especially prevalent in countries that have a large public sector and poorer governance systems, both of which are characteristics of developing countries. Corruption acts as a major growth inhibitor in developing economies, and in some cases, accounts for up to 16% of the country's total GDP, as is the case in Albania, calculated by Gokcekus and Muedin (2008). It is interesting to note that some of the fastest growing economies of the world, such as Indonesia, India, Brazil and China, are also the most corrupt in the world (Transparency International Corruption Index Rankings 2009). The incremental growth potential of these already fast developing economies could probably be huge if corruption is suppressed. Myint (2000) states that there are many potential causes of corruption, including rent-seeking, cultural perceptions, low standards of living and higher expectations in terms of quality of life.

One question that policy makers in such countries are asking is not whether corruption exists or not, but the extent and the causes of corruption. According to Lambsdorff (2003), administrative corruption (also referred to as public sector corruption) is a major contributor of the total corruption in developing countries. Abed and Gupta (2002) and N'Zue and N'Guessan (2006) say that a big reason that low literacy levels, high poverty and sub-optimal infrastructure in these

countries still exists is public sector corruption at every level of the implementation and operation process. It is thus extremely relevant to understand the reasons for the existence of such kind of corruption. This thesis specifically aims to concentrate on one important factor – the corruption-wages link in the administrative sector. The goal is to understand the effects of wages of public officials on the corruption levels in various developing countries over time. The hypothesis is that corruption and wages are inversely related. The results of this study can be significant for anti-corruption policy makers since it can highlight how important of a role does government wages play in changing corruption levels in the country.

II. Literature Review

There has been some work done on identifying the importance of the corruption-wages link in different countries. However, most of the work is either outdated or requires inclusion of more variables like standard of living, human development, education etc. I would like to discuss the work of Gorodnichenko and Peter (2006) and Gokcekus and Muedin (2008), who have shown that it is possible to quantify administrative corruption in a country based on the residual wage differentials and labor market equilibrium. Their approach and methodology is particularly useful for me in establishing my own model and custom datasets.

Gorodnichenko and Sabirianova (2007) estimate the size of public sector corruption in Albania using actual data on income and assets, as well as a labor market equilibrium model. Gokcekus and Muedin (2008) calculate administrative corruption in Albania using relative wage differentials between public and private sector, derived from survey data. Both these papers are

important for the formulation of this thesis because they create models to perform the relevant regressions on income variables related to corruption, and also provide a mechanism to measure the amount of money obtained from corrupt practices in those particular countries.

Gorodnichenko and Sabirianova (2007) aim to estimate the size of public sector corruption in Ukraine. The authors develop a framework that can estimate corruption using micro-level data on labor market outcomes, household spending and asset spending. The motivation for this paper was to understand why public sector employees continue working in their field, despite their lower rates of official salary as compared to the private sector. In some cases, the wage gap between public and private sector officials ranges from 24-32%. The paper begins with the assumption that the most probable reason for these observed wage differences is bribery.

The authors looked at this wage gap and account for various factors such as differences in hours of work, union participation, job satisfaction and secondary employment. They found out that despite taking all these factors into account, the wage gap remained large. An unexpected finding was that the consumer expenditure levels and asset holdings were almost identical for the public and the private sector. This was an important finding because this showed the presence of additional non-reported monetary compensation that enabled the public sector employees to have similar levels of consumption as those in the private sector. They then used the conditions of labor market equilibrium and residual wage differential framework to calculate the aggregate measure of bribery in the public sector in Ukraine. They found that public sector employees in Ukraine receive 24-32% less in monthly wages as compared to their private sector counterparts. They also determined that large sectoral differences in wages did not translate into comparable differences in the level of consumer expenditures and wealth in the public and private sector remain the same. Using their OLS estimates and regression model, they estimated that the extent

of bribery in Ukraine is between 460 mn and 580 mn US dollars, which accounted for 0.9-1.2% of Ukraine's GDP in 2003. The core value of this paper for this thesis is the provision of a model for quantifying corruption. It helps in the better understanding of the different factors that need to be controlled for when looking at wages and consumer expenditure levels. It also provides a systematic measure to estimate the extent of bribery based on micro-data, which would be greatly helpful in the framework that needs to be developed for this thesis. Further, this paper is useful since it identifies the datasets that would be needed, as well as the assumptions that need to be made, in order to run a thorough regression.

Gokcekus and Muedin (2008) rely on a similar approach to quantifying corruption as the previous paper, however use different data sets and regression models. The aim of their paper was also to estimate corruption levels in the public sector, particularly in Albania. The motivation for their paper is that it is hard to quantify corruption because does not only consist of illegal monetary exchanges in the form of bribery, but also in the form of gifts and favors. Thus, they adopted an indirect approach to quantifying corruption. They focus on a survey dataset that gives information about the civil servants' current salary and the salary they are willing to accept to move to a comparable job in the private sector.

The authors utilized key information elements from a survey conducted for public officials in Albania. This information included the civil servants' education, experience, gender, place of work, and current and expected salary information. A human capital earnings model was created based on the human capital theory, which basically states that an employee's earnings depend on productivity, and productivity in turn depends on the employee's skills that are necessary to complete the job requirements. The wage differentials were decomposed into the public and private sector, and the above mentioned factors were included in the regression. The results of

their regression showed that administrative corruption was approximately 257% of the public officials' current salary. Specifically, that means the amount that a public official received via corruption was 257% of his salary. Based on this estimate, the authors showed that corruption in Albania corresponds to around 16.7% of the GDP.

The above paper is important because it provides another perspective on approaching the problem of understanding the relationship between public sector wages and corruption. A strong point made by Gokcekus and Muedin (2008) is that there are many components to corruption, and not just bribery. This was an assumption that was made by Gorodnichenko and Sabirianova (2007). Another significant aspect of Gokcekus and Muedin (2008) is that it proves that survey data that consists of civil servants' background data as well as their preferential salary expectations can be a valuable dataset for quantifying corruption. Even though the aim of this thesis is to look at the effects of public sector wages on corruption rather than quantifying corruption itself, it is helpful to understand the wage decomposition frameworks and human capital equation models that are used to measure corruption. Further, I believe that the authors take into account some extremely relevant and important additional factors such as education and income, which definitely strengthens their model. I have taken into account these factors in my empirical model, along with some extra variables to test their effect on corruption. A detailed explanation is given in Section IV: Empirical Methodology.

Even though the above mentioned papers provide a stellar model for quantifying administrative corruption in a country; however, they do not discuss the effects of public sector salaries on corruption levels. The contribution of this paper is not to quantify corruption in a country. The value of this thesis is that it uses datasets on wages of public officials and historic corruption levels (perceived) to identify the correlation between the two variables (wages and corruption

levels). The papers discussed use the differences between public and private sector wages, and some supporting assumptions, to provide a measure of corruption. My thesis uses an independent measure of corruption to analyze the effects of the public-manufacturing sector wage differential on corruption in developing countries over time. This is particularly relevant for anti-corruption policy makers, since it could help them determine whether varying wages of government officials would have any effects on the corruption levels in the country. The correlation would not imply causality, however it would provide an idea of the kinds of measures and policies that can be put into place to reduce corruption. For example, a negative relationship between corruption and wages can potentially point to the fact that an increase in government wages can be one of the ways to deal with corruption.

III. Theoretical Discussion

There are two important theories of corruption – the shirking model and the fair-wage hypothesis. The elements of the two theories can be combined to create the empirical model for analyzing the relationship between corruption and wages.

The first important theoretical model of corruption is the shirking model, which is a variant of the model presented by Becker and Stigler (1974). According to this model, government employees are assumed to maximize present discounted value of expected income. In this maximization scheme, they try to balance the total benefits from corrupt behavior with the total amount of perceived or actual penalties. The shirking hypothesis predicts that government wage policy does have an effect on corruption. If the total benefits from corrupt behavior exceed the

total amount of perceived or actual penalties, then the government employees engage in corrupt behavior. The model implies that an increase in penalties or wages can decrease corruption levels.

The second model that looks closely into the effects of wages on corruption is known as the fair-wage hypothesis. The idea for this hypothesis was given by Akerlof and Yellen (1990) who claimed that if a worker does not receive a fair wage, it changes the actual effort put into the work. Fair wage implies the worker's wage that is related to factors such as wages of peers within or without the place of work, societal expectations for the worker, status etc. According to this hypothesis, the worker tries to maximize his benefits from corruption such that his expected income is equal to the fair wage.

The two theoretical models mentioned in this section are helpful in establishing the empirical methodology for the evaluation of the corruption-wages link. The shirking hypothesis helps us understand that it is possible to have a condition in which we can reduce corruption to zero levels by changing government wages. The fair wage hypothesis prompts us to think about other factors like education, societal expectations etc. apart from just wages when trying to understand the corruption-wages link.

IV. Empirical Methodology

The two theories just discussed suggest the following regression model for corruption:

$$CORRUPTION_{i,t} =$$

$$\alpha_0 + \alpha_1 RELATIVEWAGES_{i,t} + \alpha_2 HDI_{i,t} +$$

$$\alpha_3 POPULATION_{i,t} + \alpha_4 PERCENTAGEWORKINGPOPULATION_{i,t} + \alpha_5 COSTSTART_{i,t} +$$

$$\alpha_6 SPANISH_i + \alpha_7 RUSSIAN_i + \varepsilon_{i,t}$$

where CORRUPTION is a measure of corruption for a particular country (More information in the Data section V), RELATIVEWAGES is the government wage relative to the manufacturing sector, HDI is the Human Development Index that measures total human development for a particular country, POPULATION is the total absolute population in the country, PERCENTAGEWORKINGPOPULATION is the percentage of active population in a country, and COSTSTART is cost of starting a business in a particular country which is used as a proxy for government bureaucracy, SPANISH is a dummy variable that captures whether the country has been ever been part of the Spanish Empire, and RUSSIAN is a dummy variable that captures whether the country has ever been part of the Russian or the Soviet Empire.

Now, that the model has been established, it is required to understand how the variables are calculated and what they mean. CORRUPTION is a value of corruption in the country based on perceived indices. The source being used for this paper is Corruption Perception Index released by Transparency International. This is the most popular and extensive database on corruption in different countries. Corruption Perception Index is an index between 0 and 10, where a nation with an index of 0 is most corrupt, and a nation with an index of 10 is least corrupt. According to Transparency International, "The Corruption Perceptions Index (CPI) 2010 is an aggregate indicator that brings together data from sources that cover the past two years… The CPI 2010 is calculated using data from 13 sources by 10 independent institutions. All sources measure the overall extent of corruption (frequency and/or size of bribes) in the public and political sectors,

and all sources provide a ranking of countries, i.e. include an assessment of multiple countries." The CPI focuses on corruption in the public sector, or corruption which involves public officials, civil servants or politicians. The data sources used to compile the index include questions relating to the abuse of public power and focus on: bribery of public officials, kickbacks in public procurement, embezzlement of public funds, and on questions that probe the strength and effectiveness of anti-corruption efforts in the public sector. As such, it covers both the administrative and political aspects of corruption. In producing the index, the scores of countries/territories for the specific corruption-related questions in the data sources are combined to calculate a single score for each country. The weakness of this index is that it is based on perceptions rather than quantifiable corruption data. The reason for creating this index based on perceptions is that it is difficult to find hard empirical data for corruption. There is possible data for reported bribery, money that was seized from the guilty etc. However, these are not definitive measures of corruption since they merely represent the cases that have been solved or have been brought to people's attention by the media.

Data from this index is available for several countries from 1995-2011. It is generally a comprehensive measure of perceived corruption, and relies on survey questions conducted by various organizations and institutions around the world. The sources are meant to cover relevant topics such as transparency, accountability, government's capacity to punish and contain corruption in the country, misuse of public office for private gain, extent of perceived corruption etc.

RELATIVEWAGES is a relative measure of wages of civil servants compared to the manufacturing wages in the country. The data on public sector wages and manufacturing wages are obtained from the ILO databases on country wages. These sources give an indication of

monthly wages in the manufacturing sector as well as the public sector in different countries. Public sector wages, in this case, are listed within the category of Public Administration and Defence; Compulsory Social Security in the ILO databases. The people considered are standard employees in these offices, which are defined by ILO establishment surveys as "apprentices, trainees, workers on probation, commission agents, home workers, casual, seasonal and temporary workers, and persons temporarily absent from work because of paid or unpaid vacation or holiday, temporary lay off, sickness of accident, etc. Full- and part-time workers are [also] included." Data on wages is collected by using the basic rates of pay for hours worked, and computing a monthly earning value from that rate.

A ratio of public sector wages to manufacturing wages in each country will be used to maintain consistencies across different countries. It is required to obtain a reliable comparator for civil servants' wages, since they vary from country to country. Thus, we cannot simply use absolute values of wages and adjust for inflation and PPP. The reason for using manufacturing wages as comparators is that they have the advantage of being relative comparable across countries in terms of skill content. These variables provide a consistent benchmark for wages in the public sector in different countries. It is possible to use GDP per capita too, however it is only a reliable measure in developed economies. This paper is concentrating on developing economies, and in such economies, agriculture plays a huge role in influencing in the GDP per capita. Thus, it would be very normal and natural to have a high government wage relative to GDP per capita. Therefore, comparators of private sector wages and manufacturing wages are better for empirical estimation in this paper. The data on private sector wages are a little harder to find. A bigger problem seems to be the definition of private sector wages. There are questions like "What classifies the private sector?", "Are all private sector industries in one country actually privately

owned in another country too?", and "Which industry needs to be chosen for the analysis?" which are reasonably difficult to answer. If manufacturing wages are used, then we can use the RELATIVEWAGES variable as a ratio of wages of civil servants in the country compared to manufacturing wages. According to the shirking model and the fair wage hypothesis, we expect that RELATIVEWAGES should have a positive sign, which means that as wages increase, the country's CPI Index increases (corruption decreases).

HDI is a cumulative measure of the human development and standard of living in a country. It is an index published by UNDP that evaluates countries based on education, health and living standards. HDI is an index between 0 and 1, where 1 is the highest level of human development and 0 is the lowest level of human development. This is a good measure since it evaluates a country on education, health and living standards. Some of the factors it looks at are life expectancy at birth, mean years of schooling, expected years of schooling and gross national income per capita. Thus, using this index eliminates the need to include health and education as separate variables. Also, literacy rates from the United Nations and are other similar respected sources are only available every 5 years, and given the fact that the time period for my analysis is 10 years, I would have 2 or 3 data points, which is not satisfactory. HDI encapsulates literacy, standard of living and health, and is mostly available yearly. Thus, I claim that HDI is a good overall measure of human development for the empirical analysis conducted in this paper.

We expect that HDI should have a positive sign, which means that as HDI increases, the country's CPI Index increases (corruption decreases). This is because we expect that as a country develops more and achieves a higher standard of living, higher literacy rates and better health, the incentives to take corruption are going to be lower. If a majority of people are educated and healthy, and have a reasonable quality of life, as is the case with developed countries, the levels

of corruption should drop. It has been observed that corruption is higher in poorer countries, and thus as these countries become richer and more developed, there should be a decrease in corruption.

POPULATION is the total absolute population in the country, and is obtained from the World Bank books and ILO. The numbers are reported in absolute terms. Population is an interesting factor to test for its effect on corruption. We observe that the developing countries with a higher population also seem to have a lower CPI, and thus higher corruption, for example, China, India, Brazil, Indonesia, Argentina etc. This observation prompted the inclusion of population in this empirical model. We expect the sign of this variable to be negative, which means that as population in the country increases, corruption increases. The reason for that is that as population increases, more and more people contend for a similar chunk of resources (assuming there has not been a proportional rise in total resources). For example, assume that there is a family of four people, with one earning member. As the family increases and there are more people who join the family, the earning member has to support all of them. It is then that he is incentivized to accept bribes in order to improve the monetary status of the family, and even give bribes in order to get major bureaucratic work such as house registration, community maintenance etc. done as quickly as possible. Thus we expect a negative correlation between Population and CPI.

PERCENTAGEWORKINGPOPULATION is the percentage of active population in the country, and is obtained from the World Bank books and ILO country reports. Active population is defined as the population aged between 15-74 years, who are mostly “all persons of either sex who furnish the supply of labour for the production of goods and services during a specified time-reference period” (ILO). In my analysis, I use PERCENTAGEWORKINGPOPULATION in addition to the absolute population in the country. This is because the absolute population may

simply be indicating that countries with larger population have higher corruption. In order to capture the true effect of population so that the smaller countries are not excluded, we use the percentage of working population. Since we are dealing with public sector corruption and public sector wages, it is rational to assume that the people involved in giving or taking bribes are primarily the active population, rather than kids or the elderly. We expect the sign of PERCENTAGEWORKINGPOPULATION to be negative for the same reasons as that of POPULATION.

COSTSTART is the cost of starting a business in terms of percentage of income per capita, and is used as a proxy for bureaucracy in the country. This is extracted from Doing Business Reports published by the World Bank. According to *Doing Business*, "*Doing Business* records all procedures that are officially required for an entrepreneur to start up and formally operate an industrial or commercial business. These include obtaining all necessary licenses and permits and completing any required notifications, verifications or inscriptions for the company and employees with relevant authorities." The analysis needed a proxy that could take into account the difficulty and cost of getting motions passed through the bureaucratic channels of the country. The cost of starting a business fits in well with these needs. Also, the key is that the cost of starting a business data obtained from these reports excludes all bribes, and hence we do not have to worry about biasing issues. We expect that COSTSTART has a negative sign, which means that as the cost of starting a business increases, the country's CPI index decreases (corruption increases). Since cost of starting a business is a proxy for the bureaucracy in the country, we expect that as the bureaucracy in a country increases, there will be an increase in corruption. If the bureaucratic channels are such that it is hard and expensive to start a business, there is a high chance that it is due to corruption in the government process.

SPANISH is a dummy variable that is 1 if the country has ever been part of the Spanish Empire, and 0 otherwise.

RUSSIAN is a dummy variable that is 1 if the country has ever been part of the Russian or the Soviet Empire, and 0 otherwise.

These dummy variables have been included to see if there are differences in corruption levels between certain colonies. According to Treisman (2000), colonies of different nations have varied levels of corruption. For example, British colonies have been reported to be less corrupt. We cannot expect what the signs of SPANISH and RUSSIAN are going to be, since there is no theory that strongly commits to a positive or negative relationship between being a colony of these countries to corruption in that country. In our model, the dummy variable SPANISH is 1 for Phillipines, and the dummy variable RUSSIAN is 1 for Latvia, Moldova, Armenia, Azerbaijan, Georgia and Kazakhstan.

V. Data

This section will help us further understand the data that I use for the empirical analysis.
The availability of data for developing countries for any economic, social or cultural indicators is generally a bottleneck. There is no consolidated source of data that provides a clear set of points for different indicators over a period of time. Thus, the approach I adopted was to construct my own custom database by getting relevant information from various data sources. An assumption made is that the data sources are reliable and remain relatively consistent across different

measuring organizations. For example, I assume that the World Bank Total Population data and ILO Total Active Population data are consistent and can be simultaneously used for calculations such as percentage of working population etc.

A major challenge in constructing this custom database was to identify which countries to look at. I looked at reports from Transparency International, World Bank, IMF, ILO and *Freedom in the World* for 34 developing countries, and narrowed down to 10 countries. These countries are Bulgaria, China, Philippines, Moldova, Latvia, Armenia, Azerbaijan, Georgia, Kazakhstan, Czech Republic.

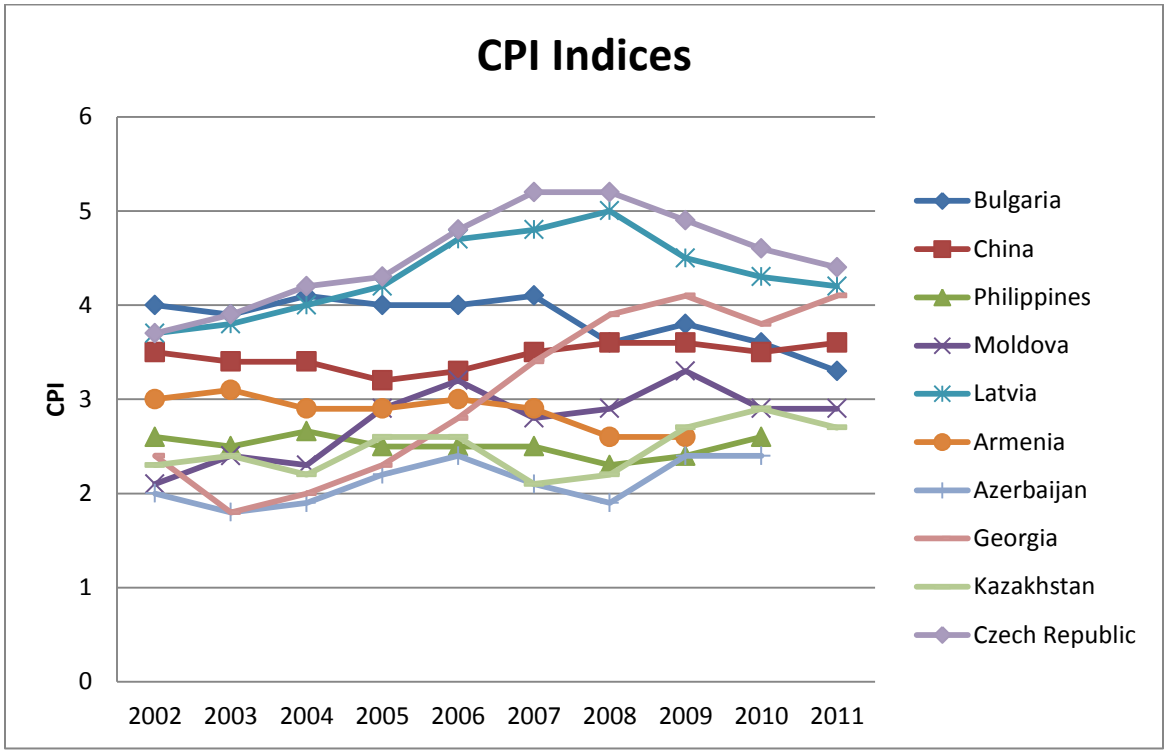
An important point to note is that these 10 countries were chosen simply because they have reliable, consistent and detailed datasets over a time period of 10 years starting from 1998. A close look was taken at the various datasets available for all the 34 countries, and only these 10 countries met the criteria for containing datasets for at least a time period of 10 years.

Another important point to note is that the analysis is performed on a limited dataset. This drawback is due to the fact that there are sparse and scattered data sets, and thus it is difficult to conduct a complete analysis on a reasonable time period. I would have had more data points if I would have reduced the time period to 5 years, and even more if I would have reduced the time period further. However, that would deviate from the main purpose of this study, which is to study the effects of wages of public officials on corruption levels in developing countries over time. There are data sets compiled by private companies that could have a better and broader coverage of data, however those are proprietary and cost up to $4000. Therefore, the results presented throughout this paper might not be descriptive or hold true for all developing countries in the world. That being said, the results obtained are not irrelevant either, because even though there is a limited data set, the results are strong and agree with the literature. Further, topics in

development economics generally have to deal with the issue of limited data availability. If there was more data available, the results would have definitely been enhanced.

I compiled a list of these indices for the 10 countries over a period of 10 years, starting from 2002-2011. The following chart shows the comparison between CPI Indices of the 10 countries, with 0 being highly corrupt and 10 being very clean (on a scale of 0-10).

Figure 1. CPI Indices for the countries in the dataset.



Some descriptive statistics for the CPI indices of 10 countries are shown in the following table.

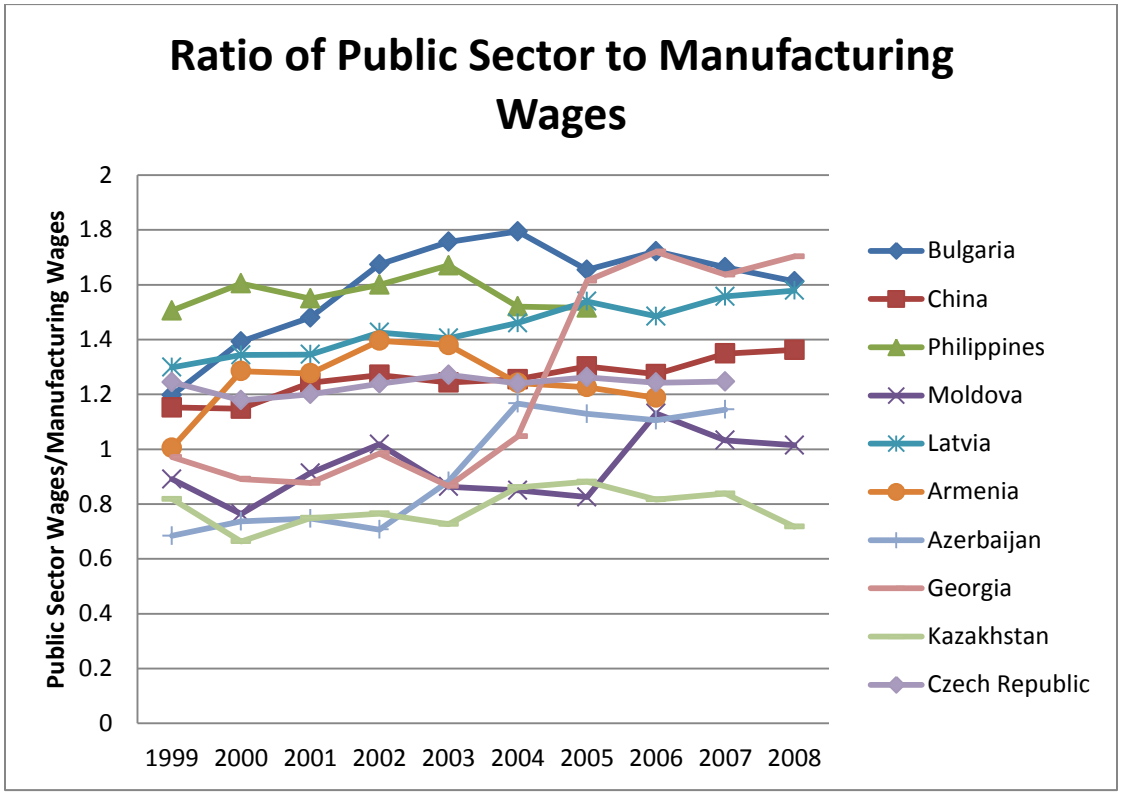
Table 1. Descriptive Statistics for CPI Indices of developing countries.

Country	Mean	Standard Deviation
All	3.2	0.235
Bulgaria	3.84	0.263
China	3.46	0.135
Philippines	2.51	0.109
Moldova	2.77	0.386
Latvia	4.32	0.43
Armenia	2.875	0.183
Azerbaijan	2.12	0.238
Georgia	3.06	0.902
Kazakhstan	2.47	0.26
Czech Republic	4.52	0.514

As can be seen in Figure 1 and Table 1, most developing countries have a low CPI, which means they are more corrupt than other countries. Also, with the exceptions of Georgia and Czech Republic, there does not seem to be a lot of difference in CPI over time. This minimal movement in CPI over time is one of the main reasons why we do not include country fixed effects in the regression analysis. We will discuss this more towards the end of this section.

The following graph shows a comparison of the ratio of government wages to manufacturing wages for different countries over time.

Figure 2. Relative Public Sector Wages for countries in the dataset.



Some descriptive statistics for the ratio of government to manufacturing wages of 10 countries are shown in the following table.

Table 2. Descriptive statistics for Relative Wages in 10 countries.

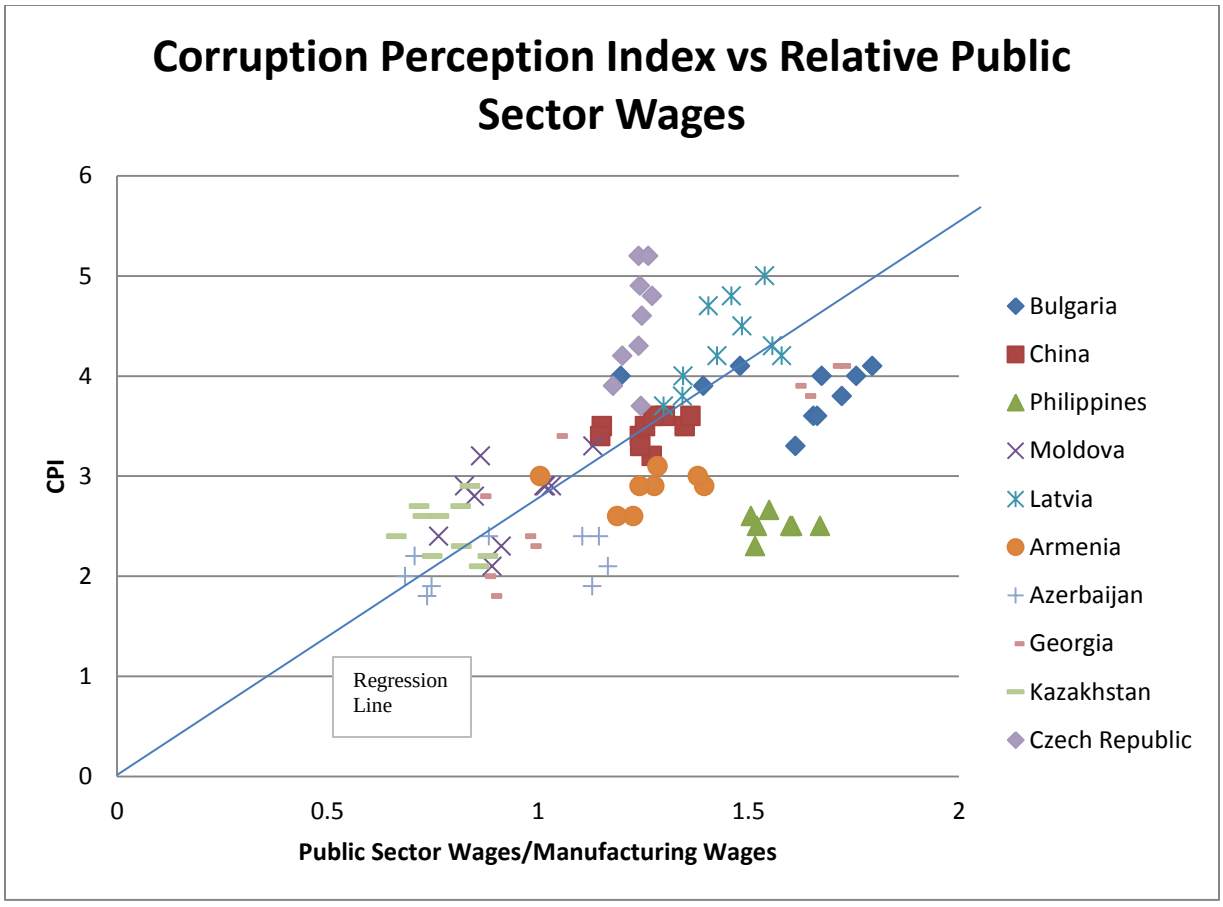
Country	Mean	Standard Deviation	Correlation with CORRUPTION dependent variable
All	1.22	0.134	0.312
Bulgaria	1.59	0.185	-0.137
China	1.26	0.071	0.335
Philippines	1.57	0.060	0.034
Moldova	0.93	0.114	0.488
Latvia	1.44	0.097	0.594
Armenia	1.25	0.122	0.134
Azerbaijan	0.92	0.211	0.402
Georgia	1.23	0.381	0.909
Kazakhstan	0.78	0.07	-0.22
Czech Republic	1.24	0.03	0.577

An interesting observation is that in all countries except Moldova, Azerbaijan and Kazakhstan, public sector salaries are actually more than manufacturing sector salaries. This is a trend that has been observed even in countries that have not been included in this model. Also, there is a slight negative correlation between the Wages dataset and Corruption dataset for Bulgaria and Kazakhstan, which means that as Wages increase, Corruption increases too (since according to the CPI Index, a higher score means less corrupt). This could be simply due to a small dataset,

and the fact that we have not added other variables to this analysis. Again, there is not a lot of difference between relative wages over time.

The following scatter plot between Relative Wages and CPI Indices can help us better understand the natural relationship between the quantities (without any controls).

Figure 3. Plot between Relative Public Sector Wages and Corruption Perception Index.



The plot shown in Figure 3 does in fact indicate a positive relationship between relative public sector wages and CPI. That means as the ratio of public sector wages to manufacturing wages increases, the CPI index increases, showing that corruption decreases. This agrees with the theory as well as the hypothesis of this paper.

The table below illustrates some descriptive statistics performed on HDI Indices for 10 countries, given that the range of HDI scores are from 0-1, with 0 being the lowest development and 1 being the highest development.

Table 3. Descriptive Statistics for HDI for developing countries.

Country	Mean	Standard Deviation
All	0.72	0.02
Bulgaria	0.76	0.018
China	0.65	0.032
Philippines	0.63	0.013
Moldova	0.63	0.02
Latvia	0.79	0.024
Armenia	0.7	0.025
Azerbaijan	0.73	0.001
Georgia	0.72	0.008
Kazakhstan	0.71	0.028
Czech Republic	0.85	0.018

The following tables show some descriptive statistics for total population and percentage of working population in 10 countries over the period 1998-2008.

Table 4. Descriptive Statistics for Population Data of developing countries.

Country	Mean	Standard Deviation
All	143550816	2976412
Bulgaria	7829633	175240.4
China	1297940000	23924651.4
Philippines	80612065	4496705.5
Moldova	3616829	26241.87
Latvia	3896615	174149.6
Armenia	3067015	5866.9
Azerbaijan	8547612	312962.6
Georgia	4382164	39260.2
Kazakhstan	15307024	491722.9
Czech Republic	10309205	117321.4

Table 5. Descriptive Statistics for Percentage of Active Population in developing countries.

Country	Mean	Standard Deviation
All	44.07%	3.71%
Bulgaria	43.3%	1.967%
China	58.8%	0.937%
Philippines	41.7%	0.907%
Moldova	41.7%	3.511%
Latvia	29.1%	1.044%
Armenia	41.4%	3.6%
Azerbaijan	37.3%	18.6%
Georgia	46.2%	1.72%
Kazakhstan	50.7%	4.53%
Czech Republic	50.5%	0.26%

The following table shows some descriptive statistics for the cost of starting a business as a percentage of per capita income in 10 countries in the dataset.

Table 6. Descriptive Statistics for Cost of Starting a Business as a percentage of per capita income in developing countries.

Country	Mean	Standard Deviation
All	9.29%	3.68%
Bulgaria	5.93%	4.1%
China	9.59%	5.14%
Philippines	23.16%	2.58%
Moldova	13.16%	5.49%
Latvia	4.29%	3.17%
Armenia	4.8%	2.01%
Azerbaijan	7.96%	5.49%
Georgia	8.1%	4.35%
Kazakhstan	6.3%	3.71%
Czech Republic	9.6%	0.77%

SPANISH is a dummy variable that is 1 if the country has ever been part of the Spanish Empire, and 0 otherwise.

RUSSIAN is a dummy variable that is 1 if the country has ever been part of the Russian or the Soviet Empire, and 0 otherwise.

SPANISH is 1 for Philippines, and RUSSIAN is 1 for Moldova, Latvia, Armenia, Azerbaijan, Georgia and Kazakhstan.

One control variable that I was planning to add to the model was proxies for probability of detection, such as index for the quality of bureaucracy, and index for the rule of law. This data can be found in ICRG and Freedom House *Freedom of the World.* However, due to proprietary data and exorbitantly expensive data sets, this variable could be not be added to the analysis. One other control group that I was planning to look at was cultural determinants. For including cultural determinants in the model, I planned to use an index of ethnolinguistic fractionalization. This is because Mauro (1995) showed that ethnolinguistic fractionalization has an effect of corruption. This index measures the probability that two randomly selected persons from a specific country actually do not belong to the same ethnolinguistic group. However, due to similar reasons as stated for proxies for probability of detection, this variable could not be added to the analysis.

Another aspect of this model that should be discussed is the reason for not including country-fixed effects. This is because of previous studies argue that the effects between wages and corruption are not found when country-fixed effects are taken into account. This is because (a) the time period of consideration is relatively small (~10 years), and running country fixed effects will make you lose at least one time period and (b) as explained by Van Rijckeghem and Weder (2000) is that this is due to ineffectual wage policies and regulations in the short run in the observed countries. Since certain variables in my estimation such as Corruption Perception Index and Human Development Index do not change a lot over time, it may be a reasonable claim to perform the analysis without country fixed effects. However, I am planning to include country-fixed effects in an additional regression analysis.

VI. Results and Discussion

The aim of this section is to discuss analytical results, their economic significance with regard to the data, and the next steps in the process of arriving at a final result with a certain degree of confidence.

The dataset consists of time-varying and cross-sectional information for developing countries. Thus, I conducted individual country-specific regressions, followed by dynamic time-varying regressions on the balanced panel data. The results so far have been satisfactory, and in line with the hypotheses that an increase in public sector wages leads to a decrease in corruption levels in developing countries.

The following table shows a summary of the main results from the individual country-specific regression analysis, with corresponding p-values given in the parentheses.

Table 7. A Summary of Results from Individual Country Regression Analysis

Country	RELATIVEWAGES	HDI	POPULATION	COSTSTART	PERCENTAGEWORKINGPPOPULATION	R^2
Bulgaria	1.53 (0.232)	-28.81 (0.215)	-2.155e-6 (0.332)	0.023 (0.597)	-0.004 (0.929)	0.919
China	-2.97 (0.61)	-9.82 (0.62)	5.087e-8 (0.496)	0.096 (0.645)	-0.05 (0.916)	0.705
Philippines	-2.15 (0.524)	-5.81 (0.841)	1.403e-8 (0.9)	0.018 (0.789)	0.158 (0.574)	0.327
Moldova	0.99 (0.393)	18.68 (0.267)	4.21e-5 (0.255)	-0.065 (0.223)	-0.15 (0.338)	0.833
Latvia	0.65 (0.851)	6.53 (0.805)	-2.86e-6 (0.415)	-0.075 (0.565)	-0.288 (0.283)	0.852
Armenia	2.03(0.244)	-23.18 (0.15)	-4.1e-5 (0.202)	-0.26 (0.152)	0.06 (0.257)	0.982
Azerbaijan	-0.8 (0.731)	2.95 (0.957)	1.22e-6 (0.654)	-4.23e-5 (0.99)	-0.134 (0.497)	0.936
Georgia	0.61 (0.336)	39.17 (0.561)	1.28e-5 (0.194)	-0.114 (0.202)	0.038 (0.634)	0.99
Kazakhstan	1.34 (0.016)	-3.4 (0.235)	-5.6e-8 (0.182)	-0.09 (0.049)	0.68 (0.451)	0.783
Czech Republic	6.03 (0.136)	46.35 (0.0287)	2.26e-6 (0.306)	0.37 (0.154)	1.37 (0.136)	0.912

Note : The p-values for the variables are in the parentheses.

Table 7 shows the main linear regression results from data from individual countries. I will use a comparator to understand the relative effects of changes in wages to the CPI Indices. The comparator in this case is the total average of CPI indices for the top 50 least corrupt countries, and that is 7.2.

A majority of the countries have the expected positive sign for RELATIVEWAGES, but are not significant. In the case of China, Philippines and Azerbaijan the sign of RELATIVEWAGES is negative, and is not significant. This negative sign, which is opposite of what is expected, could be due to the fact that we have limited data points for each country. An additional explanation for that could be that as public sector wages increase, government officials inherently expect a larger chunk of money coming through corrupt activities. For example, if a government official's salary increased from 10000 to 20000, and if he was previously taking a bribe of 1000, then he may not be content with the same amount of money to maximize his utility function. Thus, he wants more money through corrupt activities to maintain the previous level of utility.

To explain the results, let us take Bulgaria for illustrative purposes. For Bulgaria, RELATIVEWAGES has a positive sign and a value of 1.53, which in economic terms means the average ratio of public sector wages to manufacturing wages needs to increase by 138.11% for Bulgaria to increase its average CPI from 3.84 to that of average CPI of the top 50 least corrupt countries. This number was calculated by dividing the difference between the desired value of CPI, i.e., 7.2, and the average CPI, i.e., 3.84, by the coefficient of RELATIVEWAGES. The percentage was obtained by dividing the result by average relative wages in Bulgaria, i.e., 1.59. The final result is thus that there needs to be an increase in relative wages by 138.11% for Bulgaria to increase its average CPI from 3.84 to that of the average CPI of the top 50 least corrupt countries.

A wide range of values was present when analyzing the changes that need to be made to relative wages in each country to increase their average CPI to that of the top 50 least corrupt countries.

The minimum increase in relative wages needs to be implemented in Czech Republic, with an increase of 35.84% and the maximum increase in relative wages needs to be enforced in Georgia, with an increase of 551.78%. For China, Philippines, and Azerbaijan, there needs to be a decrease of 99.9%, 139% and 690.2% respectively. However, these results seem skewed, and it might be due to the small dataset. The average increase in relative wages is 120.85%.

HDI has both positive and negative signs for the countries, and the results are not significant. If we consider Bulgaria, HDI seems to have a negative sign, which is opposite of what we expected. This could be due to the fact that we have limited data for each country, and the problem seems to be reduced when we look at the balanced panel data regression analysis.

POPULATION has both positive and negative signs for the countries, and the results are not significant. Also, the coefficients are low, mostly in the order of 10^{-5} to 10^{-8}. The low coefficient is as expected because the population needs to change by a significant amount before it can cause changes to major nationally dependent variables like corruption or education. The sign of POPULATION is negative for Bulgaria, which is what we expected. This means that as population increases, CPI decreases, or in other words, corruption increases. In economic terms, the population of Bulgaria needs to decrease by 20% for Bulgaria to increase its average CPI from 3.84 to that of the top 50 least corrupt countries.

COSTSTART has both positive and negative signs too, with results that are mostly not significant. The sign of COSTSTART is negative for Bulgaria, which is what expected. This

means that as the cost of starting a business increases, CPI decreases, or in other words, corruption increases.

PERCENTAGEWORKINGPOPULATION has both positive and negative signs, with results that are mostly not significant. The sign of PERCENTAGEWORKINGPOPULATION is positive for Bulgaria, which is opposite of what we expected. As pointed out for other variables, this could be due to the limited data set for each country.

The R^2 values for most countries, with the exception of Philippines, are high. However, the variables are insignificant at the 5% and 10% significance levels. One explanation for this situation is that we have a very small number of observations for each country, and thus the effect of these variables is not being fully captured. As we will see later, the balanced panel data regression tries to capture the effects of these variables as a whole across the entire dataset.

The R^2 value for Bulgaria is high, and that does give us some confidence about the regression results obtained. However, the p-values for the variables seem to show that the variables are insignificant at the 5% and 10% significance levels.

The CPI variable data does not have much movement over time for a single country. It is relatively constant for each country for a small period of time. This is true for RELATIVEWAGES variable data as well. Thus, a balanced panel data regression needs to be conducted on all 10 countries, to eliminate imprecise estimates of the RELATIVEWAGES coefficient that we get from considering each country individually. Thus, the balanced panel data regression will help us give better and more significant estimates for the key parameter in our model. A balanced time-varying panel data regression was conducted on all 10 countries at once. This was done in a 10 year time period ranging from 2000-2009 (in some cases, the range varied

from 1999-2008 or other similar numbers. However, that is acceptable since the numbers in consideration such as wages and HDI do not change drastically from year to another).

The following table shows the main group regression results on data from all the countries.

Table 8. Regression results on data from all countries.

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-0.601779812	1.430237258	-0.420755	0.6751212	-3.450344	2.246784561
RELATIVEWAGES	0.776025144	0.302672713	2.563909	0.0123238	0.1732	1.378850097
HDI	7.132124285	1.181059292	6.038752	5.318E-08	4.779841	9.484407726
POPULATION	7.37475E-10	1.97549E-10	3.733118	0.0003631	3.44E-10	1.13093E-09
COSTSTART	0.021082112	0.013698227	1.53904	0.127948	-0.0062	0.048364495
PERCENTAGEWORKINGPOPULATION	-0.046182644	0.010587619	-4.361948	4.001E-05	-0.06727	-0.025095574
SPANISH	-1.211952405	0.271088524	-4.470689	2.683E-05	-1.751872	-0.672032817
RUSSIAN	-0.584898903	0.224026281	-2.610849	0.0108759	-1.031086	-0.138711896

Regression Statistics	
Multiple R	0.889515008
R Square	0.79123695
Adjusted R Square	0.772008774
Standard Error	0.42665958

RELATIVEWAGES has a positive sign, which is what we expected. In economic terms, the developing countries need to increase the relative wages by 422.51% to increase their average CPI from 3.2 to that of the top 50 least corrupt countries. This number seems to be higher than the average increase in relative wages of 120.85%. The p-value for RELATIVEWAGES shows that it is significant at 5% and 10% significance levels. Thus, conducting an analysis on all the countries did help in giving us better estimates for RELATIVEWAGES.

The sign of HDI is positive, which is what we expected. In developing countries, as the standard of living, income and literacy increases, its CPI should increase, and thus corruption should decrease. The p-value shows that it is significant at the 5% and the 10% significance level. Thus,

HDI is an important control variable and has a conclusive impact on corruption in developing countries.

The sign of POPULATION is positive, which is the opposite of what we expected. This means that in developing countries, as the population increases, the CPI increases, and thus corruption decreases. This result is opposite of what we expected, however, it has a very low positive coefficient.

To gauge the economic significance of this variable, we will look at the results with and without China. This is because China, with a population of 1.3 billion, is by far the most populated country in the dataset, more than even 400 times than some of the smaller countries in the dataset.

If China is included, then the population in developing countries needs to increase by 3778.8% to increase their average CPI from 3.2 to that of the top 50 least corrupt countries. This result goes against our hypothesis that as population increases, corruption decreases. It could be possible that there are a few countries in the dataset that might be distorting the entire model. China seems to be the obvious country that has a large enough population to cause this kind of a difference. Thus, when China is not included, then the results appear to be more satisfactory. The coefficient of POPULATION is then -2.9e-8.

If China is not included, then the population in developing countries needs to decrease by 902.37% to increase their average CPI from 3.2 to that of the top 50 least corrupt countries.

COSTSTART has a positive sign, which is the opposite of what we expected. This means that as cost of starting a business increases, CPI increases or corruption decreases. However, the result

is not significant at 5% or 10% significance levels. The reason for this could be the limited dataset.

PERCENTAGEWORKINGPOPULATION has a negative sign, which is what we expected. This means that as the percentage of working population increases, CPI decreases or corruption increases. The result is also significant at the 5% and 10% significance levels. This is an important result that shows that an increase in the percentage of working people can actually increase the corruption levels in the country.

SPANISH variable has a negative sign, which means that Spanish colonies might be more corrupt than non-Spanish colonies. Also, this variable is significant at the 5% and 10% significance levels.

RUSSIAN variable has a negative sign, which means that Russian colonies might be more corrupt than non-Russian colonies. Also, this variable is significant at the 5% and 10% significance levels.

VII. Conclusion

Corruption is a global phenomenon that is especially hampering growth in developing countries. There could many social, economic or cultural causes for corruption. The goal of this thesis was to study the relationship between public sector corruption and wages of civil servants in developing countries, and observe these effects over time. The hypotheses, based on theory and literature, was that public sector corruption can be decreased by increasing wages. To test this

hypothesis, an empirical model was constructed with corruption as the dependent variable and relative wages as the independent variable, where relative wages was defined as the ratio of public sector wages and manufacturing wages. Other variables that might affect corruption such as Human Development Index, Population, Percentage of Active Population, Cost of Starting a Business, and whether the country was a Spanish or a Russian colony or not were added to the regression. The hardest part was to find the data for all these variables because there is no consolidated database that has consistent and reliable values for developing countries. Thus, a significant amount of time was spent in creating a database from various sources, and selecting 10 developing countries that had consistent and time-varying data. There were 11 regressions that were performed – one regression on each of the individual countries, and then one cross-sectional and time-varying balanced panel data regression on the whole group. Based on the results of the regressions on individual countries, the range in which the relative wages need to be increased for that particular country to increase its average CPI to that of the top 50 least corrupt countries is 35.84%-551.78%. The cross-sectional and time-varying balanced panel data regression on the whole group was performed to eliminate country fixed effects, and any other biasing effects due to small datasets. The results show that for developing countries to increase their average CPI to that of the top 50 least corrupt countries, they have to increase their relative wages by 422.51%. Even though the results are in no way suggestive of the entire world since I have a limited dataset, they still tell us that there seems to be a relationship between public sector wages and corruption. It is thus possible to strengthen this result with the inclusion of more countries to the dataset. The fact that corruption can be reduced by increasing public sector wages can provide an important and elegant solution to solving this problem. Singapore and Qatar have been successfully able to reduce corruption levels in their country by paying the

public officials wages that are comparable to that in the private sector. I believe that similar approaches, along with a smart implementation scheme, can help mitigate the problem of public sector corruption in developing countries.

References

1. Abed T., George, Gupta, Sanjeev (2002). "Governance, Corruption, and Economic Performance." International Monetary Fund.
2. Akerlof, G.A., Yellen, J. (1990). "The fair wage effort hypothesis and unemployment. Quarterly Journal of Economics." 105(2): 255–283.
3. Becker, G.S., Stigler, G.J. (1974). "Law enforcement, malfeasance, and the compensation of enforcers." Journal of Legal Studies 2: 1–19.

   Economiques Et Sociales.
4. Godet A. and Gokcekus O. (2006). "Group Dynamics of Corruption in Public Organizations." *Journal of Economic Policy Reform*, 9(4): 275-287.
5. Gokcekus O. and Muedin A. (2008) "Quantifying Corruption by a Human Capital Equation." *International Review of Economics*, 55(3): 243-252.
6. Gorodnichenko Y. and Sabirianova P. (2007). "Public sector pay and corruption: measuring bribery from microdata." *Journal of Public Economics*, 91(5–6):963–991
7. Jurges, H. (2005). "The distribution of the German public-private wage gap. " *Labour* 16(2): 347-381.
8. Lambsdorff J (2003a). "How corruption affects productivity." Kyklos, 56(4):457–474.

9. Littvay, Levente (2006). “Corruption and Democratic Performance.” Dissertation, Political Science Department, *University of Nebraska-Lincoln.*

10. Mauro P (2004). “The persistence of corruption and slow economic growth.” International Monetary Fund, Washington, 51(1): 1-18

11. Mauro, P. (1995). “Corruption and growth.” Quarterly Journal of Economics 110(3) : 681–712.

12. N’Zue F., Felix, N’Guessan, J.F. Coffi (2006). “The Causality Between Corruption, Poverty and Growth : A Panel Data Analysis.” Centre Ivoirien De Recherches

13. Rauch, J. E. and Evans, P.B. (2000)."Bureaucratic Structure and Bureaucratic Performance In Less Developed Countries.” *Journal of Public Economics,* 75(1): 49-71.

14. Reinikka, R. and Svensson, J. (2005)."Fighting Corruption to Improve Schooling: Evidence from a Newspaper Campaign in Uganda.” *Journal of the European Economic Association,* 3(2-3): 259-267.

15. Rose-Ackerman S (2004). “The challenge of poor governance and corruption.” Copenhagen Consensus Challenge Paper.

16. Sandholtz, W., and William K. (2000). “Accounting for Corruption: Economic Structure, Democracy, and Trade,” *International Studies Quarterly* 44: 31-50.

17. Van Rijckeghem, C. and Weder, B. (2001). "Bureaucratic Corruption and The Rate of Temptation: Do Wages in the Civil Service Affect Corruption, and by how Much?” *Journal of Development Economics*, 65(2) :307-331.

18. You J, Khagram S (2005). “A comparative study of inequality and corruption.” *American Sociological Review*, 70(1):136–157.

19. Myint, U. (2000). “Corruption: causes, consequences and cures.” *Asia-Pacific Development Journal,* 7: 33–58.

20. La Porta, R., Lopez-de-Silanes, F., Shleifer, A., Vishny, R.W. (1999). “The Quality of Government.” *Journal of Law, Economics, and Organization*, 15(1), 222–279.

21. Treisman, D. (2000). “The causes of corruption: a cross-national study”. *Journal of Public Economics.*