The link between corruption and economic growth: real or illusory causation?

An empirical investigation

Master Thesis: International Economics

Erasmus University Rotterdam

Supervisor: Maarten Bosker

Student: Christiaan Broekman – 320313

E-mail address: cy.broekman@gmail.com

Content

Abstract

The primary aim of this thesis is to shed light on the question of how corruption affects economic growth. Mocan's 2004 paper "What determines corruption" will largely be used and his claims will be questioned. He stated that corruption does not have a direct impact on economic growth. Any appearance to the contrary, he argues, is due to the effect of institutions on both economic growth and corruption. Firstly, I question parts of the methodology used to arrive at these conclusions, particularly the illogical temporal order and questionable instrumental variables. Secondly, I replicate his research as closely as possible, and do not arrive at similar results. Thirdly, I run regressions which I argue to be more suitable for the question at hand, and the results, though mixed, offer some evidence to the contrary view, namely that actual corruption does have a direct negative influence on economic growth, controlling for all stable factors and for perception of corruption.

1. Introduction[1]

One development in economic research since Douglass North has been to take institutions more seriously (North, 1987). Institutions, roughly defined as 'the rules of the game', can exert tremendous influence on people's behaviour and therewith the allocation of scarce resources, and therefore are ignored by economists at their own peril. More recent empirical research has shown the importance of economic institutions in promoting or impeding economic growth (Acemoglu, Johnson, & Robinson, 2001), an importance which takes primacy over other determinants such as trade and geography (Rodrik, Subramanian, & Trebbi, 2004). One instance where weak institutions are manifested is in the ability to control corruption. Corruption can come in many shapes and sizes, and can be described generally as the misuse of public power for private gains (Bardhan, 1997). This can be large-scale appropriation by politicians, small-scale bribe taking by civil servants, or even absenteeism by public teachers. Corruption is to a large degree negatively correlated with economic growth, though there is so far no consensus on how this relationship takes place.

In this thesis, the term corruption will not be used in the all-encompassing form I have described above. Two types of data will be used to measure corruption: the corruption perception index from Transparency International, and results from a survey where people were asked about the experience of corruption. While the former may be based on different forms of corruption, the latter only refers to the payment of bribes. This data is imperfect, but there are reasons to believe

[1] I thank Dr. Maarten Bosker for useful comments on previous versions of this thesis

it is the best we have for the purpose at hand. Other ways of measuring corruption, like measuring the number of prosecuted corruption-related cases, can be noisy measures, and moreover may have a counter effect of showing those countries, where institutions allow corruption to come to light and prosecution to effectively take place, to be more corrupt.

A paper by Mocan (2004) will be largely used throughout this thesis, as his conclusion will be questioned and put to the test. Concluding, I offer a counter-narrative to his claim that corruption does not directly affect economic growth but only appears to do so due to corruption and economic growth both being linked to institutions. Instead, I show that there is some evidence to the contrary. Admittedly, the evidence is not convincing enough to prove the opposite is true, but this is may partly be due to limitations with data consistency and the size of datasets. Finally, I will offer suggestions for future research and more importantly future data collection.

The thesis is structured as follows: Chapter 2 will outline the main literature on this topic and present unanswered or misdirected questions. Chapter 3 will describe the data that is used for this research. Chapter 4 will explain which methods I use to arrive at the conclusions. Chapter 5 presents the empirical results, and finally, chapter 6 presents concluding remarks.

The paper can be understood as a critique of Mocan from two different angles. Firstly, I disagree with the method he uses to arrive at his conclusion. However, I still replicate his method, if only for the reason of establishing whether his data match mine. Section 5.1 should largely be understood as providing this, and gaining initial insights. However, the most force lies behind section 5.2, which I argue is stronger methodologically and its results should be taken more seriously. This takes me to the second way in which this thesis is a critique of Mocan, in that it challenges his conclusion.

2. Literature Review

This chapter will cover the main relevant economic literature on the relation between corruption and economic growth. Section 1 will discuss the different ways corruption has been measured over recent years, showing an emergence of micro-economic techniques. Section 2 will discuss the diverse theories about what causes corruption. This may prove useful to avoid omitting variables and shedding light on the direction of causality between economic growth and corruption. Section 3 will discuss the effects of corruption on economic growth and the proposed channels through

which this happens. Finally, Section 4 will elaborate on potential pitfalls or unanswered questions in previous papers on the subject, in order to show where further work is needed.

Section 2.1: **The many faces of Corruption Measurement**

Corruption is notoriously difficult to measure. This is mostly due to it being a social taboo and the fact that officers engaging in it go through great lengths to hide their practices (Banerjee, Hanna, & Mullainathan, 2012). Several different methods exist for measuring corruption, each with their own merits and limitations. All measures can be roughly categorized as follows: perception-based surveys, experience-based surveys and direct corruption measurement.

One common method, especially in early measurement years, has been to measure the perception of corruption which may be present in a particular country. This is done by asking people from various groups (expats, business-people, citizens) to what degree they perceive a country to be corrupt (Mauro, 1995). These measurements are performed by (among others) Transparency International and the World Bank group. However, there are some doubts regarding the accuracy of this measurement, as perceptions may not be based on facts and may deviate from actual corruption (Olken & Pande, 2011). An alternative, more recent method has been to ask citizens of a particular country not how they perceived corruption, but whether they (or their families) have been asked to pay a bribe in the last 12 months (Mocan, 2004). This has the benefit that it is less reliant on potentially biased perception. However, there is still room for bias as some people may not refer to some type of payment as bribes while others would. Throughout this thesis, I will refer to the former measurement as *perceived corruption*, and the latter as *experienced corruption.* Sometimes I will use the term *actual corruption*. To be clear, with this I mean the corruption that is measured by *experienced corruption*. Mocan (2004) makes a useful distinction between breadth and depth of corruption; breadth being the prominence of bribe-taking, and depth the monetary amount of bribes. The corruption perception index as a measure does not distinguish between the two, because it is purely perception-based. The survey data *(experienced corruption)* measures the breadth of corruption. Finally, recent years have seen an upsurge in more *direct* observations of corruption. One example is Olken's (2005) research on road projects in Indonesia, where he assessed corruption in a road project by evaluating estimated costs of the road, and comparing this to the cost that was written down by civil servants. This method of study is very useful for micro-

analysis, but it is less viable for cross-country studies as it is difficult to have consistent measures across countries.

Perceived and experienced corruption, rather than being two alternative ways of measuring corruption, could simply be measuring different things entirely. This is supported by Treisman (2007), as he mentions that perceived corruption is strongly correlated with several variables (such as economic development, long-established democracies, free press and a high share of women in government), whereas measures of actual corruption experiences barely correlate with any of these once income is controlled for. Mocan (2004) shows that a number of countries have very low levels of corruption, although their perceived corruption seems disproportionately higher than warranted. Mauro (1995) also established that subjective evaluations themselves influence investment decisions, growth, and political behavior of citizens. A change in corruption does not always correspond with a proportional change in the perception of corruption. Moreover, Olken (2006) found that bias in perceptions is correlated with demographic characteristics, which shows limitations of relying on corruption perception for measuring corruption. This is particularly problematic because many perception measures are not based on random samples (Banerjee, Hanna, & Mullainathan, 2012).

In this thesis I would like to research which underlying mechanism can best explain the negative relationship between corruption and economic growth, and for this an international study is more suitable than a national or regional study, in order to avoid finding a context-dependent relationship. At this moment, the only consistent international data available are the perceived and experienced corruption indexes. Both of these will be used, as they can be considered as metrics of different concepts rather than alternative metrics of the same concept. Indeed, this difference will be leveraged in order to attain insights on the channel by which corruption influences economic growth.

Section 2.2: The causes of corruption

In order not to omit important variables and to avoid misunderstanding the relationship between corruption and economic growth, it is useful to determine several established determinants of corruption. Mocan (2004) lays out several of the main determinants of corruption. Firstly he states that the legal system of a country plays a role. Specifically, the British common law developed to be more individual-focused rather than state-focused. This has been shown to be a significant

factor in determining whether there is corruption today. Moreover, Treisman has established that the *culture* of a country has an influence on the degree of corruption in a country. According to him, this is due to the hierarchical nature of religions such as Catholicism, Eastern Orthodoxy and Islam, which make it difficult to challenge authority. This allows for an abuse of power on behalf of public servants (Treisman, 2000). His theory is supported by the evidence. Moreover, countries where the risk of expropriation is lower also have a lower propensity to be asked for a bribe (Mocan, 2004). Lastly, whether the country has a federal system can have an impact on corruption, though it is not clear whether this effect is more likely to be positive or negative. On the one hand it is argued that federal systems are more honest due to competition between jurisdictions (Weingast, 1995) while on the other hand it is argued that there will be less honesty in federal systems because there is less centralization to monitor honesty, and because there is more interaction with public servants at the local level (Tanzi, 1995).

Section 2.3: The channels by which the relationship emerges between corruption and economic growth

A negative correlation between corruption and economic growth has been established on numerous occasions, the most famous paper probably being Paolo Mauro's paper "Corruption and Growth" (Mauro, 1995). There have also been theories about a *positive* relation between corruption and economic growth, mainly because it may "grease the wheels"; i.e. bribe-paying may give entrepreneurs the possibility to set up companies relatively free of burdens (Leff, 1964, Lui, 1985). However, it has been claimed that this hypothesis is based only on anecdotal evidence and is implausible (Aidt, 2009). Moreover the hypothesis has been largely refuted by empirical evidence (Wei, 1999). Therefore, this section will cover only possible explanations for a negative relationship between corruption and economic growth. There are several theories regarding the nature of the relation between corruption and economic growth. These theories need not be mutually exclusive. They can be categorized roughly in the following ways:

Channel 1: High growth causes lower actual corruption

Firstly, the relationship could be that high economic growth causes actual (experienced) corruption to be lower. This relationship is supported by the theory that when firms have the ability to grow large enough, the costs of moving to another country are relatively lower (Bai, Jayachandran, Malesky, & Olken, 2013). Therefore, public officials have an incentive to ask for lower bribes.

Another reason economic growth could influence corruption is due to the resources it renders available to fight corruption. This channel has been explained by Treisman (2000). Under this channel, the relationship between economic growth and perceived corruption established by Mauro would be due to the effect of growth on experienced corruption, and (in turn) the effect of experienced corruption on perceived corruption.

Channel 2: Higher perceived corruption causes lower investment

The uncertainty surrounding countries with high levels of corruption could lead to lower economic growth due to lower levels of investment. While there are theories that corruption is not any more harmful than a similarly sized tax, Wei (2000) suggested that the uncertainty surrounding corruption makes it more costly than an equivalently-sized tax. He looked at FDI and measured uncertainty through perceptions-based metrics. In terms of our previous separation of perception-based corruption and experience-based corruption, this should be primarily influenced by perception. If corruption were to decrease, but the perception of corruption would remain at the same level, I would expect that FDI would not change (if this theory is correct). Malesky and Samphantharak (2008) find an example in Cambodia, where changes in governors in Cambodia are associated with increases in uncertainty about corruption and therewith decreased firm-level investment, even though actual corruption levels decreased.

Channel 3: Higher perceived corruption is associated with weaker rule of law which influences economic growth.

Moreover, a potential avenue by which perceived corruption and economic growth are correlated is that they are both caused by a third variable, namely the strength of institutions. This hypothesis has been extensively argued for by Naci Mocan (2004). He concludes this based on results of his empirical investigations, which show that once the level of institutional quality is controlled for, the extent of experienced corruption does not have a direct impact on perceived corruption. Moreover, when he includes experienced corruption variables and expropriation risk in his regression, no variable is significant, but when he leaves expropriation risk out, experienced corruption variables are significant. He suggests weak institutions cause high corruption (experienced and perceived) and weak institutions impede economic growth, but once the quality of institutions are controlled for, there is no direct impact of experienced corruption on economic growth.

In addition, research by Al-Sadig shows that perceived levels of corruption have an adverse effect on FDI inflows, but after controlling for the quality of institutions these adverse effects disappear, and he concludes that the country's quality of institutions is more important than perceived corruption in encouraging FDI inflows (Al-Sadig, 2009).

Channel 4: Higher experienced corruption leads to inefficiencies and welfare costs

Finally, experienced corruption may also have an effect on firm behaviour by causing a change in the effective marginal tax rate. An example of this is when firms go a long way around to avoid a corrupt port (diversion effect), bribes reduce overall tariff revenue as bribes are paid to officials in order not to pay a tariff (revenue effect) and when re-routing of firms increases congestions and transport costs (congestion effect) (Sequeira & Djankov, 2014). Moreover, there are efficiency effects of corruption through government provision of goods and services. If projects that would be cost-effective do not get initiated due to the additional costs of corruption, then there is an efficiency loss in the economy (Olken & Pande, 2011). This idea is called the price effect and has been researched by Olken. He showed that, in a rice redistribution campaign, the welfare losses due to missing rice outweighed the gains due to redistribution (Olken, 2006). In addition to price effects, other distortions may cause corruption to negatively influence growth. Due to the secretive nature of corruption, officials may not have an accurate idea of the costs of corruption. Moreover, the need to keep corrupt activities from becoming public also creates inefficiencies, as resources are spent towards this (Olken & Pande, 2011). This channel should mostly show itself in empirical investigations through *experienced corruption* data.

Section 2.4: The unanswered or misdirected questions.

Most economists acknowledge the negative correlation of corruption on economic growth, while being aware of shortcomings in measurement. Moreover, the channel question remains unanswered. I propose that the *perceived* and *experienced corruption* variables, rather than being different ways of measuring the same thing, are measuring different things, to wit, the perception of corruption among businessmen (whether justified or not) and the actual extent of bribe-taking present in the country, respectively. This feature can be leveraged in order to shed more light on how corruption is affecting growth; if the effect is better explained by perceived corruption, it is more likely that a decrease in growth is due to a decrease in investment. On the other hand, if

experienced corruption has a more significant effect on growth (rather than perceived corruption), it is more likely that economic growth decreases due to efficiency costs.

A problem in including both variables to the regression is that they are highly correlated; regressing corruption perception index on experienced corruption leads to a correlation which is significant at 5% (Mocan, 2004). More details on this will be given in the methodology section of this thesis.. This problem may be fixed by doing a panel regression. Here, the *change* in perceived and experienced corruption over a period of time will be regressed on a *change* in economic growth. It may be that these are less strongly correlated than levels themselves (Dollar & Kraay, 2003). I propose that researching which variable has a stronger partial effect through this method offers added value to the discussion, as Mocan (2004) has not used this method.

If we go back to the channels outlined, each of them could be supported by a higher correlation for either *perceived* or *experienced corruption* in a regression where both variables are included. Channels 2 and 3 would be supported by a higher effect of *perceived* corruption. If corruption itself has little effect, but perceived corruption does, this suggests that it is not efficiency costs themselves which are causing economic troubles; instead, it is the change in perception. On the other hand, if experienced corruption is higher, this suggests that channel 4 may be the stronger explanation. Alternatively this outcome would also emerge if channel 1 is more suitable, namely that economic growth diminishes actual corruption. To be clear, the point is not to find out which channel explains the relation between corruption and growth, as they are not mutually exclusive; rather it is to find out which channel has a relatively stronger effect.

3. Data

Appropriate data for corruption is notoriously difficult to come by, which makes studying the effects and causes of corruption deeply problematic. In the last years, several new methods of measuring corruption have emerged (Olken & Pande, 2011), but only few have the right data available for cross-country studies.

The most widely-used method until recently was the Corruption Perception Index, by Transparency International (TI). Dr Eigen, Chairman of TI, explained the Corruption Perception Index as follows: “It is an assessment undertaken for us by a specialist economist, Dr Johann Graf Lambsdorff of the University of Göttingen, in which existing polls of international business

interests and financial journalists have been analysed and collated. It is thus a picture of how international business sees the levels of corruption in the 41 countries ranked in the survey." (Transparency International, 1995). More specifically, it is emphasised that it is an attempt to assess the level at which corruption is impacting on commercial life, as perceived by businessmen. In 1995, seven surveys were used for the index, including three from the World Competitive Report from the Institute for Management Development in Lausanne (1992-1994), three from the Political & Economic Risk Consultancy Ltd, Hong Kong (1992-1994) and a 1980 survey from Business International, New York. A clear problem with this measure is that perception can be subject to bias, based on unfounded rumours or false stereotypes.

A potentially more accurate measure of corruption is based on surveys which ask about direct experiences with corruption in the last year. While these have shortcomings of their own, they have the virtue that they are relatively more objective; either people have had to pay a bribe in the last 12 months or not. Data for experienced corruption comes from two sources. The 1995 data is identical to the data Mocan used for his 2004 paper, and was retrieved from his website. The information was obtained from over 90,000 individuals from 49 countries, who answered whether or not they were asked or expected to pay a bribe by any government official. Mocan in turn got his data from the International Crime Victim Survey compiled by the United Nations Inter-regional Crime and Justice Research Institute. However, since data from this source in later years was not available, a similar survey is used for the years 2005, 2011 and 2013 by the Global Corruption Barometer, as part of Transparency International .

It is important to note that throughout this thesis, the perception index has been multiplied by -1. This is to avoid confusion at the apparent opposite directions the two corruption indexes run. Since experienced corruption is measured by establishing the percentage of people who have had to pay a bribe in the last 12 months, the index shows higher corruption for a higher number. The corruption perception index, on the other hand, gives a higher grade to "cleaner" countries, and hence seems to give a lower number to the countries with higher corruption. The adjustment of multiplying by -1 has been made throughout the entire thesis.

Data for Gross Domestic Product has been gathered from the World Bank database for 1995-2015 regressions, but from the World Penn tables for 1975-1995 regressions as GDP of these years was not available on the World Bank database.

4. Methodology

The aim of this thesis is to find out whether it is actual corruption, or merely the perception of corruption which drives variations in economic growth. In order to determine which has the larger partial effect we can regress economic growth on both of these variables. This chapter will cover two sections. In section 4.1 I will present an OLS, regressing economic growth on either one or both of the corruption variables in addition to control variables. In section 4.2 I will present a panel regression in order to control for all unobserved variables which are constant in countries throughout time.

Section 4.1

This regression will be similar to Mocan's (2004), except it will also include new data from more recent years. Firstly, I will replicate Naci Mocan's regressions as closely as possible to see if his data matches with the data I use. Thereafter, I will test his intuitions by running his regressions with up-to-date levels of experienced corruption. One difference is that he runs a 2SLS, using several instrumental variables, including ethnolinguistic fragmentation. Since he does not clearly specify which variables he used to instrument for each specific endogenous variable I am unable to replicate this, and will use an OLS instead. Moreover I do not actually consider the instruments that he does use suitable. For example ethno-linguistic fractionalization can affect economic growth through many channels other than corruption. An appropriate instrumental variable is one which is correlated with the independent variable while being uncorrelated to the error term (Reiss, 2008). Mocan (2004) does also include "average protection from risk of expropriation", but it is not unlikely that there are other unobservable variables related to institutions which are not captured by the protection from expropriation variable.

The following regression will be run:

$$\ln(y_c) = \alpha_0 + \beta_1(X_c) + u_c \qquad (1)$$

where y is average economic growth (over time periods 1975-1995 and 1995-2014), the subscript c represent individual countries, and X_c is a set of independent variables, including experienced corruption in 1995, average protection from expropriation risk and a set of control variables which are assumed to influence economic growth, such as the legal origin, religious determinants and initial GDP.

One part of Mocan's (2004) research is quite peculiar; he claims to be testing for the causal effect of (experienced) corruption on economic growth. However, he regresses average growth in 1975-1995 on 1995 experienced corruption. It seems more straightforward to regress economic growth from time t to t+x on corruption at time t, since this follows a logical temporal order. Hence, I will regress 1995 experienced corruption on 1995-2015 economic growth in addition to the replication of his regression on 1975-1995 growth.

Mocan's (2004) paper does not include a regression where both experienced and perceived corruption are included, one controlling for the other. This is why I will run an additional regression including perceived corruption.

One potential pitfall in doing a partial regression is that experienced and perceived corruption may be highly correlated. As can be seen in Figure 1-2, in both 1995 and 2004 experienced and perceived corruption are significantly correlated. In 1995, the correlation coefficient between the two is .7947, and in 2004 it is .6094. On the other hand, the difference in perceived corruption between 1995 and 2004 is not highly correlated with the difference in experienced corruption between 1995 and 2004. The correlation between the two is of only .1897. Thus, doing a panel regression can sidestep issues of multicollinearity.

Section 4.2

For the second regression I will look at how the two corruption variables together affect GDP growth over time. Because the data-points are cross-country and spread throughout time, I use a panel data set of the following form:

$$g_{ct} = \delta_0 d_t + \beta_1 (y_{ct}) + \beta_2 (x^e_{ct}) + \beta_3 (x^p_{ct}) + \beta'_4 (X_{ct}) + a_c + u_{ct} \qquad (2)$$

With $g_{ct} = (\log y_{c,t+k} - \log y_{c,t})/k$

where y is log-level of GDP (PPP) per capita from year t to t+k (in words, g represents average GDP growth from t to t+k), x^e_{ct} is experienced corruption, x^p_{ct} is perceived corruption, X is a set of control variables which vary over time (e.g. trade), a_c is a country dummy which controls for all variables which are stable over time, and d_t is a set of time dummies. While Mocan (2004) controls for other variables such as geographic, cultural and legal characteristics, this is not necessary in this case because I do not expect these variables to vary over time. In order to

eliminate variables that do not change over time within countries (a_c) I will do a fixed effects estimation and a first difference estimation.

The first difference estimation will run the following regression:

$$\Delta g = \delta_0 + \beta_1 (y_{ct-k}) + \beta_2 \Delta x_{ct1} + \beta_3 \Delta x_{ct2} + \beta'_4 \Delta(X) + \Delta u_{ct} \quad (3)$$

This first-differenced equation is estimated with an intercept and two time dummies (for the last two years). The regression will be run for the years 1995, 2005, 2011 and 2013 as experienced corruption data is available for those years. In some years, the data portrays slightly different information; for example, in 1995 the question which is asked is: "Have you been asked or expected to pay a bribe by a government official in the last year?", whereas in 2011 the following question was asked: "Have you paid a bribe in the past 12 months?". In 2005, the following question was asked: "In the past 12 months, have you or anyone living in your household paid a bribe in any form?" While this is not unproblematic, the fact that I am using a panel regression (hence, over time) cancels out some of the bias. For example, in 2005 what is really being measured can be represented as:

$C_{it} = \hat{C}_{it} + v_{it}$

Where C_{it} is measured corruption, $\hat{C}_{it}$ is actual corruption and v_{it} is measurement error due to larger family size. I presume here that this measurement error will occur equally in all countries in 2005, and therefore it will not affect the conclusion (see appendix B).

One potential objection to this presumption is that households differ in size, and thus larger households may seem to be more affected by corruption. However, I do not consider this to be a serious problem; even if there are considerable differences in household size across the world, it seems a safe assumption that this is mostly due to variations in amounts of children people have, and children are not often the target of bribes. Data for 1995 could be more problematic, as the question states whether the respondent has been *asked* for a bribe, rather than actually *paid* a bribe. A similar approach as above can be used, but a problem remains: citizens in some countries may be systematically more likely to pay a bribe when asked to and may thus appear less corrupt than they are in 1995. This again need not be too much of a problem: I assume that the propensity of civil servants to ask for a bribe is heavily related to the willingness of civilians to pay for them.

There are multiple benefits to panel data; firstly, many of the issues and biases in corruption measurement get partially solved. For example, some countries may have populations which are relatively more honest when discussing corruption. This is problematic when comparing countries with each other. However, this gets solved in a panel regression, as the differences within countries get measured. If we assume the "honesty bias" is relatively constant over time, and citizens of a country will be equally honest in 1995 and 2005, the change in corruption which is apparent from surveys should be accurate (or at least more accurate than static regressions). More generally, all relatively stable variables within countries will be controlled for.

5. Empirical results

Section 5.1

Firstly, I run the replication of Naci Mocan's 2004 regression as explained above. Since Mocan did not publish all data he used online, I have tried to replicate his data as much as possible but there are some differences, exemplified by the fact that the number of observations is different.

To be clear, the purpose of this exercise is to see to what degree the results match and whether the outcome is the same for more recent years. However, I do not consider the method to be adequate for the purpose of gaining more information regarding the channel by which corruption may cause differences in economic growth. Hence, the regressions are not as relevant as later regressions and I will not dwell on them too much.

The dependent variable in the following regressions is average economic growth for the 20-year period (1975-1995 in the first set of regressions, and the period of 1995-2005 in the second set of regressions), and for the first regression, independent variables include experienced corruption and a set of variables which is strongly related with both corruption as growth, such as cultural and legal variables, similar to Mocan's regression. I also include (experienced) corruption squared. Again, the primary reason for this is to follow Mocan's footsteps as closely as possible. The reason he states for doing this is that the quadratic variable provides a better fit, because in a small number of countries citizens have reported high levels of corruption even though the external perception of corruption is relatively low. In appendix C, I show how, also with my data, the predicted values of experienced corruption^2 (curved line) provide a better fit than the linear corruption variable. I will thus include the corruption-squared variable in the replication of Mocan's regression. However, I will not make much use of them afterwards, as it is not appropriate for the way I am

framing my question; while Mocan seems to want to replace perception of corruption with a second-order form of experienced corruption, my aim is to precisely to exploit the differences between the two measures. Therefore including corruption-squared in order to have a better fit with perceived corruption would defeat the purpose.

A note on standard errors: homoscedasticity is one of the Gauss-Markov assumptions. If it weren't, the estimator of the variances would be biased. Luckily, standard errors can be adjusted so that they are valid in the presence of heteroscedasticity of an unknown form (Wooldridge, 2009). In all regressions of this thesis, the standard errors are robust, and in appropriate cases the cluster option is used (which implies robustness).

The results can be found in table 1 below. In regression 1, only the institution variable (average protection from expropriation) is significant. Unsurprisingly, the institutions variable (average protection against expropriation risk) has a positive effect on economic growth, which is in accordance with contemporary theories in economics (Acemoglu, Johnson, & Robinson, 2001). None of the other variables turn significant when the institution variable is taken out, as regression 2 shows. Furthermore, the table shows very different results than the one shown in Mocan's paper (2004). For example, the coefficient for corruption in regression 1 was -.007 in Mocan's results, while in this case it is 0.224. There can be several reasons for this; firstly, the data is not identical, and therefore some countries may have been included in my regressions that were not included in his. Moreover, Mocan performed a 2SLS, where he instrumented corruption and protection from expropriation risk. However, he did not explain in enough detail how he did this in order to replicate. Finally, corruption is not significant, either in my regressions or his regressions. In any case, it is important to note that small changes in the data can produce such different results, which should already shed some doubt on his results. It should be noted that in his research, Mocan clustered standard errors by region. However, I tried both clustering by region and simply using robust standard errors, and found that standard errors for the experienced corruption variable were smaller when clustering by region. This means some of the variation has been cancelled out within the cluster, which implies that there is negative correlation within the cluster. I do not believe it is plausible that being in the same region causes this negative correlation, and believe it to be a mere coincidence. Therefore, I have used robust standard errors instead of clusters, which is more conservative but more appropriate.

Table 1

Dep. Var: ***Avg 20 yr GDP growth***	**(1)1975-1995**	**(2)1975-1995**	**(3) 1995-2005**	**(4) 1995-2005**
Experienced Corruption 1995	-.224 (.22)	-.267(.35)	.120(.29)	.083(.24)
Corruption^2	.688(.70)	.524(1.01)	-.041(.95)	.002(.76)
Low expropriation risk	.010**(.00)		.004(.01)	
Africa Dummy	.033(.02)	-.007(.02)	.009(.04)	-.014(.02)
Asia Dummy	.019(.02)	-.005(.02)	.027(.02)	.013(.01)
North America Dummy	.026(.03)	.005(.02)	.016(.02)	.005(.01)
South America Dummy	.022(.02)	.017(.03)	.000(.03)	-.007(.01)
Scandinavia Dummy	.015(.01)	.010(.01)	.016(.01)	.001(.01)
Western Europe Dummy	.011(.02)	.012(.01)	.006(.01)	.007(.01)
British Legal Origin Dummy	-.017(.02)	.002(.02)	-.002(.02)	.003(.01)
French Legal Origin Dummy	-.006(.01)	-.002(.01)	-.008(.01)	-.004(.01)
Socialist Legal Origin Dummy	Omitted due to multicol.	Omitted due to multicol.	.014(.01)	.015(.01)
Catholic Percentage 1980	-.000(.00)	-.002(.00)	.000(.00)	.000(.00)
Muslim Percentage 1980	-.001(.00)	.001(.00)	-.001(.00)	-.000(.00)
Protestant Percentage 1980	-.000(.00)	-.000(.00)	-.000(.00)	.000(.00)
Federation Dummy	.001(.01)	.012 (.01)	-.011(.01)	-.003(.01)
Initial GDP	-.000*** (.00)	-.002(.00)	.000(.00)	.000(.00)
Constant	-.033	.058(.04)	-.030(.05)	-.059(.03)
R^2	.760	.580	.592	.622
Observations	25	25	28	31

Significant at 1%:*, at 5%:**, at 10%:***; Standard deviations in parentheses; Standard errors are robust.

A few more regressions can give more insight; since the amount of observations is little and the list of variables long, the degrees of freedom are low. Hence, the following table includes results when most control variables have been taken out (e.g. legal origin, regional dummies). In addition, this allows us to include the perceived corruption variable as well and get an insight into the effect of each of the corruption variables when controlling for the other.

Table 2

Dep. Var: *Avg 20 yr GDP growth*	(1)1995-2015	(2)1995-2015	(3) 1995-2015	(4) 1995-2015	(5) 1995-2015	(6) 1995-2015
Experienced Corruption 1995	.037(.05)	.001(.03)	.043(.06)	-.000(.02)		
Perceived corruption 1995		.001(.00)		-.001(.00)	-.001 (.00)	-.001(.00)
Low Expr. Risk	.007*** (.00)	.003(.00)			.003(.00)	
Federation Dummy	-.001(.00)	.001(.00)	-.005(.00)	-.000(.00)	-.002 (.00)	-.002(.00)
Initial GDP	-.000(.00)	-.001*** (.00)	.000(.00)	-.001*** (.00)	-.001*** (.00)	-.001* (.00)
Constant	-.024(.03)	.007 (.02)	.026*** (.01)	.028*(.01)	.011(.02)	.027*(.01)
R^2	.237	.570	.102	.497	.276	.259
Observations	30	21	40	21	45	46

Significant at 1%:*, at 5%:**, at 10%:***; Standard deviations in parentheses; Standard errors are robust

This time, we see that none of the corruption variables are significant, and the institutions variable is again significant. Generally, these results have not given us a lot of significant results. This is largely because there are problems with both of the above regressions; the first set of regressions contains too many variables. Combined with the small sample size this makes the results less than reliable. However, the second set of regressions has a problem of its own; omitted variables. Due to the complexity of interconnected causes in a national economy, many important features are not taken into account. This, in turn, also means that the results cannot be taken too seriously. To solve for both of these problems a panel regression can be used; due to its nature, stable variables are automatically considered. Excluding these stable variables from the regression makes the set of variables relatively smaller, solving the problem mentioned above. The following section will cover this.

Section 5.2

The regressions in this section can be divided into two sets; the first set of regressions includes corruption data for the years 1995, 2005, 2011 and 2013 (the years for which both experienced and perceived corruption data is available). The second set of data only consists of corruption data for the years 1995 and 2005. While the first set has the benefit of having more data and thus carrying more information, there is a serious drawback; there is not always a long enough timespan between measurement years to get a good impression of the effect corruption has had in growth in

subsequent years. To be clearer, sometimes the negative effects of corruption in a particular year can take a long time to manifest themselves, such that the effect cannot be visible in the 2011-2013 timeframe. As such, while there are more data points available, the data is not certain to be reliable. The second set of data can be expected to give more reliable results, as in both years the corruption variables get regressed on 10 years of subsequent economic growth. The only downside is that there is a lower size of data. Since in the first set of data years are separated by different lengths of time, an average is always taken when performing first differences regression. For example, Δx^e is $(x^e_{2005} - x^e_{1995})/10$ for the 1995-2005 difference, and $(x^e_{2011} - x^e_{2005})/6$ for the 2005-2011 difference. In the fixed effects regression standard errors are clustered by country. Clustering relaxes the usual requirement that observations are independent within certain groups. This avoids issues of heteroscedasticity and arbitrary autocorrelation within countries (Verbeek, 2008). In the first difference regression the difference in the independent variables between 1995 and 2005 is regressed on the difference between economic growth following both years, and thus clustering by country would not make a difference (there are no longer different observations for each country). However, robust standard errors would still be used in order for the homoscedasticity assumption to hold.

We can see in the first two regressions that in cases where all years are included, almost everything is insignificant, except for perceived corruption in the first differences regression. Perceived corruption is significant at 5% when doing a first differences regression, with a coefficient of -.013. This means that for every grade decrease in the corruption perception index (keep in mind that this is a 10-point scale), GDP growth decreases by 1.3%.

Table 3

Dep. Var: *Av. GDP growth*	(1) FE All years	(2) FD All years
Experienced Corruption	-.001(.02)	.035 (.03)
Perceived corruption	-.000 (.00)	-.013**
Year 2005 dummy	.021* (.01)	.000 (.00)
Year 2011 dummy	.023* (.01)	-.026** (.02)
GDP	-.004* (.00)	-.014 (.00)
Trade	.000 (.00)	.000 (.00)
Constant	.074* (.01)	.007* (.00)
Observations	181(101)	49

Significant at 1%:*, at 5%:**, at 10%:***; Standard deviations in parentheses; Standard errors are clustered at Country level. Observations for FE show the number of groups in parentheses. Groups with only 1 observation are not included in the regression, hence the number of used observations will be between the number of observations and the number of groups.

The reason it is preferable to control for each of the other corruption variables is that, since they are correlated, the effect of the perception of corruption (for example) could be (falsely) captured by the experienced corruption variable. A downside to controlling for the other, however, is that both variables could make the other look weaker than it really is. To see to what degree this is the case I also run regressions with only experienced corruption and with only perceived corruption.

Table 4

Dep. Var: ***Avg GDP growth***	**(1) FE All years**	**(2) FD All years**	**(3) FE All years**	**(4) FD All years**
Experienced Corruption	.015(.02)	.029(.03)		
Perceived corruption			-.000(.00)	-.013***(.01)
Year 2005 dummy	.019*(.01)	-.002(.00)	.016(.01)	-.005(.00)
Year 2011 dummy	.023*(.01)	-.002(.00)	.019(.01)	-.033**(.02)
GDP	-.005*(.00)	-.010*(.00)	-.004**(.00)	-.031*(.00)
Trade	.000(.00)	.001*(.00)	.000(.00)	-.001(.00)
Constant	.076*** (.01)	.003**(.00)	.072**(.03)	.017*(.01)
Observations	261 (111)	132	367(147)	141

Significant at 1%:*, at 5%:**, at 10%:***; Standard deviations in parentheses; Standard errors are clustered at Country level. Observations for FE show the number of groups in parentheses. Groups with only 1 observation are not included in the regression, hence the number of used observations will be between the number of observations and the number of groups.

The results did not change much; perceived corruption is still the only significant corruption variable in a first difference regression, and the coefficient stayed the same. This shows that the results in the original regression were not affected too much by the interconnectedness of the two corruption variables.

One additional potential issue is that the set of countries for which there are observations can change a lot when different variables are included. This may cause biased results. For example, one regression may accidentally include more countries which were both corrupt and experienced economic growth. In order to control for this, I will also run regressions where a sample set of countries has been held constant.

Table 5

Dep. Var: *Avg GDP growth*	(1) FE All years	(2) FD All years	(3) FE All years	(4) FD All years
Experienced corruption	-.001(.02)	.071(.04)		
Perceived corruption			.000(.00)	-.016**(.01)
Year 2005 dummy	.020(.01)	-.008**(.00)	.020*(.01)	.002(.00)
Year 2011 dummy	.023(.01)	-.006***(.00)	.023*(.01)	-.030**(.01)
GDP	-.004*(.00)	-.017*(.00)	-.004*(.00)	-.015*(.00)
Trade	-.000(.00)	.000(.00)	-.000(.00)	.000(.00)
Constant	.072*(.01)	.008*(.00)	.072*(.01)	.007*(.00)
Observations	181(101)	49	181(101)	49

Significant at 1%:*, at 5%:**, at 10%:***; Standard deviations in parentheses; Standard errors are clustered at Country level. Observations for FE show the number of groups in parentheses. Groups with only 1 observation are not included in the regression, hence the number of used observations will be between the number of observations and the number of groups.

Again, as we can see, experienced corruption remains insignificant. Moreover the effect of perceived corruption becomes slightly stronger. In any case the above regression shows that the results are not excessively biased by having a different set of countries.

One problem with this first set of regressions is that the panel is heavily unbalanced when all years are taken into account. In table A (Appendix D), we can see that there are only 5 countries for which there is data on both experienced and perceived corruption for all the years. In addition, the negative effects of corruption may manifest themselves many years after the corruption is taking place, through business that would have gotten started but did not, investments that would have been made but did not, or talented people which would have gotten hired but did not. These effects may not be captured in the 2-year or 6-year time frame used above. For these reasons, I also run regressions for only 1995 and 2005 data. This allows us to regress on the average 10-year growth of the decade following the corruption measurements. First, a regression will be run including both corruption variables.

Table 6

Dep. Var: *Avg GDP growth*	(1) FE 1995 & 2005	(2) FD 1995 & 2005	(3) FE 1995 & 2005	(4) FD 1995 & 2005
Experienced Corruption	-.145*(.02)	-.080*** (.04)	-.144* (.00)	-.079*** (.04)
Perceived Corruption	.000 (.00)	-.001 (.00)	-.000 (.00)	.001(.00)
FDI			-.000(.00)	-.000(.00)
GDP	-.003* (.00)	-.004* (.00)	-.003* (.00)	-.004* (.00)
Trade	.001* (.00)	-.000 (.00)	.001* (.00)	.000(.00)
Constant	.053*** (.01)	.013 (.01)	.052* (.02)	.013(.01)
Observations	75 (61)	14	74(60)	14

Significant at 1%:*, at 5%:**, at 10%:***; Standard deviations in parentheses; Standard errors are clustered at Country level. Observations for FE show the number of groups in parentheses. Groups with only 1 observation are not included in the regression, hence the number of used observations will be between the number of observations and the number of groups.

In this case we can see that experienced corruption has a significant negative effect on economic growth, both in the case of the fixed effects regression as in the case of the first difference regression. This sheds some doubts on the results presented in Mocan (2004), who claimed that the relationship of corruption and economic growth was only due to the perception of corruption, and denied a direct relationship of corruption and economic growth. Furthermore, these results lend less credibility to channel 2; the idea that corruption affects economic growth due to lower investments made to countries, because this would imply a stronger correlation with *perceived* corruption. Indeed I have added foreign direct investment as a variable and see that indeed it does not have a significant effect on economic growth, while experienced corruption remains significant.

Having said that, these results should be taken with a grain of salt. The group of countries for which we have data available for both corruption measurement and both years is very small (see table B, appendix D), and even though we can see in the list that it is relatively diverse still (it includes both developed countries such as Austria, Switzerland, United Kingdom and emerging countries such as South Africa, Philippines, India), there are still major shortcomings in such a short list and there would be large benefits in having better measurement in the future in order to include more and more countries. Furthermore, while there are emerging countries, many of the poorest countries are not present, and these could be the ones where Mocan's hypothesis is validated.

Finally, as before, I will run the regressions again, checking if the results change when including only one of the two corruption variables.

Table 7

Dep. Var: *Avg GDP growth*	(1) FE 1995 & 2005	(2) FD 1995 & 2005	(3) FE 1995 & 2005	(4) FD 1995 & 2005
Experienced Corruption	.016(.06)	.034(.02)		
Perceived Corruption			.003**(.00)	.004*(.00)
GDP	-.003*(.00)	-.006*(.00)	-.003*(.00)	-.004*(.00)
Trade	.000(.00)	-.000(.00)	.000(.00)	.000(.00)
Constant	.056*(.01)	.023(.01)	.056(.02)	.008(.02)
Observations	95(74)	22	74(60)	46

Significant at 1%:*, at 5%:**, at 10%:***; Standard deviations in parentheses; Standard errors are clustered at Country level. Observations for FE show the number of groups in parentheses. Groups with only 1 observation are not included in the regression, hence the number of used observations will be between the number of observations and the number of groups.

Above, we can see that when experienced corruption is excluded, perceived corruption has a significant *positive* effect on economic growth. This is contrary to expectations. It may be the case that some countries are included which were either increasingly perceived to be corrupt and decreasing in growth, or the other way around, for external reasons. A look at the data shows that Spain, Portugal, Italy and Greece are included in the observations. These countries all climbed higher in position on the corruption perception index (meaning they were perceived as being less corrupt in 2005 than in 1995), while they all experienced lower growth in the decade following 2005 than the decade following 1995. This is not surprising, considering they were among the countries most affected by the financial crisis. Indeed, when these four countries are deleted, the variable becomes insignificant.

I also run the regressions again while keeping the sample fixed. The results are in table 8 below. Perceived corruption is now insignificant. The observations in this dataset also do not include Spain, Portugal and Italy, which is consistent with the above explanation for why perceived corruption appeared to have a positive effect on economic growth when experienced corruption was not included. Experienced corruption is significantly negative when by itself as well.

Table 8

Dep. Var: *Av. GDP growth*	(1) FE 1995 & 2005	(2) FD 1995 & 2005	(3) FE 1995 & 2005	(4) FD 1995 & 2005
Experienced Corruption	-.144* (.02)	-.084*** (.04)		
Perceived Corruption			-.002 (.00)	-.002 (.00)
GDP	-.003* (.00)	-.004* (.00)	-.003* (.00)	-.005* (.00)
Trade	.001* (.00)	.000(.00)	.001*(.00)	.000(.00)
Constant	.050* (.01)	.013(.01)	.028(.02)	.023* (.00)
Observations	74	14	75(61)	14

Significant at 1%:*, at 5%:**, at 10%:***; Standard deviations in parentheses; Standard errors are clustered at Country level. Observations for FE show the number of groups in parentheses. Groups with only 1 observation are not included in the regression, hence the number of used observations will be between the number of observations and the number of groups.

One worry is that the differences in other variables have influenced the change in GDP growth for reasons other than corruption. Although generally, if the influence of other omitted variables is unsystematic, it is assumed these influences "cancel out", this may not happen in a small sample size. Indeed, we can see significant changes between regressions that were run when a different sample of countries was included. When working with smaller sample sizes, there is a higher chance for accidental correlations.

The above regressions can lend credence to the hypothesis that actual corruption does have a direct influence on economic growth separate from its effect on the perception of corruption. Linking this back to the discussion at the end of chapter 2, this means that the results support the theories of corruption affecting economic growth through channel 1 or channel 4. As such, it may be that the countries with higher growth are more conducive to lower corruption because firms can be relatively larger, which gives them a better ability to move when public servants demand bribes (channel 1). Alternatively, the countries where corruption is higher suffer directly from the efficiencies and welfare costs associated with bribes being asked frequently (as in channel 4). The channels 2 & 3 are hereby not falsified, but they are not strongly supported by the available evidence. Indeed, when including foreign direct investment as a control variable, it does not change the results too much as can be seen in table 6.

All things considered, the evidence presented in this thesis is not consistently pointing in one direction. In table 3 it appears that only perceived corruption has a negative effect on economic growth (when controlling for experienced corruption) whereas in table 6 it appears that only

experienced corruption has a negative effect on economic growth (when controlling for perceived corruption). I argue that the latter hypothesis is the result of a more suitable methodology, since a longer timeframe is taken into account. It seems highly plausible that any way in which corruption would influence economic growth, the effects would become visible many years after corruption measurement. However, the relatively stable results of the former method cannot be ignored. In fact, I also ran one regression with the sample of countries in table 6 to see if there was something about the sample group that makes table 6 subject to more significant results for experienced corruption. The result here is that *both* experienced and perceived corruption have a significant negative effect on economic growth, when both variables are included. In this case, experienced corruption has an effect of -.05 and perceived corruption has an effect of -.004. These numbers are not directly comparable because the experienced corruption variable is based on the percentage of people answering in a survey, whereas the perceived corruption variable is based on a vote out of 10. However, the effect of experienced corruption is more significant (p-value is 3.4% as opposed to 9.4% for perceived corruption). While these results should not lead one to conclude that there is only a direct effect of corruption on economic growth, I do believe they indicate that Mocan's conclusion was too hasty.

Concluding remarks

Many regressions have been run in this thesis, but the more reliable results are from panel regressions, since they can include both perceived and experienced corruption variables, without having to include all stable variables. Two sets of panel regressions have been run, each with their own pros and cons. The regressions which take place in 1995, 2005, 2011 and 2013 have the benefit that there are many observations. However, the period in which growth is measured is not consistent; sometimes a 10-year growth period is covered, but there is also a 6-year period, a 2-year period and a 1-year period. While averages per year are always taken, there are good reasons to believe the full effects of corruption are not yet discovered in each timeframe. The regressions which only take place in 1995 and 2005 in table 6 have the virtue that they cover a consistently long enough period of time after corruption measurement to reap results.

To conclude, this thesis has shown that, while results are not all pointing in one direction, there is some evidence to believe that actual corruption does have a direct negative effect on economic growth, over and above any effect it may have through perceived corruption causing lower investments, and over and above any impact from institutions on both corruption and economic

growth. By using a panel regression, all stable variables within countries are controlled for, including institutional quality. Some nuances are in order, however.

Firstly, the size of the database has serious limitations. Due to interconnectedness of many different variables in the economy it is tricky to be sure about the effect of corruption. Indeed from table 7 one could wrongly infer that a country's being perceived as corrupt has a *positive* influence on economic growth, if one is unaware of Portugal, Italy, Greece and Spain being included. The possibility should not be excluded that similar anomalies occurred in table 6, such that it only appears that actual corruption caused lower economic growth.

Secondly, we cannot have certainty over the direction of causality. Good instrumental variables are notoriously difficult to come by in economic research generally, but especially in the case of corruption, which has many intertwined causes and effects. One benefit of the regressions I ran is that average growth of the years after corruption measurement were used, and therefore it is unlikely that growth influenced corruption in the past. However, it is possible that unobservable features, such as changes in institutional quality which are hard to measure, affected both economic growth and corruption.

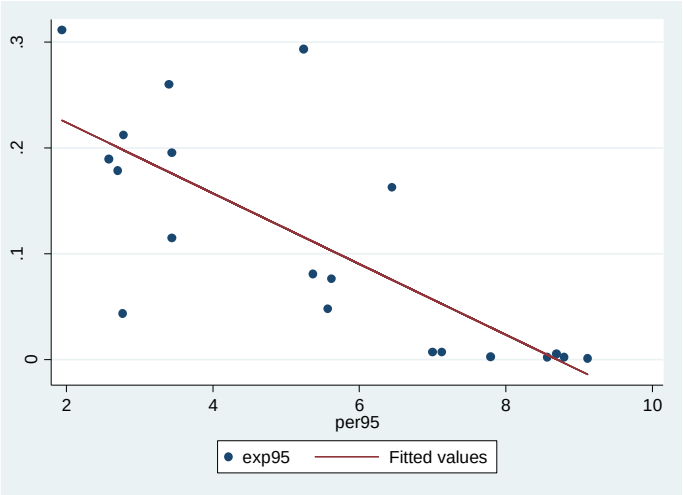
In addition to the conclusion stated above, this thesis has led to suggestions for future research. One important suggestion for future data collection is to bear in mind the importance of consistent data collection methods across countries and throughout time. Panel regressions can prove to be highly valuable due to their ability to control for all stable variables, but this advantage cannot be fully seized if corruption measurement is not done over a large amount of countries in a similar manner. At this time, the questions were not always asked in the same way, and the same countries were not always included in subsequent years. Another suggestion for future research is to investigate further through which channel corruption is particularly harmful. If Mocan were to be right, namely that actual corruption does not have an especially strong direct effect on economic growth, more resources can be spent in other areas which promise more effective increases in economic growth. I believe to have shown this conclusion of his to be premature. While it is not hereby proven beyond reasonable doubt that actual corruption directly influences economic growth, there is evidence which should encourage economists to investigate further.

Finally, this thesis has focused mainly on the effects of corruption, and specifically the economic effects. The causes of corruption have not gotten much attention in this thesis. In order to really be

able and change countries for the better, it is not enough to diagnose the problem. Research should be directed at the evolution of the institutions that allowed certain countries to experience low degrees of corruption while others less (North, 1987). In addition, non-economic effects of corruption have not been discussed. While I have in this thesis mostly given the impression that we need to find out how corruption affects economic growth, I do not wish to give the impression that corruption would *only* be undesirable if it would have a negative effect on economic growth. Indeed, there may be reasons to wish to avoid corruption even if it turned out to be *good* for economic growth (i.e. if the "greases the wheels" hypothesis were correct). This is because it would be at odds with ideas of a just, meritocratic society. If licenses and permits for businesses would go to the highest bidder, this may unfairly limit the freedom of the poor, and would not treat them as equals. As Ronald Dworkin argued in *Sovereign virtue,* the state is obligated to treat all of its members with equal concern and respect. He also argues that all liberal political philosophies are fundamentally committed to this abstract idea of equality (Dworkin, 2000). Allowing some people to start businesses based only on the fact that they have more money to circumvent the bureaucracy would be in conflict with this principle and would thus not be consistent with a liberal society.

Appendix A

Figure 1 & Figure 2:



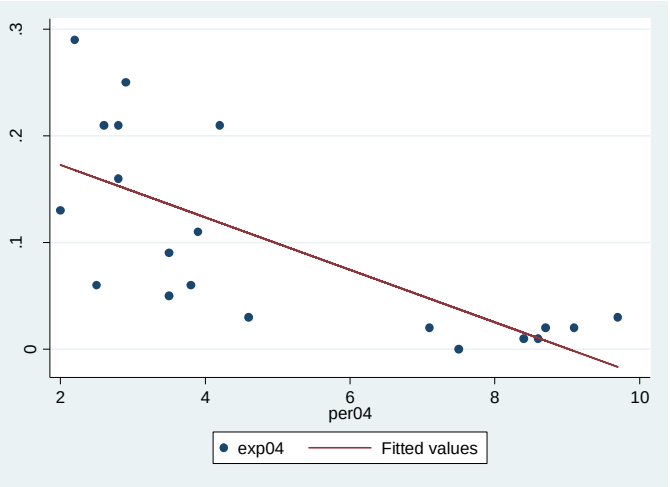
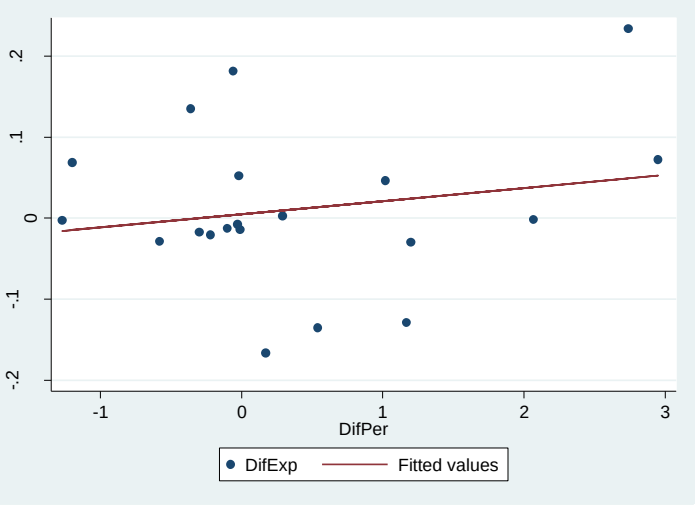


Figure 3:



Appendix B

$C_{it} = \hat{C}_{it+} v_{it}$

$v_{it} = \mu_i + \mu_t + \mu_{it}$

$v_{it+1} = \mu_i + \mu_{t+1} + \mu_{it+1}$

$\Delta v_{it} = \Delta\mu_t + \Delta\mu_{it}$

$C_{it+1} = \hat{C}_{it+1} + v_{it+1}$

$y_t = \alpha C_t + \varepsilon_t$

$y_{t+1} = \alpha C_{t+1} + \varepsilon_{t+1}$

$\Delta y_t = \alpha\Delta C_t + \Delta\varepsilon_t$

$\Delta y_t = \alpha(\Delta\hat{C}_{it} + \Delta v_{it}) + \Delta\varepsilon_t$

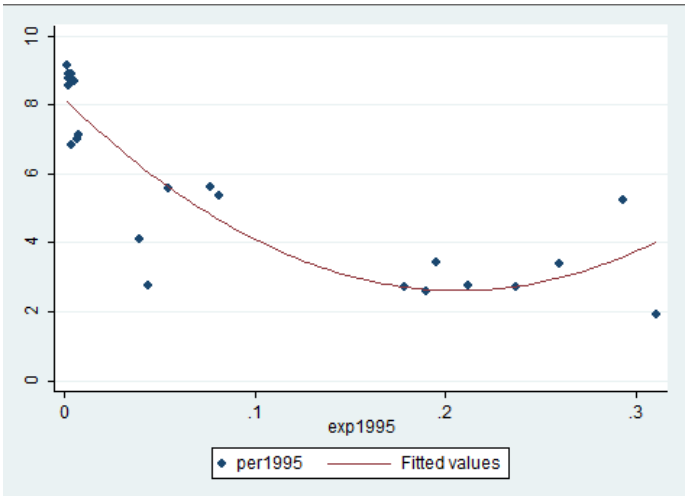
$\Delta y_t = \alpha\Delta\hat{C}_{it} + \alpha\Delta v_{it} + \Delta\varepsilon_t$

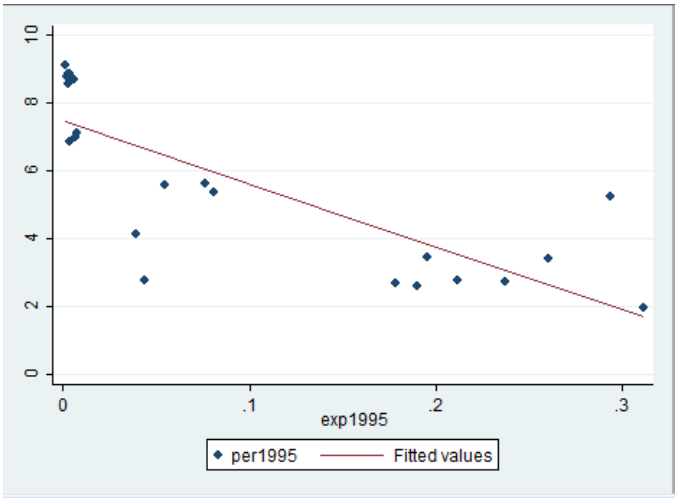
ε_t is uncorrelated with y_t.

In this example α accurately captures both the differences due to increases in actual corruption as the differences due to measurement error. This is because in the year 2005 the question is asked differently (have you or someone from your household…). Thus, corruption will be over-represented at time t, but for all countries equally. μ_i (which represents all country fixed effects) disappears in Δv_{it}. The year dummy should thus fix this, as long as the error is stable across all countries in the particular year. One way this may not be the case is if households differ in size. However, this is also unlikely to be a problem; although it is possible that household sizes differ across countries, this should mostly be due to some households having more children and I assume it to be unlikely for children to be asked for a bribe.

Appendix C

Figure 4 & Figure 5:





Appendix D

Table A:

4 Years:

Country	***Number of years measured***	***Years***
Bolivia	4	1995, 2005, 2011, 2013
Colombia	4	1995, 2005, 2011, 2013
Czech Republic	4	1995, 2005, 2011, 2013
India	4	1995, 2005, 2011, 2013
Indonesia	4	1995, 2005, 2011, 2013
Austria	3	1995, 2005, 2011
Bosnia and Herzegovina	3	2005, 2011, 2013
Bulgaria	3	2005, 2011, 2013
Cambodia	3	2005, 2011, 2013
Cameroon	3	2005, 2011, 2013
Canada	3	1995, 2005, 2013
Croatia	3	2005, 2011, 2013
Ethiopia	3	2005, 2011, 2013
Finland	3	1995, 2005, 2013
Greece	3	2005, 2011, 2013
Kenya	3	2005, 2011, 2013
Nigeria	3	2005, 2011, 2013
Philippines	3	1995, 2005, 2013
South Africa	3	1995, 2005, 2013
Switzerland	3	1995, 2005, 2013
United Kingdom	3	1995, 2005, 2013
Afghanistan	2	2011, 2013
Armenia	2	2011, 2013
Bangladesh	2	2011, 2013
Belgium	2	1995, 2013
Brazil	2	1995, 2011
Chile	2	2005, 2013
Denmark	2	2005, 2013
El Salvador	2	2011, 2013
France	2	1995, 2005
Georgia	2	2005, 2013
Ghana	2	2005, 2013
Hungary	2	1995, 2013
Iraq	2	2011, 2013
Israel	2	2005, 2013
Kosovo	2	2011, 2013
Lithuania	2	2005, 2013
Malaysia	2	2005, 2013
Mexico	2	2005, 2013

Moldova	2	2005, 2013
Uruguay	2	2005, 2013
Nepal	2	2011, 2013
Norway	2	2005, 2013
Pakistan	2	2005, 2013
Papua New Guinea	2	2005, 2013
Paraguay	2	2005, 2013
Peru	2	2005, 2013
Poland	2	1995, 2005
Portugal	2	2005, 2013
Romania	2	2005, 2013
Senegal	2	2005, 2013
Thailand	2	2005, 2013
Turkey	2	2005, 2013
Uganda	2	1995, 2013
Ukraine	2	2005, 2013
Uruguay	2	2005, 2013

Table B:

2 years: 14

Country	***Number of years measured***
Austria	2
Bolivia	2
Canada	2
Colombia	2
Czech Republic	2
Finland	2
France	2
India	2
Indonesia	2
Philippines	2
Poland	2
South Africa	2
Switzerland	2
United Kingdom	2

Bibliography

Acemoglu, D., Johnson, S., & Robinson, J. A. (2001). The Colonial Origins of Comparative Development: An Empirical Investigation. *American Economic Review*, 1369-1401.

Aidt, T. S. (2009). Corruption, Institutions and Economic Development. *Oxford Review of Economic Policy*, 271-291.

Al-Sadig, A. (2009). The Effects of Corruption on FDI Inflows. *Cato Journal*, 267-294.

Bai, J., Jayachandran, S., Malesky, E., & Olken, B. (2013). Does Economic Growth Reduce Corruption? Theory and Evidence from Vietnam. *National Bureau of Economic Research*.

Banerjee, A., Hanna, R., & Mullainathan, S. (2012). Corruption. *HKS Faculty Research Working Paper Series*.

Bardhan, P. (1997). Corruption and Development: A Review of Issues. *Journal of Economic Literature*, 1320-1346.

Dollar, D., & Kraay, A. (2003). Institutions, trade, and growth. *Journal of Monetary Economics*, 133-162.

Dworkin, R. (2000). *Sovereign Virtue.* Cambridge, MA: Harvard University Press.

Leff, N. (1964). Economic Development Through Bureaucratic Corruption. *The American Behavioral Scientist*, 3-14.

Lui, F. T. (1985). An Equilibrium Queuing Model of Bribery. *Journal of Political Economy*, 760-781.

Malesky, E., & Samphantharak, K. (2008). Predictable Corruption and Firm Investment: Evidence from a Natural Experiment and Survey of Cambodian Entrepreneures. *Quarterly Journal of Political Science*, 227-267.

Mauro, P. (1995). Corruption and Growth. *The Quarterly Journal of Economics*, 681-712.

Mocan, N. (2004). What determines corruption? International evidence from micro data. *National Bureau of Economic Research*.

North, D. (1987). Institutions, Transaction costs and Economic Growth. *Economic Inquiry*, 419-428.

Olken, B. (2005). Monitoring Corruption: Evidence from a Field Experiment in Indonesia. *National Bureau of Economic Research*.

Olken, B. (2006). Corruption and the costs of redistribution: Micro evidence from Indonesia. *Journal of Public Economics*, 853-870.

Olken, B. (2006). Corruption Perceptions Vs. Corruption Reality. *National Bureau of Economic Research*.

Olken, B., & Pande, R. (2011). Corruption in Developing Countries. *National Bureau of Economic Research*.

Reiss, J. (2008). *Error in Economics: Towards a More Evidence-based Methodology.* Milton Park: Routledge.

Rodrik, D., Subramanian, A., & Trebbi, F. (2004). Institutions Rule: The Primacy of Institutions Over Geography and Integration in Economic Development. *Journal of Economic Growth*, 131-165.

Sequeira, S., & Djankov, S. (2014). On the Waterfront: An Empirical Study of Corruption in Ports. *Journal of International Economics*.

Tanzi, V. (1995). Fiscal Federalism and Decentralization: A Review of Some Efficiency and Macroeconomic Aspects. *Annual World Bank Conference on Development Economics*.

Transparency International. (1995, July 15). *Press Release.* Retrieved from Transparency International: http://www.transparency.org/files/content/tool/1995_CPI_EN.pdf

Treisman, D. (2000). The causes of corruption: a cross-national study. *Journal of Public Economics*, 399-457.

Treisman, D. (2007). What have we learned about the causes of corruption from ten years of cross-national empirical research? *Annual Review Political Science*.

Verbeek, M. (2008). *A Guide to Modern Econometrics.* West Sussex: John Wiley & Sons.

Wei, S.-J. (1999). Corruption in Economic Development: Beneficial Grease, Minor Annoyance or Major Obstacle? *Harvard University Manuscript*.

Wei, S.-J. (2000). How Taxing is Corruption on International Investors? *The Review of Economics and Statistics*, 1-11.

Weingast, B. R. (1995). The Economic Role of Political Institutions: Market-Preserving Federalism and Economic Development. *Journal of Law, Economics, and Organization*, 1-31.

Wooldridge, J. (2009). *Introductory Econometrics - A Modern Approach.* Canada: South Western Cengage Learning.