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The Effect of Corruption on Firm Performance

A case study of Brazil

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I. ABSTRACT

This thesis investigates the effect of corruption on firm performance for enterprises in Brazil. Corruption is measured by the amount of bribe payments and corporate performance by the amount of total annual firm sales. For this specific study I used the Enterprise Survey data set which was published by the World Bank in 2009. The data set contains firm-level data on 1,802 non-agricultural enterprises in Brazil. The econometric analysis applies both the Ordinary Least Squares (OLS) method and the instrument variable (IV) method. The findings suggest a positive significant relationship between administrative corruption and firm performance, i.e. total firm sales increase with bribe payments. An increase in informal payments by one unit (here: US$ 1,000) leads to an increase in the total sales by 0.4% in the OLS model and to an increase in sales by 4.5% in the IV approach. Differentiating between the relative sizes of informal payments revealed a pattern in the results: the positive effect on the performance is smaller for firms paying 1% or more of their sales in bribes than for those that pay a smaller share. The results are robust and were controlled for various factors and also for different fixed effects.

(word count: 198)

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III. List of Abbreviations

AS	assumption(s)
BEEPS	Business Environment and Enterprise Performance Survey
bn	Billion
CEE	Central and Eastern European (countries)
CPI	Transparency International's Annual Corruption Perception Index
DV	dependent variable
ES	Enterprise Survey(s)
EY	Ernst & Young
FDI	Foreign Direct Investment
FY	Fiscal year
GDP	Gross Domestic Product
GDPpc	Gross Domestic Product per capita
Govt.	Government / governmental
ICS	Investment Climate Survey
IMF	International Monetary Fund
LA	Latin America(n)
LAC	Latin American and the Caribbean countries
LDC	Less developed countries
mio	Million
R$	Brazilian Real (local currency)
ROI	Return on Investment
SME	Small- and Medium-sized Enterprise(s)
SSA	Sub-Saharan Africa
Tsd.	Thousands
US$	U.S. Dollar
w.r.t.	with respect to

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1 INTRODUCTION

A construction company in Brazil called 'Cyrela' has planned for a long time to build a golf course in a nature park. Cyrela, however, did not get the permission since the area belonged to a natural reserve which was protected by law. Somewhat later the election phase for the mayor in Rio de Janeiro started and Cyrela helped to finance the election campaign of the candidate Eduardo Paes with R$500,000 (US$156,570[1]). After Paes had won the election he allowed Cyrela to not only build the golf course but also to build apartment towers in an area where it was not allowed before. This scandal of corruption was reported recently by the Brazilian lawyer Jean Carlos Novaes in an interview with a German newspaper (FAZ, 2015).
Herman Lindqvist hit the nail on the head when he said that in most parts of the world the production of many companies would stand still if they would not pay bribes. This does not only apply to large companies, it is an issue for all types of firms (Aftonbladet, 2014).
Corruption happens to occur worldwide in a variety of forms and magnitudes. It could be the politician who misuses his public power to bend the law as a return of favor, as seen in the Brazilian example above. It may, however, also be the local official demanding bribes from ordinary citizens to get access to a new water pipe; it could be the public official embezzling funds for school renovations to build his private villa; or it could be the multinational company that pays a bribe to win the public contract, despite proposing a sub-standard offer (OECD, 2014). The media covers of course more often multinational firms such as Europe's biggest engineering company, the German Siemens AG (Bloomberg, 2014), which was involved in massive bribe scandals in Brazil or the computing multinational giant Hewlett-Packard (HP) that had to pay over US$100 million to settle a bribery case (WSJ, 2014). The list goes on and all these examples make clear that corruption is a sort of "necessary evil" that helps to "get things done", regardless of where, when or how. When it comes to corruption, it seems that neither the size of the country nor the size of the enterprise matters (WP, 2014).

The examples above suggest that bribing public officials seems to be fairly helpful for a single person or a single business in the micro view. However, in the bigger picture or economically seen, corruption has caused, and still causes, a great damage in many nations. Estimates of the World Economic Forum (WEF) (2009) show that the cost of corruption equals more than 5% of the global GDP (US$2.6 trillion), with over US$1 trillion paid in

[1] Exchange rate March 31, 2015 (publishing date of the article): 1 Brazil real = 0.31314 U.S. dollars, according xe.com (2015)

bribes each year. Globally, corruption adds up to 10% to the total cost of doing business, and in developing countries Ernst & Young (EY) (2012) reckon that it adds even up to 25% to the cost of procurement contracts. The OECD (2014) states that in countries with mid and high corruption level the extra cost due to corruption add up to 20% to the total cost of doing business. Moving a business due to these enormous extra costs from a country with a low level of corruption, like for example Denmark, to a country with medium, such as Brazil, is found to be equivalent to a 20% tax on foreign business (ICC, 2008).

A concrete definition of corruption that applies globally is hard to pin down since there are rather a few different ones used around the world. The most common definition of corruption, however, is the one by the World Bank Group which says: corruption is ***"the abuse of public office for private gain"*** (World Bank, 1997). To measure corruption is not possible directly but there is a measure for the perception of corruption (figure 1 in appendix part I) which is called the Corruption Perception Index (CPI) established by the Transparency International (Transparency, 2015a).

The numbers for the economic damage are even more alarming for the largest economy in Latin America and Caribbean (LAC). Ernst & Young (EY) (2012) reported that corruption costs Brazil between 1.4% and 2.3% of its GDP each year. Roughly estimated, that is US$146 billion in total each year. For 2013, the costs of corruption for Brazil, the country that hosted the football World Cup 2014 and that will also be the host of the Olympic Games in 2016, were estimated to be up to US$51.6 billion (Forbes, 2013). In September 2014, only a month before the presidential elections, Brazil was rocked by a corruption scandal with a scale of US$4 billion (R$11.5 billion). This corruption case which involved the giant state-controlled oil company "Petrobras" (NY Times, 2014a & 2014b) has become the biggest one in the history of Brazil (IBTimes, 2014).

I. Research Question:

Based on the above outline of the research area, the main research question this study will be dealing with is:

- **What is the effect of administrative corruption on the performance of enterprises in Brazil? What is the extent of that impact?**

This study will use the method of cross-section analysis. From a simple regression the model will be expanded to a multiple regression as we control for other variables. In addition, the study will also check for fixed effects between different areas, sectors and firm size groups. For the investigation the 2009 Enterprise Survey (ES) data set which is provided by the World Bank (WB) will be exploit. Due to the fact that in many countries, especially in a developing country such as Brazil (ISI, 2015), corruption is a very sensitive topic the data set suffers from the lack of responses since various questions regarding this topic count missing or refused responses.

Based on the firm-level data, the findings of the empirical analysis suggest that there is a significant positive effect of administrative corruption on the performance of micro enterprises, SMEs and large enterprises. Moreover, the results reveal that the extent of the effect is positive but fairly small (increase in sales by less than 1%) as we use the Ordinary Least Squared (OLS) approach. As we use the instrumental variable (IV) approach the effect of informal payments increases to just over 6%. The results further reveal that the extent differs in terms of the size of bribery, meaning that the effect for those firms that pay a relatively small amount (less than 1% of their total sales) is found to be 1.7% and for those firms that paid a larger amount to corrupt public officials is found to be 0.7%. Leaving aside those firms that are counted as refusals the effect is even a bit smaller.

The structure of the paper is as follows: Section 2 reviews the existing literature to the topic of corruption and enterprises. Section 3 provides some background information on corruption as well as on Brazil and its economy. In section 4 the data set that is used in this paper is presents more in detail. Section 5 continues by using this very data for the econometrical analysis part. Section 6 will discuss the results found by the econometrical analysis in terms of quality and trustworthiness and finally section 7 will give a summarizing conclusion.

2 LITERATURE REVIEW

In the past years there has been, and to some extent there is still, disagreement among researchers about the question whether corruption is good or bad for business performance and business development. **This thesis which attempts to find the extent to which corruption impacts enterprises' performance in Brazil at a firm-level**, is of great interest to take up this discussion because if this thesis would show that administrative corruption has no effect at all on companies or even benefits them instead of primarily harming them, then there would be no or little reason for the enterprises to avoid corruption.

The vast majority of research publications about the topic of corruption generally agree that, by comparing different countries, corruption impedes economic development. Papers by Shleifer & Vishny (1993), Mauro (1995) or Bardhan (1997) deliver strong evidence to support this argumentation by using data on a country-level. Unlike these papers that compared a selection of countries, the papers by Svensson (2003), Kimuyu (2006) and Gbetknom (2012) have investigated the effect of corruption for certain African countries by using firm-level data and they were able to show that on a firm-level, too, corruption is negatively correlated with firm growth. In line with these results are the papers by Athansouli et al. (2012) for Greece, Kochanova (2012) for Central and Eastern European (CEE) countries, Gaviria (2002) for LAC and both Carvalho (2008) and Ramalho (2007) for Brazil. The last three named papers utilize firm-level data and deliver evidence for the argument, too, that corruption impedes firm growth.

To some part the findings of Gaviria's (2002) fit to the group above but to some part the results show otherwise. For transition countries[2] Gaviria, too, found that there is a clear and significant negative effect of corruption on firms' investment growth. However, for SSA and LAC his results reveal that there is no significant effect at all for investment growth for firms.

Opposite to the papers mentioned above which in essence promote the idea that corruption hampers economic development and firms' performance or growth, Gaviari (2002) concluded that corruption is unlikely to have any positive effects.

However, there are also studies that conclude otherwise by saying corruption is rather helpful for operating businesses. In the past there has been much debate about whether or not

[2] The term "transition economies" usually refers to countries that move from centrally planned to market-oriented economies. These countries- which include China, Mongolia, Vietnam, former republics of the Soviet Union, and the countries of Central and Eastern Europe- contain about one-third of the world's population. (World Bank, 2015)

corruption and facility payments are essential for companies to do business in difficult markets and in different countries. The general idea is that companies operating in an environment characterized by high levels of administrative corruption need to make unofficial payments to circumvent administrative obstacles such as red tape and rigid rules. This reasoning is strongly promoted by Leff (1964) and Huntington (1968), for example, as well as more recent literature by Méon & Weill (2010) and for China by Wang & You (2012). From their perspective, bribery is thereby seen as an efficiency enhancing mechanism or instrument that "greases the wheels" of doing business by enabling firms to maneuver easier through cumbersome regulatory environments (Leff, 1964; Huntington, 1968; Wang &You, 2012). Wang & You (2012) speak from the "Eastern Paradoxon" meaning that even though there is a high level of corruption the firms benefit if they bribe.

In a narrowed view, the following papers investigate a research question that is, to some extent, very close to the one that is asked in this particular study. My research question is: to what extent does corruption impact the performance of enterprises. The paper by Gaviria (2002) investigates in general similar to mine the effect of corruption on specifically firm sales growth. Also, the paper on China by Wang & You (2012) which concludes that corruption rather enhances firm growth is very close to my question because the authors focus specifically on firm growth measure by sales. The papers by Athansouli et al. (2012), Gbetknom (2012) and Kochanova (2012) are even closer to my study since they control for the differences among regions and sectors. All three papers used firm-level data and found that administrative corruption deters the performance of firms significantly. The paper by Gbetknom (2012) which states that bribing is extremely costly for firms, especially for small and medium-sized enterprises that simply have a small budget.

From an econometric point of view, of all considered research studies mentioned here the one by Svensson (2003) and by Kochanova (2012) convince the most because Svensson (2003) uses the instrumental variable approach to improve the quality of the results and Kochanova (2012) convinces by combining two firm-level datasets. The BEEPS survey data and the Amadeus survey data, and conducts thereby a study with data of more than 500,000 firms of more than 14 CEE countries.

This thesis attempts to contribute to the existing literature by focusing only on Brazil. There are studies with a slightly broader research question for a group of other different countries, amongst them also Brazil in the paper by Gaviria (2002). However, there is no existing paper that investigates corruption on a firm-level basis solely for Brazil. The aim of this paper is therefore to fill this gap.

3 Corruption and Brazil

As the examples in the introduction have shown, corruption does not know any boundaries or country borders. The fact that private individuals as well as companies have to deals with this issue in their day-to-day operational matters makes this topic even more interesting to investigate. Besides that, Brazil is highly interesting to investigate because of two reasons. First, there is no other study published newer than 2009 that has investigated the effect of corruption on firm performance by using firm-level data on Brazil only. Second, economically seen Brazil is highly interesting since studies show that the costs of corruption in this particular country are considerably large, in fact they can add up to 2.3% of its GDP every year as the EY report (2012) report has shown. In other words, for Brazil that means an amount up to US$ 146 billion in total each year. This section 3 will therefore provide a more detailed explanation of the term 'corruption' and will briefly discuss the economic situation in Brazil.

I. Corruption

3.I.1 Definition and types

Corruption comes with not only one single definition. It rather comes in a great variety of types, shapes and sizes plus its causes vary due to different interpretations. Consequently, it becomes clear that it is very hard to agree upon a *'one-size-fits-all'* definition of corruption (Kotkin & Sajó, 2002). This is further manifested in the fact that there is no globally accepted definition of corruption or bribery, despite the existence of several international anti-corruption reforms (Business-Anti-Corruption Portal, 2014). For the purpose of this study, the term 'corruption' is defined as ***"the abuse of public office for private gain"*** (World Bank, 1997). This definition is internationally and most commonly used and established by the World Bank (1997) which also provided the data set that is used for this study.

Corruption is a broad and complex term that covers a large variety of practices and individual behaviors. Therefore it makes sense to explain some of the different types of corruption that will play a role in the context of this thesis. According to the Business Anti-Corruption Portal (2014), following corruption types fit in the category ***administrative corruption***:

Abuse of office is public if office holders act outside the boundaries of their legal permission.

Bribe is defined as to offer, promise or give any undue pecuniary or other advantage, whether directly or through intermediaries, to a foreign public official, for that official or for a third party, in order that the official act or refrain from acting in relation to the performance of official duties, in order to obtain or retain business or other improper advantage.

Embezzlement is the appropriation of money or property by a person entrusted to safeguard the assets in another's interests.

Facility payments are a form of bribery made with the purpose of expediting or facilitating the performance by a public official of a routine governmental action and not to obtain or retain business or any other undue advantage. Facilitation payments are typically demanded by low level and low income officials in exchange for providing services to which one is legally entitled without such payments. Herman Lindqvist (Aftonbladet, 2014) does indeed have a point when he says that in most countries bribes or facility payments are seen as an existential pillar for bribe takers since their ordinary wage is simply too little for them to live from.

Gifts are in the context of corruption, a financial or other benefit, offered, given, solicited or received with an obligation to provide any benefit in return. Gifts may include cash or assets given as presents, and political or charitable donations. Hospitality may include meals, hotels, flights, entertainment or sporting events.

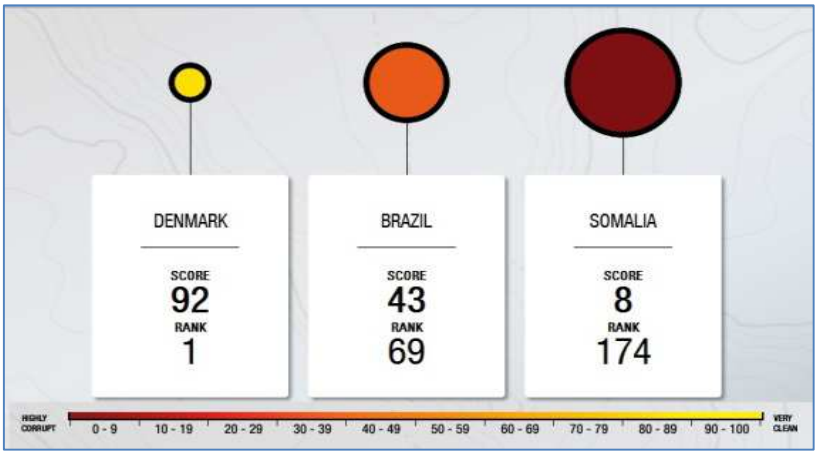
Corruption in form of patronage in not directly related to the term 'administrative corruption' but it often appears in the context. Patronage is also called favoritism or clientelism and it occurs in form of preferential treatment of firms and/or individuals by public officials regarding the compliance with government rules for the allocation of government contracts or transfer payments. The private sector counterpart consists of "*special favors*" in the form of financial rewards or professional opportunities granted to the public official involved (OECD, 2013).

3.I.2 How to measure corruption

As mentioned before, measuring corruption is not directly possible. However, it is possible to measure the perception of corruption. The most common known measure is the 'Corruption Perception Index' (CPI) Index by Transparency International (2015b). The CPI ranks countries and territories based on how corrupt their public sector is perceived to be. A country or territory's score indicates the perceived level of public sector corruption on a scale from 0 to 100, where 0 means highly corrupt and 100 very clean. A country or territory's rank indicates its position relative to the other countries and territories in the index figure 1 (appendix part I), The 2014 CPI index includes 175 countries and territories (Transparency,

2015a). A lower perception of corruption results in a higher rank on the list and vice versa. An example: in 2014, Denmark scored 92 and was thereby ranked as #1 which makes Denmark the least corrupt country in the whole world (figure 2 below). At the bottom end of the list we find Somalia with a score of 8 which makes it the most corrupt of all 175 countries (Transparency, 2015a).

Figure 2: CPI country comparison



Source: Transparency International (2015c) – Compare

According to this ranking by the Transparency International, Brazil is places as a mid-level corrupt country (figure 2 above). In 2014, Brazil (score: 43) was ranked as the 69th out of 175 considered countries (Transparency, 2015a). The evolution of Brazil's scores and ranking spots over the past years are displayed in figure 3a and 3b (in appendix). These two figures show the evolution of other emerging markets and the U.S., as well.

Between 2002 and 2008, Brazil's score dropped a few spots which indicate that the perception of corruption in Brazil has increased under this period of time.

II. Brazil and SMEs

Brazil is the 7th largest country in the world (World Bank list, 2015a) and Latin America's largest economy (Financial Times, 2014). Measured by population Brazil is with a population of more than 204 million people (IBGE, 2015) the 6th largest country in the world and the 5th largest worldwide by geographical area, according to the CIA World Factbook (2014a). In 2001, Brazil became a member of the BRIC countries. The BRIC countries is a selected group of four[3] large, developing countries – Brazil, Russia, India and China – that are considered to

[3] In 2010, they became five because South Africa joined the group, so from then on this group was called "BRICS countries".

be promising emerging markets due to their demographic and economic potential to rank among the world's largest and most influential economies in the 21st century (Global Sherpa, 2011).

3.II.1 Brazil's economy

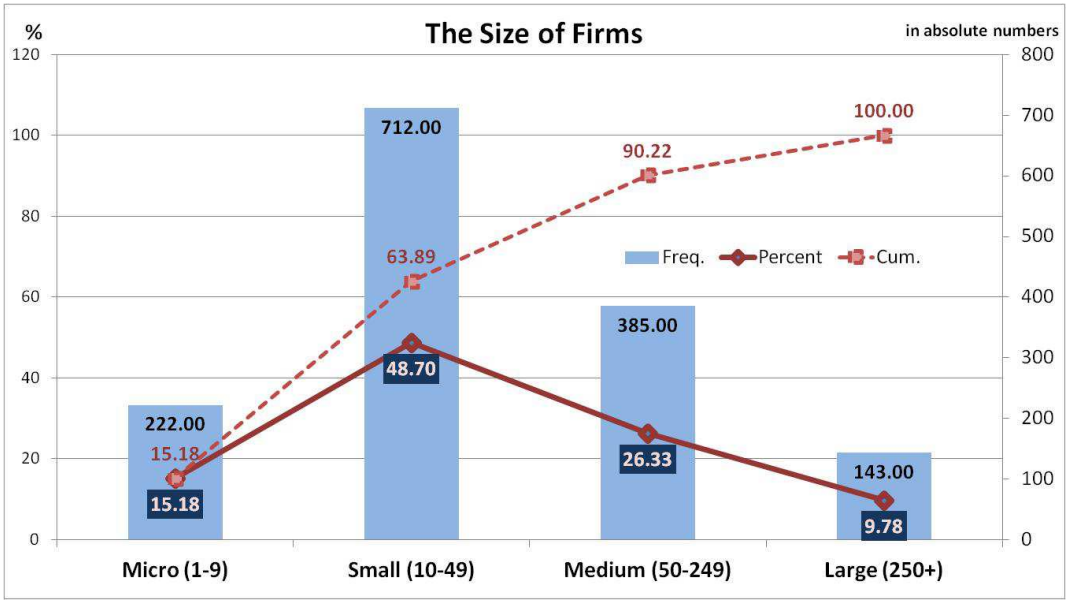
A snapshot with the some core indicators of the economy of Latin America's largest country (Financial Times, 2014) is provided by table 1 in the appendix (part I). In addition, figure 4 and 5 (also in appendix part I) will give a quick overview of Brazil's total GDP in 2007 and 2013 to show the evolution and also to set it into relation by comparing it with a selection of other countries. To get an idea of how many enterprises there are in Brazil the current information from Trading Economics (2015) displayed in figure 6 (appendix) will give a rough number. According to those numbers, there have been over 5.5 million registered businesses in Brazil in 2005. The data set from the 2009 ES survey is about the fiscal year (FY) 2007. Thus, since the trend of growth for registered firms continued for the years after 2005, according to the number of new registered enterprises in Brazil (Trading Economics, 2015), it is therefore not unrealistic to assume that in the country that has a population of more than 204 million people the number of registered businesses reached in 2007 the mark of 6 million enterprises.

Table 2 (appendix part I) gives information particularly about the different economic sectors in Brazil for the fiscal year 2011, according to the CIA World Factbook (2014a).

3.II.2 Size groups of enterprises

In this paper the firms will be assigned into four different size groups: "micro", "small", "medium" and "large" (figure 7 below), according to the definition of the OECD (2005). The OECD categorizes enterprises in micro, small- and medium-sized, and large enterprises. By definition **micro** enterprises are as those that employ less than workers, **small** companies that 10 to 49 employ workers, **medium** enterprises employ 50 to 249 workers and **large** enterprises are all those that employ 250 or more workers (figure 8 in appendix). Small- and medium-sized enterprises, short SMEs, are thus those two groups combined with a work force of 10 to 249 workers. Financial assets and annual turnovers are also used to define SMEs (OECD, 2005). However, these definitions will not be applied in this particular study. Figure 7 below and figure 9 (appendix) further show how the market shares differ between each of the size groups (IFC, 2010). As in most of the emerging economies the business landscape is shaped by very many micro and small-sized enterprises but only very few (less than 1% of all firms) large enterprises that have 250 or more employees.

Figure 7: categories of firm sizes



Source: author's computation based on the 2009 ES data set

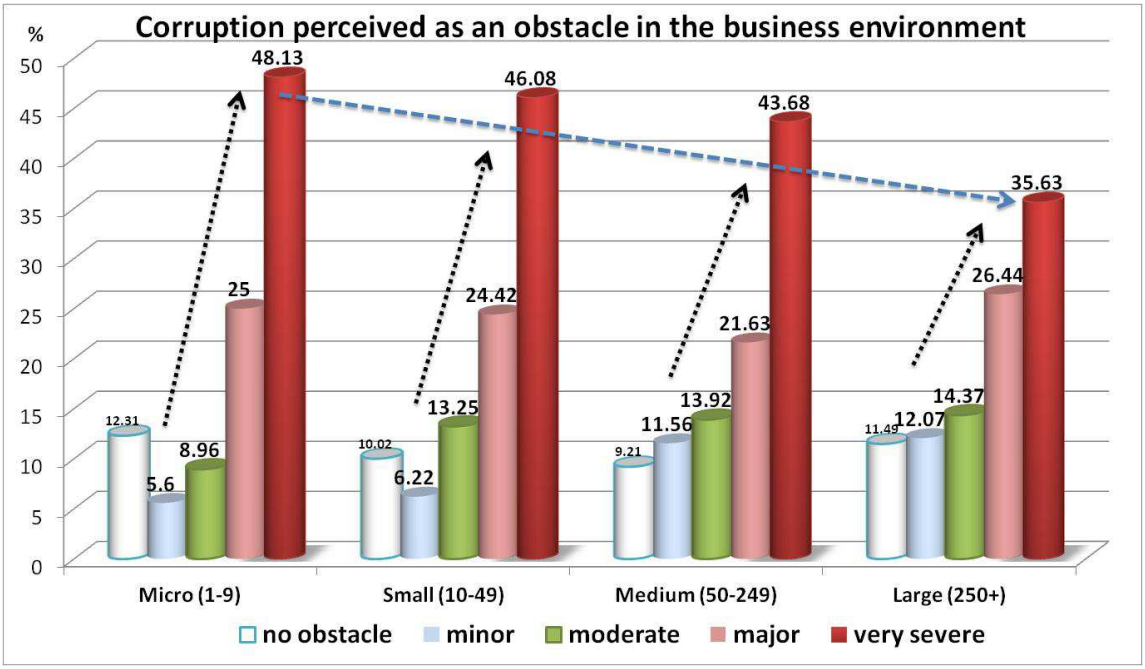
One can see in figure 7 above that small-sized enterprises are by far the biggest group and cumulated with the group of micro firms they share nearly more than two third (64%) of the market. Adding the medium-sized enterprises to make the term of SMEs complete the share rises up to 90%. This matches with the observations seen in the figure 9 (ICF, 2010) before and with the numbers in table 3 (appendix) which provide numbers on the labor occupation for each firm size. From these numbers one can tell that micro and small-sized enterprises employ the vast majority of the workforce.

III. Corruption as an obstacle for businesses in Brazil

The 2009 ES data set consists of some information on the business environment of the local firms in Brazil. Figure 10 (appendix) highlights the business climate for the firms with respect to corruption. In essence, corruption becomes more of a severe obstacle as one goes from left to right, i.e. from no obstacle at all to a very severe constraint. Figure 11 below sorts the overall numbers by firm sizes and it can be summed up by the statement: regardless of the firm size, about a quarter of the firms (22% - 26%) stated that corruption is a major constraint to their business followed by an even larger share of firms (36% - 48%) that perceives corruption as a very sever obstacle to their operating business. For micro and small-sized firms the situation seems to be extremely tough as the black arrows indicate because the percentages for major and severe obstacle responses that come from micro and small-sized

enterprises are relatively higher than for large companies. This picture slightly relaxes (blue arrow) as we go up (to the right) in size group. These results are identical to the results of Forgues (2013).

Figure 11: Corruption perceived as an obstacle, each firm size separately



Source: Author's computation based on 2009 survey data

As the numbers in figure 11 above show, companies that suffer the most from corruption are small and medium sized enterprises (SMEs). This is in line with the World Bank's evidence from the private sector and in line with the Gbetknom (2012) and Athanasouli (2012) paper and especially with the report by (Forgues, 2013). The World Bank states that small firms bear a disproportionately large share of the costs of corruption (The White House, 2015). Due to the liability of size and thereby limited resources and capabilities it is harder for small firms to avoid corruption (Gbetnkom, 2012). As a result, many SMEs simply accept corruption as a normal element of doing business and use it as a mean to '*get things done*', despite knowing that it is both illegal and that it raises the cost of doing business. However, corruption and bribery in some markets may also open doors to 'easier' and preferential investment conditions (Wang & You, 2012; Méon & Weil, 2010), which ultimately represent a dilemma for companies such as SMEs when weighing up the advantages and disadvantages of engaging in corrupt behavior.

4 THE DATA

This section 4 discusses the data of the Enterprise Survey data set (World Bank, 2009) that was used for the analysis and also the problems that unfolded as the data set was discovered more in depth.

I. General information on the survey data

The data set that is used in this particular study is an Enterprise Survey (ES) data set which is taken from the World Bank (WB). This unique ES data set is published by the WB in 2009 (Enterprise Surveys, 2014a) and the survey that was conducted in Brazil ran from May 14th, 2008 to June 19th, 2009 (Description of Brazil implementation, WB, 2011). During this time span the companies were asked questions about their fiscal year (FY) 2007.

So, to avoid any confusion, 2009 is the publishing year and 2007 is the fiscal year that the firm-level information in the survey is about. The data set contains information of more than 1,800 Brazilian firms on a variety of business-related topics. These topics are: A. "Control Information", B. "General Information", C. "Infrastructure and Service", D. "Sales and Supplies", E. "Degree of Competition", G. "Land", H. "Location", I. "Crime", J. "Corruption", K. "Finance", L. "Labor, M. "Business Environment", N. "Performance" and at the end some concluding questions about the duration of the survey, etc. (core questionnaire, 2009).

A cross-sectional data set consists of a sample of individuals, households, firms, states, etc. taken at a given point of time (Wooldridge, 2013). Since the 2009 ES data set consists of a sample of firms for a single time period (FY 2007) in 15 different states in Brazil this, i.e. it depictures a kind of snapshot of the situation in Brazil at one specific point of time, the data is categorized as **cross-sectional data**.

4.I.1 Non-responses

The Enterprise Surveys, along with many other surveys, suffer from both survey non-response and item non-response (Description of Brazil Implementation, 2009). Non-response refer to refusals to participate in the survey altogether whereas item non-responses refer to the refusals to answer some specific questions. The two local agencies had several difficulties due to the high rate of refusals when trying to get appointments for interviews. The local agencies also noted several specific questions that were difficult for firms in Brazil to answer. To give you

an example of how the lack of responses (non-responses) is noticeable in this 2009 survey, the following questions are only some of those regarding the corruption topic plus the number of responses out of 1,802 possible in parentheses:

- Among these sensitive questions was the question J6 (establishment secured or attempted to secure a contract with the government): only few firms (185 = 10.3%) were willing to answer this question.
- Question j15 (When you applied for an operating license was an informal gift requested?) was answered by only a bit more than a quarter (504 = 28%) of all respondents.
- The question j12 (when you applied for an import license was an informal gift requested?) showed also a big portion of non-responses, in fact 81% (343 replied = 19%) did not respond to this question.

During the process of the field study different strategies were used to address issues of non-responses and item non-responses (Description of Brazil Implementation, 2009).

1) Extensive efforts were made to complete interviews with each first preference establishment before contact with a replacement establishment was allowed. At least four attempts were made to contact each sampled establishment for an interview at different times/days of the week before a replacement establishment was allowed to be contacted for an interview.
2) Establishments with incomplete information on critical productivity variables including total sales, cost figures and employment levels were re-contacted in order to complete this information and minimize item non-response. However, re-contacts did not fully eliminate low response rates for some items.
3) For sensitive questions that may generate negative reactions from the respondent, such as corruption or tax evasion, enumerators were instructed to collect the *'refusal to respond'* (-7) as a different option from *'don't know'* (-9).
4) Since respondents did not have the deepest trust in the public sector also the manner of how and when the questions concerning corruption were asked in the survey was important.
    a. Questions were posed indirectly to avoid implicating the respondent of wrongdoing (Svensson, 2003), for example "*When establishments like this do business with the government, what percent of the contract value would be typically paid in informal payments or gifts to secure the contract?*",

b. Questions on corruption were asked at a later point in the survey, so that there was some time for the respondents to build up some trust to the interviewer (Svensson, 2003)
c. In the questionnaire there were multiple questions in the corruption section in order to gain a little more accuracy, correctness and security on the answers. The dataset was published in 2009, conducted in 2008 and 2009, and the questions that were asked refer to the calendar (fiscal = calendar) year 2007 and partly to the fiscal year 2004.

4.I.2 Missing values & refused responses

In the 2009 data set responses were basically counted as follows: '*Yes*' counted as a '*Yes*'; '*No*' as a '*No*', and positive value or number stayed a positive value. However, in some questions some of the firms chose to reply by ticking the box *'Don't know (-9)'* or by refusing to answer the question (*'refusals (-8)'*). In variable j7b, that was the case (see table 5 in appendix part II). 127 companies 'did not know' the answer and 22 companies did reply by choosing the 'refusal' response. The *'Don't know (-9)'* responses have been declared as missing values and with regard to the *refusals* the World Bank suggests treating them as a positive payment[4]. These necessary alterations were adopted from the Indicator Description by the World Bank (2014). The 2009 original data set consists of 1,802 observations in total. After having generated all the variables that were required for this specific study and having cleared the data sample from all observations that contained missing values in these generated variables the sample consists of 1,462 observations with no missing values (see descriptive statistics in table 4 below and table 5-8 in appendix part II).

II. Descriptive Analysis

Before taking a look at the summary statistics it is important to note that in the process of generating the necessary variables two of the main variables, *'Sales'* and *'Bribe'*, have been converted. Since both of these two variables are numerical and originally express their values in R$ (Brazilian Real) which is the local currency in Brazil, these values have been converted into US$ (US Dollar). The reason for the conversion is that US$ as a currency is applied more

[4] "This indicator ([corr4] for 'to get things done') is created from the variable j7. If either j7a or j7b is positive, then the firm is considered to pay. If the respondent answers -8, it is also interpreted that the firm pays" Indicator Description" by the World Bank (2014, p.22)

broadly and more convenient for the purpose of international comparison. The exchange rate (table 9 in appendix part II) is 1BRL = 0.56196 USD, according to XE (2015)[5].

Table 4 below provides summary statistics of the variables of interest for the entire sample and table 5 (in appendix part II) describes each variable of interest. In addition, table 6, 7 and 8 in the appendix present the summary statistics for the chosen variables of interest as well. However, these last three tables separate them into different groups. Separation in table 6, for example, means that it differentiates between the size groups of the firms meaning, i.e. it shows separately the numbers for micro, small- and medium sized (SMEs), and large firms. Table 7 separates between the companies that paid no bribes at all or less than 1% of their sales in US$ and those that paid 1% of their sales or more to corrupt public officials, and table 8 separates between firms that did not refuse to answer the bribe question and those that did.
The numbers in table 6 show some discrepancies between the firm types. In general, there is a sort of overall ranking to recognize. The average values for most of the variables such as Sales (in mio. US$), Bribes (in tsd. US$), age, trade, tax inspection and the share of time spent with governmental regulations micro enterprises have the lowest value, SMEs are placed in the middle and large firms have the largest values.
In table 7, there are only a few differences between the two payment categories compared to the whole sample (table 4 below). Interesting to see here is that the firms that pay 1% or more of their sales in unofficial payments have on average nearly three times less employees and a mean total sales amount which is far lower than that of those companies that paid less than 1% or no bribes at all. In other words, on average smaller businesses with smaller amounts of total sales paid relatively more bribes.
As explained before, the corruption topic is one of the sensitive topics and some questions regarding corruption suffer from missing responses or refusals. Table 8 provides summary statistics on 1,440 firms that did answer the bribe question (j7b)[6] and on 22 firms that chose to refuse this specific question. The results of the summary statistics of table 4 with 1,462 and the results of table 8 with all 1,440 firms that did not refuse are quite similar. If one takes a closer look at the 22 firms that refused question j7b in the 2009 ES it is striking that these firms had a considerably smaller average value of total sales (US$2.17 million) compared to

[5] The values are converted to USD using the exchange rate, according to XE.com, corresponding to the fiscal year in the survey. So the chosen date is **Dec. 31, 2007**. This particular date was chosen since in the data of the 2009 ES data set the values taken for the two main variables of interest are about the FY 2007.
[6] "total annual informal payments"

the rest 1,440 companies that have total value of (US$12.84 million). Moreover, these 22 firms had on average only half of the work force than the other firms had.

Table 4: summary statistics

Sum.Stats.	Variable	Mean	Median	Std.Dev.	Min	Max
Total	**Employees**	140.41	30	465.1627	1	6,500
(N = 1,462)	**Sales (R$)**	22,600,000	1,200,000	91,200,000	1,200	1,010,000,000
	Sales (US$)	12,700,000	674,352	51,300,000	674	569,000,000
	Sales (in mio US$)	12.68	1	51.2753	0.00	569.49
	(log)Sales	13.51	13	2.5656	7	20
	Bribe (R$)	15,490	0	97,263	0	1,500,000
	Bribe (US$)	8,705	0	54,658	0	842,940
	Bribe (in tsd. US$)	8.70	0	54.6581	0.00	842.94
	Bribe/Sales (in %)	0.50	0	2.9450	0.0	56.2
	Size	2.31	2	0.8442	1	4
	Age	19.70	15	16.3385	1	127
	Sector	1.39	1	0.7240	1	3
	Region	3.51	4	1.1652	1	5
	Trade	0.22	0	0.4146	0	1
	Tax inspection	0.49	0	0.5001	0	1
	Gvt.regul. (% of time)	19.38	10	20.8345	0	100
exchange rate (Dec 31,2007)	1R$ = 0.56196 US$					

Source: author's computation based on the 2009 ES data set

Table 10a below (enhanced table 10b in the appendix) shows the correlation matrix between the selected variables. In this correlation matrix one can see in the row for 'Bribe (in tsd. US$)' that there is a small but positive relationship between firm sales and informal payments.

Table 10a: Correlation matrix

# of obs. = 1,462	Employees	Sales (in mio US$)	(log)Sales	Bribe (in tsd. US$)	Bribe/Sales (in %)	Size	Age	Sector	Region	Trade	Tax inspection	Gvt.regul. (% of time)
Employees	1.0000											
Sales (in mio US$)	0.5592	1.0000										
(log)Sales	0.3651	0.4792	1.0000									
Bribe (in tsd. US$)	0.0143	0.0029	0.1257	1.0000								
Bribe/Sales (in %)	-0.0331	-0.0364	-0.0319	0.4755	1.0000							
Size	0.4733	0.3679	0.5811	0.0964	-0.0376	1.0000						
Age	0.3202	0.3169	0.3263	0.0597	0.0159	0.3441	1.0000					
Sector	-0.0470	-0.0378	-0.0654	-0.0085	0.0035	-0.1042	-0.0906	1.0000				
Region	0.0209	-0.0090	0.0105	0.0051	-0.0381	0.0195	0.0397	-0.0894	1.0000			
Trade	0.2269	0.1784	0.3993	0.0686	-0.0441	0.3933	0.2559	-0.1426	0.1038	1.0000		
Tax inspection	0.2031	0.1648	0.2125	0.0504	-0.0130	0.2522	0.1711	0.0017	-0.0569	0.1195	1.0000	
Gvt.regul. (% of time)	0.1146	0.1219	0.1513	0.0882	0.0448	0.1697	0.0564	0.0090	0.0231	0.0828	0.1026	1.0000

Source: author's computation based on the 2009 ES data set

5 EMPIRICAL FRAMEWORK

The previous section 4 introduced the data that will be used in this section 5 for the empirical analysis that lies behind this thesis. Part I of this section discusses the Ordinary Least Squares (OLS) method for both the bivariate and the multivariate model. Part II deals with the Two Stage Least Squares (2SLS) approach which makes use of an instrumental variable (IV). For the bivariate OLS regression in the first part the two main variables, the dependent variable *'(log)Sales'* for firm performance and the independent (explanatory) variable *'Bribe'* for administrative corruption, are presented. After that follow the regression models which are expanded to a multivariate model including additional variables in the function of control variables. Part II is about the IV method that allows us to further address the endogeneity concerns since with this method consistent estimation are possible as the main explanatory variable is correlated with the error term. The associated regression results will be presented at the end of each part. A comprehensive discussion of those results follows in section 6.

I. Ordinary Least Squares (OLS) approach

As described above, this first part will start with the bivariate relationship between *'(log)Sales'* and *'Bribe'*, followed by the method that implements control variables.

5.I.1 The relationship between Bribes & Sales

The literature review in section 2 has already shown that there are a number of papers that have established a significant relationship between the informal payments and the performance or growth of firms (see Gnbetknom, 2012, Wang & You, 2012, etc.). The results that were found support both sides of the argumentation, on the one hand for the proponents that say the more a company bribes the public officials the better off will the company ultimately be (Leff, 1964 & Huntington, 1968), and on the other hand for the critics that claim that firm performance and growth decrease with the level of corruption (see Mauro, 1995). The relationship that is often found between bribes and firm sales is very interesting because, as mentioned in section 1 and 3, corruption poses in most parts of the world an obstacle that the firms, regardless of their size, have to deal with in their daily business and this issue needs to be addressed. Interesting to find out is if bribe payments propel the sales for firms or if they act the other way, i.e. they lower the firms' sales. Corruption is a special factor that most likely may alter the business environment for companies as seen in section 3 plus it is a factor that varies across nations or even regions (see Kochanova (2012) paper for country difference

and Wang & You (2012) paper for regional difference). In most countries and especially in the emerging economies, such as Brazil or China, it appears to be a severe concern that the local firms cannot really avoid. The question to ask is therefore how much of an influence is the request for informal payments or gifts to public officials for the firms' performance.

General modeling

In Section 3, it is mentioned that the information in this ES data set (WB, 2009) is in essence a sort of 'snapshot' of the situation in Brazil at one point of time (FY 2007). Hence, the data is cross-sectional data and the econometric analysis will therefore be a **cross-sectional analysis**.

The general modeling is set up in form of the **Ordinary Least Squared (OLS)** method and the **baseline regression model** that is defined as a log-level regression model such as:

$$\log(Sales_i) = \beta_0 + \beta_1(Bribe_i) + u_i \qquad (1.0)$$

The OLS method enables us to obtain results for the linear causality between the dependent and independent variables. It delivers the shortest distance between the y_i values and the fitted values $\hat{y}$ of the OLS regression line since this method minimizes the sum of squared residuals (Wooldridge, 2013). Having transformed the dependent variable '*Sales*' into a logarithmic variable *'(log)Sales'* allows us further to interpret changes in (*y*) total firm sales as 'percent changes' rather than the absolute changes (Wooldridge, 2013). The ideal OLS model produces the best linear and unbiased estimator (BLUE) if all four Gauss-Markov assumptions (G.-M. AS)[7] are satisfied.

In this study, however, we do not expect the OLS model to be ideal since we usually assume that the not all of the Gauss-Markov conditions are met. That is, we have to deal with certain issues such as heteroscedasticity (AS #2 violated), serial correlation (AS #3) or endogeneity (AS #4)[8].

Violation of assumption #2: we assume that the variance of the error terms is not constant and finite across the observations, i.e. $\text{Var}(u_i) \neq \sigma^2 < \infty$. The null hypothesis of homoscedasticity is thus not expected to hold. That is, we assume that the error terms are heteroskedastically distributed. Having conducted the White's test for heteroscedasticity (figure 12 in appendix part II) we obtain a p-value of 0.0010. As a result we can reject the null

[7] The Gauss-Markov assumptions are explained in the appendix (part II).
[8] We assume that a violation of assumption #1 is not an issue since we expect linearity in the parameters.

hypothesis of constant variance in error terms at a 95% confidence level, i.e. heteroskedastically distributed error terms. Our prior made assumption of heteroscedasticity has thereby been confirmed. To address the issue of heteroscedasticity we apply the robust standard error (S.E)[9] estimator throughout the entire analysis which will produce consistent estimates.

Violation of AS #3: serial correlation or autocorrelation is a threat if the data is time series data or panel data. Since this thesis uses only cross-sectional data with only one time dimension serial correlation is not an issue in this case.

Violation of AS #4: endogeneity, however, is a serious threat in this analysis since there is a great chance that the regressor is correlated with the error term. We will focus on that somewhat later in this study.

The dependent variable (DV)

The first key variable in our model presented in equation (1.0) is *'(log)Sales'*. It is the dependent variable and the indicator for the firm performance which is measured by the 'total annual sales in fiscal year 2007' (variable 'd2').

Firm sales were chosen as the most appropriate indicator for firm performance for a few reasons. First of all, if one considers all the possible firm variables available in the ES data set (WB, 2009), firm sales is the best choice for an indicator of performance. *'Sales'* is the most appropriate indicator in this case because other performance indicators such as cash flow, for instance, are not covered in this particular WB data set. Total sales or revenue are considered to be one of the key economic indicators for especially firms that belong to the retail business sectors and manufacturing (AAII, 2015) as it is the case here. Second of all, the World Bank, too, uses 'total firm sales' and 'growth of firm sales' as an indicator for firm performance (Indicator Description, 2014b). Third reason is, a number of papers in the literature have also chosen firm sales as an indicator for firm growth or its performance (Gnbetkom, 2012; Anthanasouli et al., 2012; etc.).

In our sample we had to leave out some observations because they were identified as outliers. Two values of total firm sales that lay above an upper bound of US$990 million were declared as such outliers and winsorized as a consequence of cleaning the data set.

Ultimately, the variable firm sales was transformed into logarithmic values so that we obtain the final variable named *'(log)Sales'*. As explained before, a log transformation provides changes as percent changes rather than absolute changes in the DV (Wooldridge, 2013). The advantage of using relative changes is that the effect of administrative corruption on firm

[9] See also appendix part II for the calculation of the standard errors.

performance is thereby more easily to compare to other countries (Anthanasouli et al., 2012 and Wang & You, 2012).

The independent variable (IDV)

The second main variable is the explanatory variable in equation (1.0) and named *'Bribe'*. It is a proxy for administrative corruption and '*Bribe'* consists of information to the "head question" j7 in the survey[10]. In the 2009 ES survey firms were asked to answer the question (j7) by either responding in percentage (j7a[11]) or in absolute values (j7b[12]) which we have seen in section 4 already. According to the "Indicator Description" by the World Bank (2014, p.22; also provided in the appendix part III), these two options are labeled together as the "percentage of firms expected to give **gifts to public officials to 'get things done'**" and fortunately all of the 1,802 did answer that question by one of the two options (185 to j7a & 1,617 to j7b). Unfortunately, however, not all of them stated a real value, as we have seen in section 4 before.

In the process of generating the final variable *'Bribe'*, this study followed the suggestion of the World Bank by assigning the refusals to a value for their payment. The trouble is, however, that the true value of bribe payment for this group of firms is obviously unknown. Therefore the bribe payments of these 22 firms were assigned to a fairly small fraction (1%) of their sales in US$[13]. The variable '*Bribe'* is essentially created by variables j7a and j7b and for the amounts stated in j7a some rearranging with a prior generated sales variable was necessary to compute the total amount of bribe payments accordingly. Having rescaled this variable, the numbers for '*Bribe'* show the total amount of annual informal payments in thousands of US$. As for the DV, outliers were winsorized in the generating process of the explanatory variable, too. One outlier with a value above the upper bound of US$1.6 million and two outliers with a $\frac{Bribe}{Sales}$ ratio of more than 100% were winsorized.

[10] Question j7 says: *"It is said that establishments are sometimes required to make gifts or informal payments to public officials to "get things done" with regard to customs, taxes, licenses, regulations, services etc. On average, what percentages of total annual sales, or estimated total annual value, do establishments like this one pay in informal payments or gifts to public officials for this purpose?"*

[11] "% of total annual sales paid as informal payments"

[12] This variable "total annual informal payments" was introduced earlier.

[13] Note that 1% of their sales measured in US$ means 1.7795% of their sales measured in R$, according to the exchange rate (table 7 in appendix part I) mentioned prior in section 4.

Calculation: $\frac{1}{0.56196} = 1.77950\ {}^{BRL}/_{USD}$

5.I.2 Results of bivariate OLS model

Table 10 below shows the results of the bivariate OLS regression for the case considering all firms in the sample as well as for all firms excluding those that refused to respond.

Table 10: OLS regressions with the bivariate model

Dependent Variable: (log)Sales		
method	**OLS**	
	(1)	**(2)**
	All Firms	no refusals
Bribe	0 .0059***	0.0056***
	[0.0011]	[0.0011]
	(5.27)	(5.23)
C	13.457***	13.480***
	[0.0680]	[0.0684]
	(197.82)	(196.87)
N	1,462	1,440
R-squared	0.0158	0.0144

The robust standard error is in the bracket.
The t-statistic is in the parantheses.
* p < 0.1, ** p < 0.05, *** p < 0.01
One unit in *'Bribe'* is = US$1,000
column (1) is the baseline regression from equation (1.0)
column (2) is the baseline regression excluding the firms that refused to respond to the question (j7b)

Source: author's computation based on the 2009 ES data set

We have shown in table 10 above that the results are statistically robust. Furthermore, the estimated relationship between firm sales and bribe payments is statistically highly significant. Table 10 displays both the value for the bribe coefficient for the entire sample in column (1) (0.0059) and the value for the group of firms without the refusals in column (2) (0.0056). For example, a one-standard deviation increase in informal payments (about US$54,600, see table 4 above) is associated with additional total firm sales by 0.59%, i.e. US$322.

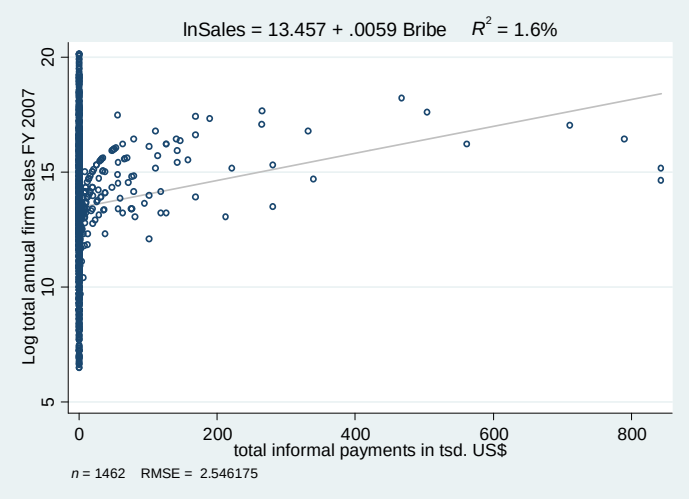
Table 11 in the appendix (part II) even displays additional regression results for the firms that paid no or a little bribes (where 'little' means less than 1% of their sales) and for the firms paying relatively more bribes ('relatively more' means 1% or more of their sales)[14]. In a third column the latter regression is repeated but without including the 22 refusal firms.

[14] See also table 5 (appendix part I) for more information on the shares of little and more bribes.

This table 11 shows that there is a difference in the size of the bribe coefficient between the different payment groups. The companies that pay an amount of informal payments which is less than 1% of their sales experience a significant increase in their total sales by 1.73% compared to an increase in total sales of 0.71% which is 1.2 percentage points smaller for the firms that pay a larger share of their sales in bribes. The difference between the effects of the two groups is even bigger with 0.63% if we leave out the 22 firms that refused to answer the corruption questions. In short, firms that paid relatively more bribes experience a relatively lower increase in their total amount of annual sales compared to those that paid only a little of no bribes at all.

Figure 13 below underlines the correlation between corruption and firm performance. The figure highlights the positive relationship between the dependent variable '*(log)Sales'* and the main independent variable '*Bribe'* in form of the straight grey line added to the actual dots (slope value of 0.0059 from the sample of 1,462 firms), i.e. overall the firm sales increase with informal payments.

Figure 13:
Scatter plot plus line of fitted values $\hat{y}$



Source: author's computation based on the 2009 ES data

The bivariate OLS model displayed in equation (1) is not the ultimate model since it produces biased and inconsistent estimates as it violates the Gauss-Markov assumptions. There are most likely other explanatory variables hidden in the error term which means the model might be vulnerable to endogeneity. Endogeneity means that in the bivariate model the correlation between the two main variables, '*(log)Sales'* and '*Bribe'*, might be likely biased because the

explanatory variable, '*Bribe'*, is also correlated with the error term (u_i). Causes for endogeneity can be a) measurement error, b) simultaneity and/or c) omitted variable bias.

Cause a), ***measurement error***, which is also sometimes called the error-in-variance bias, is defined as the difference between a measured value of quantity and its true value. The measurement error consists of two parts, the systematic error which always occurs with the same value, and the random error which may vary across the observations (Wooldridge, 2013). Measurement error is a serious threat in this particular study because, as we have seen before in section 4, many firms were not willing to answer certain questions of the corruption topic. Besides that, there is the risk that firms which answered the questions might not have told the truth and thereby might have misreported meaning that these companies did not state the correct amount of bribes that they actually paid. Instead, they might have reported a lower amount of bribe payments or just zero bribes paid because the firm was afraid of the consequences of truth telling. It is quite striking that more than 80% of the firms captured in this very data set reported the amount of zero informal payments but at the same time the share of firms complaining that corruption is a major or even severe constraint to their businesses is more than two third (68.6%) of 1,452 firms (figure 10 in appendix part I).

In terms of possible reason b), simultaneity or "***reverse causality***", there is certain likelihood for the relationship, *(log)Sales – Bribes*, that the causality is acting in the opposite direction (visualized by the added dashed arrow in equation (1.0) below). Reverse causality means that the DV (*y*) and the independent variable (*x*) are determined simultaneously (Wooldridge, 2013).

$$\log(Sales_i) = \beta_0 + \beta_1(Bribe_i) + u_i \qquad Bribes_i \; affect \; log(Sales_i) \quad \textit{And vice versa?} \qquad (1.0)$$

If the DV '*(log)Sales'* and the regressor '*Bribe'* are determined simultaneously, or in other words if there is a 'loop of causality' between these two variables, then, as Svensson (2003) stressed out, it would mean that not only bribe payments affect the firm sales but also that firms with higher sales are requested to pay a higher amount of bribes to public officials. Furthermore, a 'loop of causality' would also imply a time dimension which means that the effect of one variable on the other is only visible in the following time period. For example, the bribes paid in t1 affect the firm sales in t2. The same holds for the effect going the opposite direction, higher firm sales in t1 will most likely go hand in hand with higher requests for more gifts and higher facility or informal payments than in the periods before.

Suppose a tax official recognizes that the company he requested gifts from experienced a remarkable increase in its revenues, he will probably ask for higher informal payments in the next period. However, we have to bear in mind that for this particular paper the data set on Brazil provided by World Bank (2009) does unfortunately not incorporate a second time dimension for our variables of interest. We therefore have to stick with the cross-sectional analysis. Yet an effect of bribes on sales might already happen in a shorter time period than a fiscal year, perhaps within a few month or weeks. If, for example, a firm bribes a public official at the beginning of the FY to get an important license somewhat earlier and it succeeds then the company will be able to make more sales in that very FY meaning the sales figures for that very FY will increase due to the bribes paid in the same period. Thus bribe payments might have an effect on the number of total sales in the same time period.

Explanation c) for endogeneity, ***omitted variable bias***, suggests that the OLS estimator $\hat{\beta}_{OLS}$ is biased due to the fact that the bivariate model incorrectly leaves out at least one other important factor which determines both the dependent variable and the independent variable. The bias in the model is created when the model compensates for the missing factor by **over- or underestimating** the effect of one of the other factors (Wooldridge, 2013). As pointed out before, it is most likely that the bivariate model presented in equation (1.0) does not fully account the effect of corruption on firms' performances. Therefore there are probably more variables in the data set that are not taken into account yet but do significantly influence this relationship in a certain way. To address this particular problem there are a few options: i) use panel data instead of cross-sectional data ii) control for other variables, and iii) instrument variable (IV) estimator.

i) **Using panel data** instead might help since one has at least two time dimension, t0, t1, t2, etc. for instance, with which one could check for the effect to happen in the following time period(s). As explained above, this would imply that we either already have a panel data set which, we do not in this case, or that we have to take an entire new data set which is a panel data set, i.e. a data set where each entity (individual or in our model firm) is observed more than once.

ii) **Adding control variables** is, however, possible with the ES data set (WB, 2009). A control variable should be a determinant for the DV, *'(log)Sales'*, and also be correlated with the independent variable, *'Bribe'*.

iii) Using an **instrument variable** is theoretically a second possible alternative with this data set, too. Using a suitable variable (z_i) as an instrument for '*Bribe*' might help to

further address the endogeneity concern. We will, however, come back to this idea in part II of this section. In the next step, the focus is on the variables that will be added as controls.

5.I.3 The multivariate OLS model

Picking up the bivariate model from equation (1.0) we add a few control variables that have been selected prior. The result is the new **multivariate OLS regression model** which is defined as:

$$\log(Sales_i) = \beta_0 + \beta_1(Bribe_i) + \beta_2(age_i) + \beta_3(trade_i) + \beta_4(tax\ inspections_i) + u_i \quad (2.0)$$

In equation (2.0) one can see the three controls that have been chosen are: 1) the age of the firm, 2) whether or not the firm trades through in-/direct exports, and 3) if the enterprise has been inspected by tax officials within the last year. Next, each of the control variables will be discussed in two ways. First, it will be explained how the coefficient of interest $\beta_1(Bribe_i)$ is expected to change as the control is included in the regression. Second, by looking at the results of the multivariate regressions it will be discussed if the change in $\hat{\beta}_{Bribe}$ happened as it was expected prior.

The selection of controls[15]

Age:

The reason to include this variable is that the summary statistics show that the age of firms has a huge range (from 1 yr. to 127 yr.). The youngest firm in our sample is 1 year and the oldest is 127 years old, whereas the median indicates that 50% of the companies are below and the other half above the age of 15 years (see table 4 above in section 4). Thus the probability that there are differences in bribe payments is relatively high.

The relationship between '*Bribe'* and the age of firms is expected to be *negative*, i.e. the older a firm is the less does it have to pay. For example, older companies might benefit from more years of experience in the business meaning that they benefit from their knowledge of how to calculate or expect certain factors that create trouble or uncertainty such as necessary informal payments to corrupt public officials (Wang & You, 2012) to get their things done easier. Older firms may have already established a relationship to public officials which may

[15] A more detailed description of how the control variables are generated is provided in the appendix (part I).

ultimately benefit both sides. Younger firms that have less experience in the market on the other hand might be more prone to bribe requests from public officials which will result in higher amounts of informal payments. This point would be in line with the statement of Gnbetknom (2012) who says that young firms are more likely to pay proportionally higher bribes than older ones or the ones that are longer in the business/market.

The relationship between sales and age is expected to be *positive*, i.e. the older a firm is the higher will the sales or profits be. Table (appendix part II) confirms this assumption. Firms that are longer present in the market may probably know the rules of the market better. Perhaps older firms are also more established and resistant to shaky ground in the business environment. Since we have a negative and a positive effect we expect the effect on the bribe coefficient, according to the multiplication rule, to be *negative*. This means that the variable '*Bribe'* incorporates to some extent the negative effect of the variable 'age'. That is, the bribe coefficient value will go *up* as we include this variable.

Trade:

The relationship between bribes and trade is expected to be *positive*, i.e. if a firm exports directly or indirectly then it will probably have to pay more in bribes. Trade is defined by firm exports (see definition in appendix part II). This firm characteristic is adopted from Svensson (2003). Thus, more trade means more indirect or direct exports which go hand in hand with more regulations, forms to fill out, more visits at public offices, etc. As a consequence, this creates also more opportunities to small facility payments in order to skip some annoying waiting lines or tariff controls, for instance.

The relationship between sales and trade is also expected to be *positive*, i.e. exporting firm will obtain higher sales compared to those that do not trade. If the firm exports (in-)directly in some way the total sales will be higher compared to firms that do not sell to foreign business partners. Higher amounts of total sales might be explained by a wider range of costumers that can be reached by export. Trade provides possibilities to reach not only national clients which can have many up-sides for the firm that exports such as growing independency from the domestic market situation.

Having two positive effects we will expect that the variable '*Bribe'* incorporates to some extent the *positive* effect of the variable '*trade'* which would mean that the value of the bribe coefficient goes *down*, i.e. decreases.

Inspections by tax officials during the last 12 month

The relationship between bribes and tax inspections is expected to be *positive*, i.e. if a firm was lately inspected by tax officials it probably had to pay higher bribes than a firm that was not inspected within the last 12 month. Suppose a firm was inspected by tax officials during the last 12 month the probability is high that the public officials have requested any type of gifts or informal payments in the meeting if the firm wanted to get things done quicker. In a country like Brazil where the firms report that corruption is one of the biggest obstacles to their business operations (figure 10 appendix part II) this scenario is not unrealistic.

The relationship between sales and tax inspections is also expected to be *positive*, i.e. an inspected firm will obtain higher sales compared to those that were not visited by tax officials. This third case is similar to the previous one since variable '*Bribe'* incorporates to some extent the *positive* effect of the variable '*tax_inspec*'. We therefore expect that the value of the bribe coefficient *decreases* in this case, too.

Other potential controls:

Other controls such as a) the qualification the senior manager or CEO of the firm, b) firm's losses due to informal sector competitors or c) the aggregated level of infrastructure would have been presumably helpful as control variables. However, the 2009 ES data set does not contain data to these controls. The first one a), educational qualification, might be a factor decisive factor since it could affect both, the firm sales and the amount of bribe payments. The second control, competition with firms in the informal sector selling the same product or substitutes. This control would be most likely affect the firm's sales and also the bribe payments in order to get rid of these informal competitors or to be able to keep up with them. And the third control that would be helpful to have but that the 2009 data set does not cover is a measure of the overall level of infrastructure that takes into account the water, electricity, communication (tel. and internet), quality of roads and facilities etc. All these are small factors that combined may well have an effect on firm sales and especially on the informal payments.

Not having proper data about these controls leads to the fact that we leave out a great amount of explanatory power.

Lastly, also an interesting idea would be to control for a new generated variable for bribe squared (*'Bribe'*'Bribe'*). It would be interesting to investigate how the slope of the line for fitted values changes as the amount of bribe payments increases. Bribe-squared could reveal an inverted U-shaped form of the connection between sales and bribes which means a rapid

increase in sales as bribe payments are relatively small, followed by a slowed down increase or nearly a stagnation of sales increase as the bribe payments get relatively bigger (slope almost zero) and as the bribe payments get relatively large even a decrease the firm sales.

Fixed Effects (FE)

The **intuition behind this fixed effects** approach is to account for the unobserved heterogeneity related to these specific individual effects.

The reasoning behind this could be explained as that there are specific individual firm differences across areas or business sector, for instance, which are related to trade and tax inspections. Maybe firms in a region that is close to the Atlantic Ocean (NorthEast, SouthEast and South) export more directly because the near to the harbor creates an opportunity for them to do so. And that is better as compared to those firms that are located in the middle of the Amazon rural area. So, firms trading more might be paying more unofficially. Perhaps this is also true for firms located near the Amazon (North), but to a smaller extent, and in Central-West the extent is even less than that.

This is essentially what fixed effects estimators can do. They allow us to utilize the 'within' variation to 'identify' causal relationships. Using a dummy variable in a regression for each region (or sector group, or firm size type to generalize beyond this example) basically *holds constant* or *'fixes' the effects* across regions that one could not directly measure. Controlling for these differences removes the effect of those time-invariant characteristics so that one can assess the ‘net effect’ (Wooldridge, 2013). The remaining variation, or 'within' variation, can then be used to 'identify' the causal relationships we are interested in.

Region fixed effects:

$$\log(Sales_i) = \beta_0 + \beta_1(Bribe_i) + \beta_2(age_i) + \beta_3(trade_i) + \beta_4(tax\ inspections_i) + \beta_5(region\ FE_i) + u_i \quad (2.1)$$

Sector fixed effects:

$$\log(Sales_i) = \beta_0 + \beta_1(Bribe_i) + \beta_2(age_i) + \beta_3(trade_i) + \beta_4(tax\ inspections_i) + \beta_5(sector\ FE_i) + u_i \quad (2.2)$$

Firm size fixed effects:

$$\log(Sales_i) = \beta_0 + \beta_1(Bribe_i) + \beta_2(age_i) + \beta_3(trade_i) + \beta_4(tax\ inspections_i) + \beta_5(size\ FE_i) + u_i \quad (2.3)$$

All fixed effects together:

$$\log(Sales_i) = \beta_0 + \beta_1(Bribe_i) + \beta_2(age_i) + \beta_3(trade_i) + \beta_4(tax\ inspections_i) + \beta_5(region\ FE_i) + \beta_6(sector\ FE_i) + \beta_7(size\ FE_i) + u_i \quad (2.4)$$

Region (fixed effects):

Wang & You (2012) found out that there are differences between regional business environments in terms of corrupt influences the bribe payments i.e. informal payments differ between different areas. For the data on Brazil, which is the 5th largest country worldwide measured by geographical area, the chance that the region where the firm is located matters in the sense that they are located rural and urban (Amazonas vs. Rio) is high. It would not be unrealistic to assume that firms in the rural region "North" around the Amazonas pay a different amount of bribes compared to firms in the urban "SouthEast" which is also the region where the biggest cities in Brazil such as São Paulo, Rio de Janeiro and Belo Horizonte are located (Brazil.org, 2015). Presumably bigger cities are more likely to have more public officials than, for instance, areas which are more rural and that does have smaller towns. So, on the one hand the chance than a company has to deal with an official who shows corrupt behavior might be higher in bigger cities than in a small town. On the other hand, however, for companies in a small town it is harder to avoid a corrupt public official due to the lack of alternatives which puts the firms in a dependent position.

Sector (fixed effects):

The service sector accounts for 68% of the Brazilian GDP and is thereby by far the largest share (table 2 in appendix part I). The service sector which main product is the financial service occupies also the vast majority (71%) of the Brazilian labor force. Just over a quarter (26%) of the entire Brazilian GDP is done by the industry sector. 13% of labor occupation are no surprise since the industry sector is not the most labor intensive sector. The paper by Anthanasouli et al. (2012) has found that effects of corruption on firm performance are likely to vary between different business sectors. This is in line with the findings of latest the OECD bribery report (2014c) that say corruption happens to be across all sectors to a different scale. These are reasons to control for sector in this analysis, too.

Firm size (fixed effects):

Firm size is a categorical variable measured by the number of employees. As figure 7 in 3.II.2 already shows, there are considerable differences between the four size groups. It makes therefore sense to assume that the size matters not only for the total amount of firm sales but also for the amount of informal payments to corrupt officials. The Inter-American Development Bank (IADB) report (Aterido et al., 2007) pointed out in their paper that the costs of corruption are proportionally higher for micro enterprises and SMEs than for large ones (Ayyagari et al., 2005). So, this thereby just confirms my assumption of differences in bribe payments for different sizes of firms. The two size groups, small and medium, have been grouped together to SMEs so that it is in line with the information on SMEs in Brazil we have seen before.

5.I.4 Results of multivariate OLS

Table 14 below and table 15, 16a-16c (appendix part I) show the results of the multivariate OLS regressions. By adding a selection of control variables we attempt to address the problem of omitted variable bias.

In table 14 below we show that all of the results from the multivariate regression models are statistically robust. Furthermore, we can proof that even if we control for additional variables and if we control for various fixed effects the estimated relationship between firm sales and bribe payments remains still statistically highly significant. Column 3 in table 14 and 15, respectively, displays the value for the bribe coefficient including all control variables (for the entire sample: 0.0039, and for the group of firms without the refusals: 0.0036). Tables 14 and 15 (in column 4, 5 and 6) show results to regressions that control for these variables plus that also control for different fixed effects (for the entire sample: 0.0029, and for the group of firms without the refusals: 0.0028). Table 22 (appendix part II) accounts for all controls and all fixed effects together (for the entire sample: 0.0029, and for the group of firms without the refusals: 0.0027). Thus, if one controls for all control variables and fixed effects a one-standard deviation increase in informal payments (about US$54,600, see table 4 above) is associated with additional total firm sales by 0.29%.

Table 14[16]: results of the multivariate regression model

Dependent Variable: (log)Sales

all firms

	(1)	(2)	(3)	(4)	(5)	(6)
model		**(2.0)**		**(2.1)**	**(2.2)**	**(2.3)**
Control for:	**age**	**trade**	**tax. insp.**	**region FE**	**sector FE**	**size FE**
Bribe	0.0050***	0.0042***	0.0039***	0.0039***	0.0039***	0.0029***
	[0.0011]	[0.0010]	[0.0010]	[0.0010]	[0.0010]	[0.0008]
	(4.50)	(3.92)	(3.96)	(3.98)	(3.95)	(3.84)
age	0.050***	0.037***	0.034***	0.035***	0.034***	0.021***
	[0.0039]	[0.0039]	[0.0038]	[0.0039]	[0.0038]	[0.0033]
	(12.85)	(9.44)	(8.83)	(8.93)	(8.91)	(6.38)
trade		2.060***	1.995***	1.988***	2.008***	1.513***
		[0.1403]	[0.1380]	[0.1382]	[0.1392]	[0.1322]
		(14.68)	(14.45)	(14.38)	(14.42)	(11.44)
tax inspections			0.681***	0.725***	0.692***	0.394***
			[0.1198]	[0.1195]	[0.1202]	[0.1136]
			(5.69)	(6.06)	(5.76)	(3.47)
fixed effects				**North**	**Manufacturing**	**Micro (1-9)**
				[omitted]	*[omitted]*	*[omitted]*
				North-East	**Service**	**SMEs (10-249)**
				-0.260	0.330*	1.321***
				[0.2713]	[0.1906]	[0.1530]
				(-0.96)	(1.73)	(8.63)
				Central-West	**Other**	**Large (250+)**
				-0.807**	-0.081	3.638***
				[0.3428]	[0.1792]	[0.2648]
				(-2.35)	(-0.45)	(13.74)
				South-East		
				-0.838***		
				[0.2724]		
				(-3.08)		
				South		
				-0.074		
				[0.2728]		
				(-0.27)		
C	12.474***	12.288***	12.029***	12.503***	11.989***	11.193***
	[0.0953]	[0.0915]	[0.0992]	[0.2639]	[0.1084]	[0.1449]
	(130.82)	(134.20)	(121.22)	(47.37)	(110.58)	(77.21)
N	1,462	1,462	1,462	1,462	1,462	1,462
R-squared	0.1178	0.2210	0.2380	0.2555	0.2397	0.3353

The robust standard error is in the bracket.
The t-statistic is in the parantheses.
* p < 0.1, ** p < 0.05, *** p < 0.01
One unit in *'Bribe'* is = US$1,000

Source: author's computation based on the 2009 ES data set

By controlling for the different factors the bribe coefficient decreased in all the cases where the control variable was significantly correlated with the main regressor, '*Bribe'*. So the expectations made earlier are confirmed. The extent to what the bribe coefficient $\hat{\beta}_1^{Bribe}$

[16] The results for the regressions excluding the 22 refusals are shown in the appendix (part I).

was lowered differs, however, from control to control. For example, including the control 'size' decreased the coefficient from 0.50% to 0.29% (table 14). Moreover, the results in table 14 column (4) & (5) indicate that the bribe coefficient has not changed as we control region and sector. In terms of region and sector the model controlled for fixed effects.

A decrease in the value of the coefficient from 0.50% for the whole sample down to 0.29% further indicates that the effect of informal payments on firm sales shown in the bivariate model of equation (1.0) before was overestimated. Some of the effect on firm sales which is caused by other determinants that were hidden in the error term (u_i) in the bivariate model was apparently captured by the bribe coefficient.

Table 16a-16c show separately the results for the regressions that only control for the fixed effects of the categorical variables '*region*', '*sector*' and '*size*'. Striking here is that the coefficient values are the smallest in table 16c, i.e. as we control for size fixed effects.

Table 22 in the appendix displays the results for the regressions that are described in equation (2.4), i.e. for all fixed effects together.

II. 2SLS-IV approach

Part II of this section 5 introduces the IV approach. As mentioned earlier, this might be possibility d) this approach may help to further address the endogeneity concern. Having included the control variables that were selected the multivariate model in equation (2.0) and having controlled for fixed effects in equation (2.1) – (2.4) might not have entirely addressed the endogeneity concerns.

5.II.1 The instrument variable (IV) strategy

In practice, the endogeneity problem is usually the biggest problem of this Gauss-Markov assumption (appendix part II). Using the OLS method from equation (1.0) on our sample we obtain a value for our slope or population parameter $\hat{\beta}_{OLS}$ as an estimate which will be either too high or too low. Thus the estimate is going to be **systematically wrong**.

Since the problem is the correlation between regressor and error term, it is worth to check if there is a good instrument for '*Bribe*' hidden in the data that helps to explain the relationship between informal payments and firm sales. So, we have to find a third variable as a **good instrument *(z_i)*** which must be both a) correlated with the regressor (**relevance**), i.e. $Cov\,(z_i\,, x_i) \neq 0$, and b) uncorrelated with the error term (u_i) in the regression equation (**exogeneity** or **validity**), i.e. $Cov\,(z_i\,, u_i) = 0$ (Wooldridge, 2013). Admittedly, this is easier

said than done. In reality and with the 2009 ES data set on the hand, however, this task is similar to '*finding the needle in the haystack'*.

After a long and thorough search, we found one variable that could be considered as a possible choice for an instrument. The variable in question is the dummy variable for *'% of senior manager's time spent with governmental regulations?*'. This new variable ***'gvt_regul'*** generated out of the variable (j2) consists of 1,462 percentage values and no missing observations in this sample.

Coming back to our two conditions, a) relevance and b) exogeneity or validity, the results of the first stage regressions in table 17 (appendix part II) column (1) show that the first condition, **relevance**, was proved since the instrumental variable ***'gvt_regul'*** is statistically highly significantly correlated with the variable *'Bribe'*. The result reveals a positive relationship, i.e. the more time a senior manager relatively spends dealing with governmental regulation the higher the amount of informal payments and gifts will be. The chain of logic could be as follows: Regulations are considered to be an instrument that limits or constrains a right, which creates or limits a duty, or which allocates a responsibility. These regulations can take many forms such as legal restrictions imposed by a government authority, certification, accreditation or market regulation. Mostly, however, regulations are interventions that are created to correct a market failure (Lipsey & Chrystal, 2007). Suppose now that, for example, a senior manager spends several hours per day to deal with the different regulations which cuts his time for the business operations. Thus, there is a high probability that he might consider the option to go around this problem by bribing the public official since, according to the latest OECD Foreign Bribery Report (2014c), over 50% of the bribery cases involved senior management. If that works out for him he has to fill out fewer forms or to wait less time for permits. The company might thereby save important time and even get thereby an advantage compared to his contestants in the market that are still in the waiting line for their permit. So, to assume that the more regulations there are for an enterprise the more time will the senior manager need to deal with these regulations which further means that his willingness to pay bribes or give unofficially gifts to the official in charge to skip these constraints plus to be better off than the other firms in the market, this all may increase as the proportion of the senior manager's time increases.

In addition to the theory, a fact that we can observe in the 2009 ES data might give an answer to the question whether or not it possible that some firms spent less time than others with governmental regulations. Looking at the table 18a (appendix part II) there is clearly a kind of tendency (also provided in the appendix and associated with table 18b in appendix): the

bigger the firm the more of the senior manager's time governmental regulations will eat up. The percentage numbers suggest that a share of 43% of the micro firms spent less than 10% of the senior manager's time dealing with those regulations. The size of the share decrease as the size of the firm grows (36% small firms, 26% medium, and 25% large firms). Unlike this descending order, we see an ascending order for the share of firms that spent more than half of the time dealing with regulations. One can see that only 1.8% (0.90% + 0.90%) of the micro firms spend more than half of the senior's time whereas the share of large firms that spend more than 50% of the time is more than 10% (5.59% + 4.90%). So, there is indeed a tendency which was also found out by (IADB, wp626).

After we made sure that condition **a) relevance** is satisfied, we have to do the same for condition **b) exogeneity** or **validity** which means the IV is not correlated with the error term in the regression. This second one, however, is the hardest one to verify in practice. In fact, it is, at least with the 2009 ES data, very hard to verify because we would have to check the correlation between something observable, the IV, and something that is more imaginary, the error term *(u_i)*. Obviously we cannot do that. The error term *(u_i)* captures all factors that affect the dependent variable *'(log)Sales'*, but also factors which have not yet been explained by the variables on the right-hand-side (bribe payments plus a selection of controls) plus factors that might not even be covered in the data set. Hence, there are two reasons why the IV might fail: 1) the IV itself belongs in the regression meaning the IV itself is an omitted variable, and 2) the IV is correlated with one of the omitted variables. In the context of this study then it means that 1) *'gvt_regul'* is one of the factors that determine *'(log)Sales'* directly, and 2) 'something unknown' happens which inevitably has an effect on firm sales but this 'something unknown' factor has not been controlled for in our model.

The **validity** condition states that governmental regulations affect sales exclusively through bribes. In our argumentation chain we have established that bribe amounts are expected to increase with the time spent with regulations (table 18b). We have also seen that it is very likely that a firm that can skip some regulations which are seen as restrictions to it may most likely have an advantage compared to other firms in the market. The advantage that this particular firm achieved through a more illegal way may, however, result in a benefit in form of higher revenues or sales. Theoretically governmental regulations would not affect sales of

one single firm in a market where all the firms face the same regulations[17]. Ideally, it would be fairly unusual if the government would impose arbitrarily harder regulations on only one or some of the firms in the market. This would lead to a different outcome compared to the rest of the firms in the market. Thus, the regulations as such can be seen as given or as an exogenous factor that is the same for all the firms in the market. It can be seen as a law which does not apply to a single firm rather than a restriction or boundaries which applies to all firms to the same level. That is, there is a certain possibility that the validity condition is satisfied, too. So, it might be reasonable to assume that case 1), saying *'gvt_regul'* directly affects *'(log)Sales'*, is to be doubted. However, case 2), 'something unknown' happens that affects *'(log)Sales'* and that is not controlled in our model, is more likely to be a problem for our IV approach. Thus, it might be reasonable to consider the variable for ''% of senior manager's time spent with governmental regulations?' as the instrument variable (z_i) for the regressor (x_i).

The simplest way to generate such an **Instrument Variable (IV) estimator** is by using the **two-stage least squares (2SLS)** approach which is explained in the appendix (part II). The **intuition behind this 2SLS** approach is to "throw away the error term ε_i" and to just proceed with the fitted values of the regressor $\tilde{x}$ or in other words: it gets rid of the (x_i) that is correlated with the (u_i). That is, we have created an exogenous regressor which can be inserted in the original equation.
Since the new $\widehat{\boldsymbol{\beta}}_{\boldsymbol{IV}}$ is **exogenous OLS will give unbiased estimates**. For our bivariate model from equation (1.0) that means instead of using $\hat{\beta}_{OLS}$ which is biased we prefer an IV estimator $\hat{\beta}_{IV}$ that is unbiased (model 3.3 in appendix and below).

Empirically, many instruments that are used in the 2SLS approach may be valid but turn out to be rather weak in terms of the relevance. In order to find out whether or not the instrument is weak one can apply the Staiger-Stock (1997) rule of thumb. This common rule of thumb says that an instrument is deemed as weak if the associated first-stage *F*-statistic is less than 10 (Stock & Yogo, 2002). The first-stage *F*-statistic is testing the hypothesis that the coefficients on the instruments are equal to zero in the first stage of two stage least squares. The key concept to this test for weak instruments is as follows: when there is a single

[17] Note that one has to distinguish between different size classes of firm. It is not meant by the prior reasoning that small and big firms necessarily face the same amount or volume of regulations. With a bigger size of the company comes a greater amount of regulations that have to be dealt with (see table 18b in appendix).

endogenous regressor, a first-stage *F*-statistic less than 10 indicates that the instrument(s) are weak, in which case the 2SLS estimator is biased (even in large samples) and the 2SLS *t*-statistic and confidence intervals are unreliable (Stock & Watson, 2012).

The bivariate model for the IV regression:

$$\log(Sales_i) = \beta_0 + \beta_1^{OLS}(Bribe_i) + u_i \qquad \beta_1^{OLS} \text{ is the original OLS regressor} \qquad (1.0)$$

$$\log(Sales_i) = \beta_0 + \beta_1^{IV}(Bribe_i) + u_i \qquad \beta_1^{IV} \text{ is the unbiased instrument} \qquad (3.3)$$

The multivariate model for the IV regression where we control for various variables:

$$\log(Sales_i) = \beta_0 + \beta_1^{IV}(Bribe_i) + \beta_2(age_i) + \beta_3(trade_i) + \beta_4(tax\ inspections_i) + u_i \qquad (4.0)$$

Controlling for *region fixed effects*:

$$\log(Sales_i) = \beta_0 + \beta_1^{IV}(Bribe_i) + \beta_2(age_i) + \beta_3(trade_i) + \beta_4(tax\ inspections_i) + \beta_5(region\ FE_i) + u_i \qquad (4.1)$$

Controlling for *sector fixed effects*:

$$\log(Sales_i) = \beta_0 + \beta_1^{IV}(Bribe_i) + \beta_2(age_i) + \beta_3(trade_i) + \beta_4(tax\ inspections_i) + \beta_5(sector\ FE_i) + u_i \qquad (4.2)$$

Controlling for *size fixed effects*:

$$\log(Sales_i) = \beta_0 + \beta_1^{IV}(Bribe_i) + \beta_2(age_i) + \beta_3(trade_i) + \beta_4(tax\ inspections_i) + \beta_5(size\ FE_i) + u_i \qquad (4.3)$$

Controlling for *all fixed effects together*:

$$\log(Sales_i) = \beta_0 + \beta_1^{IV}(Bribe_i) + \beta_2(age_i) + \beta_3(trade_i) + \beta_4(tax\ inspections_i) + \beta_5(region\ FE_i) + \beta_6(sector\ FE_i) + \beta_7(size\ FE_i) + u_i \qquad (4.4)$$

5.II.2 Results of the 2SLS-IV approach

Table 19 below presents the results of the 2SLS-IV regressions. In addition to that, table 17 in the appendix (part II) shows the first stage regressions for each IV regression. Table 22 (appendix part II) provides results for the group of firms that does not incorporate the one that refused to answer.

As we can see from table 12 in appendix the variable "% of senior manager's time spent with governmental regulations" (j2) is positively correlated with '*Bribe'* (0.231**) at a 5% level, i.e. the more time spent the higher the amount of Bribe.

Using the 2SLS-IV approach the bribe coefficient in table 19 appears to be 8.05% in the bivariate model. In the bivariate OLS model the value for the bribe coefficient was with 0.58% less than a tenth of this value. Moreover, for the bivariate model a first-stage *F*-statisitc value for the test of weak instrumentation with 11.44 (table 17) indicates that the instrument variable (time spent with governmental regulations) is not weak, according to (Stock & Watson, 2012), since the value is above the threshold of 10.

In table 19 below we show that the results are statistically robust. Furthermore, the estimated relationship between firm sales and bribe payments is still in this IV approach statistically significant at a 95% confidence interval. For example: a one-standard deviation increase in informal payments (about US$54,600, see table 4 above) is associated with additional total firm sales by 4.28% as we add the controls and control for size FE.

Column 4 in table 19 and 20, respectively, displays the value for the bribe coefficient including all control variables (for the entire sample: 0.0592, and for the group of firms without the refusals: 0.0690). Tables 19 and 20 (in column 5, 6 and 7) show also results to regressions that control for these variables plus that control for the different fixed effects. Table 22 (appendix part II) takes all controls and all fixed effects together into consideration (for the entire sample: 0.0472, and for the group of firms with no refusals: 0.0558).

In the multivariate model (table 19) the coefficient for the IV estimator for bribes takes values between 7.35% and 5.92% as we control for additional variables and values between 6.38% and 4.28% as we also control for the different fixed effects. The associated first-stage *F*-statistic value in the multivariate model drops from 10.64, which means that the instrument is still not weak, down to 7.64.

The results for the group of firms not including 'refusals' (table 20 in appendix part II) show slightly higher percentages for the bribe coefficient than in table 19 below. Table 20 further shows results that indicate that for the group of firms without refusals the instrument is weak in all of the regression, according to a first-stage *F*-statistic value that is below the threshold of 10 in every regression.

Similar to table 16a-16c, table 21a-21c show separately the results if one only controls for the fixed effects of the categorical variables '*region'*, '*sector'* and '*size'*. The results that catch the eye here is the coefficient values in the third of these three tables, table 21c, size FE.

Compared to the results in 21a & 21b the coefficients for *'Bribe'* are considerably smaller in 21c.

Table 19: IV estimations, 2SLS-approach

Dependent Variable: (log)Sales

all firms							
model	**bivariate**	**multivariate**					
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Control for:		**age**	**trade**	**tax. insp.**	**region FE**	**sector FE**	**size FE**
Bribe	0.0805***	0.0735***	0.0637***	0.0592**	0.0638***	0.0585**	0.0428**
(instrument:	[0.0261]	[0.0250]	[0.0233]	[0.0229]	[0.0239]	[0.0229]	[0.0200]
Gvt. Regul. Time)	(3.09)	(2.94)	(2.73)	(2.58)	(2.67)	(2.55)	(2.14)
age		0.036***	0.028***	0.027***	0.027***	0.027***	0.018***
		[0.0087]	[0.0074]	[0.0069]	[0.0073]	[0.0070]	[0.0054]
		(4.20)	(3.77)	(3.82)	(3.72)	(3.85)	(3.33)
trade			1.612***	1.602***	1.568***	1.611***	1.315***
			[0.3120]	[0.2948]	[0.3097]	[0.2973]	[0.2259]
			(5.17)	(5.43)	(5.06)	(5.42)	(5.82)
tax inspections				0.456**	0.468**	0.465**	0.283
				[0.2203]	[0.2356]	[0.2201]	[0.1724]
				(2.07)	(1.99)	(2.12)	(1.64)
fixed effects					**North**	**Manufacturing**	**Micro (1-9)**
					[omitted]	*[omitted]*	*[omitted]*
					North-East	**Service**	**SMEs (10-249)**
					-0.115	0.165	1.082***
					[0.5857]	[0.3334]	[0.2552]
					(-0.20)	(0.492)	(4.24)
					Central-West	**Others**	**Large (250+)**
					-0.422	-0.063	2.998***
					[0.6694]	[0.2829]	[0.4811]
					(-0.63)	(-0.22)	(6.23)
					South-East		
					-0.687		
					[0.5713]		
					(-1.20)		
					South		
					0.051		
					[0.5977]		
					(0.09)		
C	12.806***	12.147***	12.045***	11.890***	12.193***	11.875***	11.245***
	[0.2596]	[0.2180]	[0.1893]	[0.1823]	[0.5751]	[0.1928]	[0.2222]
	(49.32)	(55.71)	(63.61)	(65.19)	(21.20)	(61.58)	(50.60)
F-stat	11.4403	10.642	9.7515	9.0572	9.1917	8.8508	7.6399
(p-value)	(0.0007)	(0.0011)	(0.0018)	(0.0027)	(0.0025)	(0.0030)	(0.0058)
N	1,462	1,462	1,462	1,462	1,462	1,462	1,462
R-squared	0.0078	0.0094	0.0112	0.0114	0.0092	0.1002	0.0173

The robust standard error is in the bracket.
The t-statistic is in the parantheses.
* p < 0.1, ** p < 0.05, *** p < 0.01
One unit in *'Bribe'* is = US$1,000
F-stat is the corresponding first-stage *F*- statistic value to the test for weak instrumentation

Source: author's computation based on the 2009 ES data set

6 DISCUSSION OF THE RESULTS

Section 6 is about the discussion of the results that were found in the econometric analysis in the previous section.

To remind ourselves, the research question for this thesis was: **what is the effect of corruption (here measured by total amount of annual bribe payments) on the firms' performance (here measured in total annual firm sales) and what is the extent of this effect?**

I. Overall findings:

The findings of the empirical analysis in section 5 suggest a causal effect of informal payments on firm performance that varies depending on the type of model that is considered. One fact that all results have in common is that the effect of bribes on sales is found to be positive. That is, there is a positive relationship between informal payments which is a proxy for the administrative corruption and total firm sales which is considered to be an indicator for the performance of firms, i.e. firm performance increases with informal payment.

In tables 10, 14 and 19 displayed above we were able to show that the results are statistically robust. Furthermore, the estimated relationship between firm sales and bribe payments is statistically significant, according to the associated p-values. The R-squared is a measure of how well the model is able to explain the variation in the dependent variable (Stock & Watson, 2012). It can take values between 0 and 1 where 0 means 0% or none of the variation is explained by the model and where 1 means 100% or all of the variation (Wooldridge, 2013). So, in theory the higher the value the better fits the model. In this thesis, however, the R-squared (R^2) value is relatively low throughout the entire statistical analysis. All the R^2 values remain below 0.34 (= 34%). That is, the chosen model explains only up to a third of the variation of the dependent variable, often less than a third. That is a reason why it is doubtful to project results obtained from the sample used in this thesis to the entire Brazilian business environment.

6.I.1 Bivariate model

For the bivariate OLS model the results (table 10) in our empirical analysis suggest an effect of just over half a percent. As we exclude the 22 firms that refused to answer the corruption question j7b we get an effect which is slightly smaller. This particular pattern remains throughout the entire statistical analysis. The results for the bivariate OLS model

further reveal a pattern as we compare the effect for the group of 1,326 firms that paid less than 1% of their sales and for those that paid 1% of their sales or more (table 11 appendix part II). If we compare the effects for the both groups we see a difference in the size of the effect by more than 1.1% (1.73% and 0.71%). The more a company pays the more will the smaller will the positive effect of bribes on their sales be. This pattern follows, too, as we proceed in the analysis. The bivariate OLS model appears to be very vulnerable, however, to endogeneity issues and since not all of the Gauss-Markov assumptions are met the OLS estimator $\hat{\beta}_{OLS}$ produces unbiased and inconsistent estimates.

Figure 14 in the appendix (part II) reveals an inverted U-shaped curve for the bivariate model as we add a quadratic fitted line to the linear fitted one seen earlier in figure 13. This inverted U-shaped curve colored in green indicates that bribes have a relatively large positive effect on firm sales as the bribe amounts are still relatively small. This picture, however, turns around as the amounts of informal payments increase. In fact, the effect of bribes on sales gets close to zero before it then turns into a negative effect, i.e. firm sales decrease with (relatively large) bribe payments. This would be in line with the vast majority of research papers published to the corruption topic (Shleifer & Vishny, 1993; Mauro, 1995, etc.).

6.I.2 Multivariate model

By controlling for various variables (table 14) that we added to the bivariate model from equation (1) we attempted to address the endogeneity issue, more precisely the omitted variable bias. Adding control variables in the OLS model led to changes in the value of the coefficient $\hat{\beta}_1^{Bribe}$. With respect to the three control variables, the expectations of the changes that were made prior (in 5.I.3) were confirmed. The bribe coefficient value decreased as expected. This indicates that some of the effect of these three controls was captured in the effect of '*Bribe*' as we had the bivariate model. The population parameter $\hat{\beta}_{OLS}$ as an estimate in the bivariate model was therefore too high.

In order to address the omitted variable bias even more we added the fixed effects (table 14) for region, sector and the firm size which led only partly to a change in the bribe coefficient. Controlling for region and sector fixed effects did not change the value of this parameter. A change in value, however, happened as we controlled for size fixed effects. The value decreased considerably down to 0.29% (table 15). Tables 16a-16c (in appendix part II) display the bribe coefficient values if we solely add the fixed effects to the bivariate model. This allows a comparison to table 14 but also between the two payment size groups

mentioned earlier. The three tables 16a-16c reveal that the same pattern is indeed going to continue.

6.I.3 The 2SLS-IV model

Still, we have to assume that the $\hat{\beta}_{OLS}$ parameter does still not deliver perfect estimates. We therefore employed the 2SLS-IV approach (table 19) where we used the variable '% of time spent with governmental regulations' as an instrument for '*Bribe'*. Table 17 (in appendix part II) shows the first stage regressions and we can see that this instrument satisfies the first condition, relevance. We have further seen the argumentation chain which suggests that, even though it is hard to check, there is a possibility that this instrument also meets the second condition, validity.

Comparing the results of the OLS estimations with the results of the IV estimations it is striking that the coefficient value for '*Bribe'* which is instrumented by '*gvt_regul'* is relatively higher (nearly 7.5% larger) in the IV approach than in the OLS model as we consider the two bivariate models. The first-stage *F*-statistic value for the test for weak instruments indicated with a value of 11.44 that we do not have a problem with a weak instrument at least for the bivariate model since the value is greater than the threshold of 10 taken from the Staiger-Stock (1997) rule of thumb. Excluding the refusals, however, leads to the result that the first-stage *F*-statistic value for all regressions is below 10, i.e. the instrument is weak.

II. Limitations

With the econometric model this thesis attempted to give an answer to the research question what kind of effect of administrative corruption on the performance of firms there is. The multivariate OLS model helped to achieve results that are less biased by omitted variables. This IV approach might have helped, to a certain degree, to address the endogeneity concerns for this empirical model, as well. However, there is no proof that these bribe estimator for the OLS or the IV fully satisfies all the Gauss-Markov assumptions. The different models that were used in the two parts of the previous section do not address the endogeneity concerns to the full extent. There is a great chance that there still might be, for instance, some control variables that would be more suitable for the multivariate model but that are not captured in this 2009 WB data set. That is, we have to assume that this econometric analysis did not lead us to the optimal model which produces the best linear and unbiased estimates.

Suggestions for an improvement of the results are, for example: a) to have better data, b) better instruments, or c) a better econometric model.

Suggestion a) means that the usage of panel data would most likely give more insights in the true effect of informal payments on the firms' performance since such data would have at least a second time dimension.

Suggestion b) means that in another data set there could be a variable which would be more suitable as an instrument variable. One example could be a variable that contains information on the number of public officials, or the ratio of public officials per firm[18]. Such a variable would easily satisfy the relevant condition because one could argue that the more public officials there are the greater is the total amount of bribes that a firm has to pay. The validity condition because it would most likely fairly easy to proof that the number of officials affects firm sales exclusively through bribe payments.

Suggestion c) means that there might be an econometric model that would fit better to the data that will be used depending on what kind of data it is.

Reverse causality is definitely an issue in this study. Only having data of one period (one fiscal year) for the investigation of an effect that can last over years is indeed a down side compared to other papers that papers that used panel data rather than cross-sectional data.

III. Comparing to the results in the literature

In the literature in section 2, we have found only a few papers where the findings suggest that there is a stimulating effect of bribe payments to public officials on firm performance or firm growth (Méon & Weill, 2010 and Wang & You, 2012). Compared to our results, the findings by Wang & You (2012) provide supportive evidence for the "East Asian Paradoxon". Their results suggest that despite the high-level corruption in China the firm growth is rather stimulated by corruption than impeded. The effect of corruption on firm growth with a value of 9.5% in the IV-2SLS approach in their study underlines the positive effect of what Wang & You (2012) call "speed money".

A more specific analysis with the focus to SMEs conducted by Gbnetkom (2012) found that bribe payments significantly slow down the growth of SMEs. For Cameroon he found results that suggest that a one percentage increase in bribe payments leads to a 1.179 fall in firm performance. Comparing this effect to our result is difficult because the measure is different. However, overall, our results from table 14 show a statistically significant effect of

[18] In reality, I assume that in most regions in Brazil the number of firms exceeds the number of public officials. So, the ratio $\frac{\#\ of\ public\ officials}{firm}$ would probably very small, i.e. between 1 and 0.

bribe payments on firm sales in the extent of 0.29% of firm sales as we use the OLS approach that controls for a selection of variables and also includes the size fixed effects. An even larger effect with 4.28% is obtained as we use the 2SLS-IV approach (table 19).

So, in economical terms our data of the 2009 ES data set provides evidence for the argumentation that paying unofficial payments to corrupt public officials rather promotes the performance of firms in Brazil. However, one has to distinguish between the relative size of the payments since we have seen in the regression results that firms that paid less than 1% of their sales experienced a larger effect of bribe payments on their sales than firms that paid 1% or more of their sales in bribes to corrupt officials.

Comparing the results of this study with the results of other studies makes clear that there are differences in the effects. Differences in the nature of the effect (positive or negative) and in the extent of the effect may well be caused by differences in the countries that have been investigated, differences in the data sets (panel data set used by Kochanova (2012) compared to the 2009 ES data set which is cross-sectional) and in the econometric models that were used for the different studies.

IV. A wrap-up:

To wrap up the argumentation of this study, the results of this thesis are based on the 2009 ES data set and they do not deliver any supportive evidence for the hypothesis that administrative corruption harms the performance of a company. Moreover, since the results suggest a positive relationship between these two parameters which in essence means that firm sales increase with informal bribe or facility payments there is no reason for the firm to avoid the administrative corruption. Unlike the vast majority of the papers found in the literature that suggest that firm growth and firm performance will be deteriorated by corruption, the results here rather unexpectedly tend to support the argumentation of the proponents of corruption such as (Méon & Weill, 2010 and Wang & You, 2012).

One must, however, not forget that the pattern in the results clearly revealed a positive effect of bribes that decreases with the share of bribes relative to the firm's sales. Also important to keep in mind is the fact that the quadratic regression line (fig. 14) displayed a "slowing down" of the positive effect as bribe amount increases until it eventually turns into a negative effect. This rather supports the critics of corruption such as Mauro (1995), etc.

V. In short:

Administrative corruption has a relatively small positive but significant effect on firm performance which becomes even smaller as the proportion of bribes to firm sales increases.

7 Conclusion

This thesis aimed to contribute to the existing literature by investigating the extent of the effect of administrative corruption on firm performance for enterprises in Brazil.
The analysis of the Enterprise Survey data set provided by the World Bank (2009) has stressed out that corruption is one of the most sensitive objects that the firms were asked questions to. A number of problems occur as the firms refuse to answer the regarding questions or misreport the actual values.

In the empirical analysis we have set up both bivariate and a multivariate models which were used in both the OLS approach and the 2SLS-IV approach. By controlling for different variables and using an instrument for the main regressor 'Bribe' we attempted to address different threats such as the endogeneity concern of the initial bivariate baseline model.
Our findings suggest that there is a positive relationship between unofficial bribe payments and the firm performance measured by firm sales. The extent of this effect reaches from 0.29% in the OLS model to 4.35% in the 2SLS-IV model as we control for selected parameters and account for fixed effects. However, there is a great chance that these models used in the empirical analysis fail to properly address the serious threat of endogeneity. Besides that reverse causality is a serious threat to our models that must not be forgotten since higher profits or sales will undoubtedly also cause that more bribes are requested, as Svensson (2003) pointed out. Thus, one has to be very careful by applying these results to the entire country of Brazil. A generalization is clearly not possible with these results that are based on the very data set. For a better analysis and more accurate results of the effect on corruption of firm performance a better set of data and a refined empirical model with, for example, a better instrument variable is required.

In line with the results of this thesis, we have seen that corruption has been a big issue in the past in Brazil. It is also currently one of the big concerns that the people and enterprises in Brazil have to deal with on a daily basis. In the past month the number of corruption scandals went up rapidly which emphasizes even more the picture of a corrupt government in Brazil. The big picture of the largest Latin American economy is about to turn as more scandals unfold and as more mass protests against a corrupt government happen (Brazil Sun, 2015). Hopefully, this does not jeopardize even more the promising economic future of Brazil (The Economist, 2015), and its more than six million enterprises.

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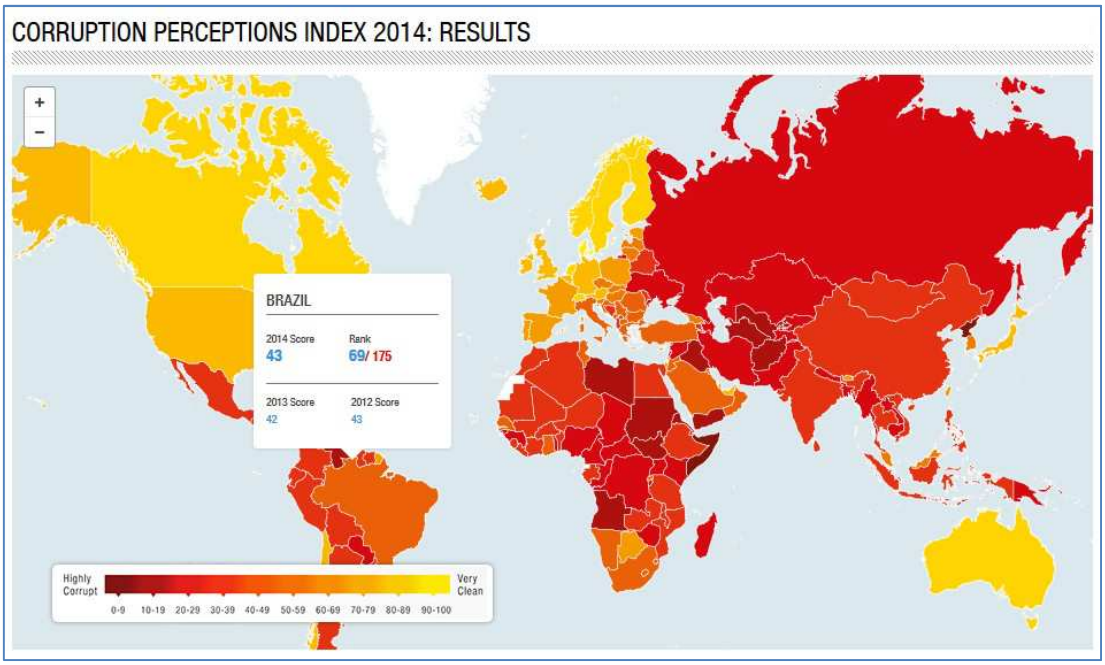
9 APPENDIX

This first part of the appendix contains figures, tables and statistics that are mentioned in the text above.

I. Text

9.I.1 Figures

Figure 1: Corruption Perception Index 2014



Source: Transparency International (2015a)

Figure 3a: CPI Rank

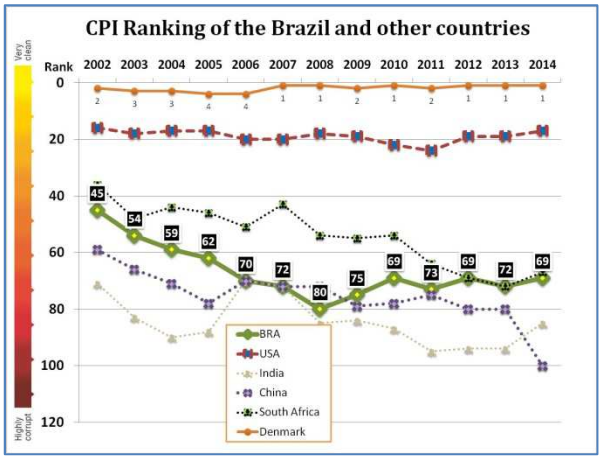


Figure 3b: CPI Score

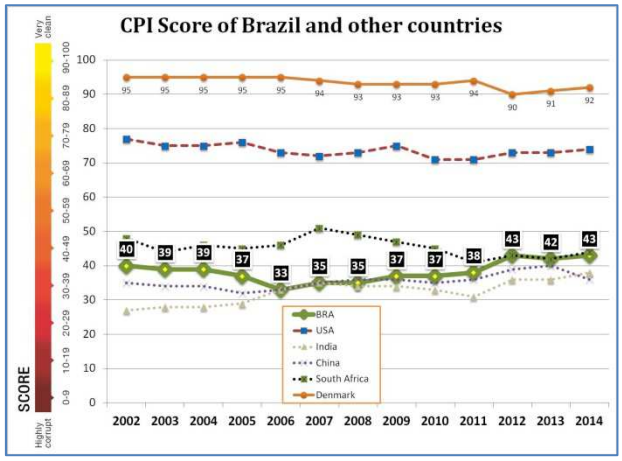
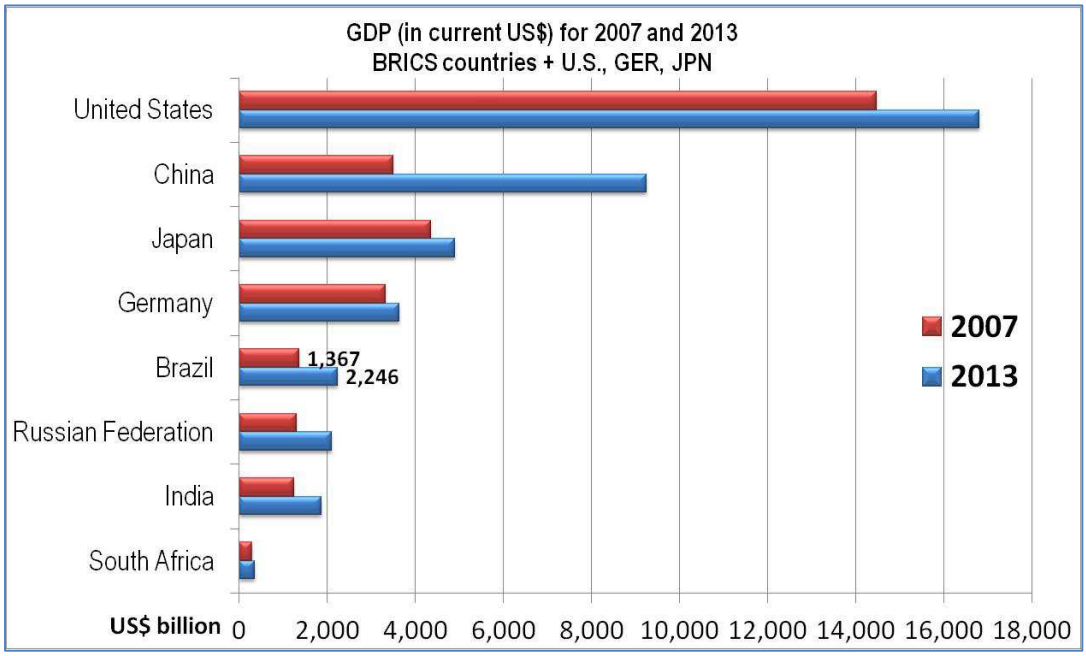


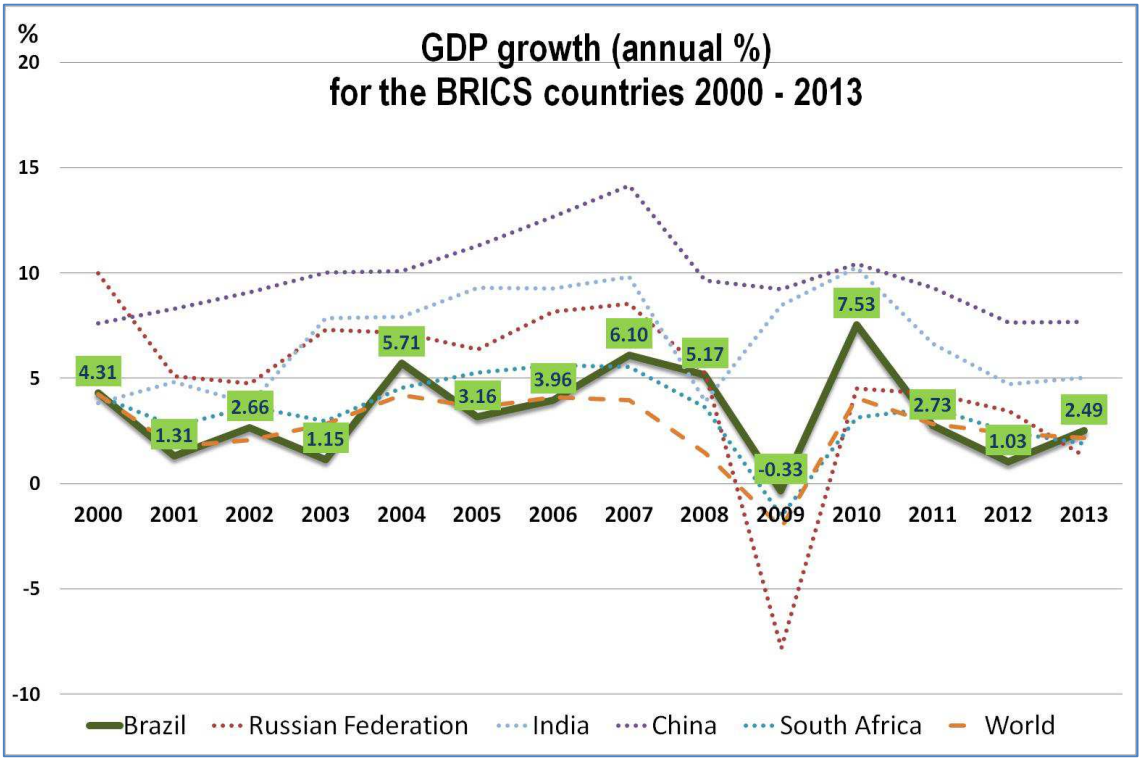
Figure 3a & 3b: author's computation based on Transparency International data 2014

Figure 4: total GDP in US$ for a selection of economies in 2007 and 2013



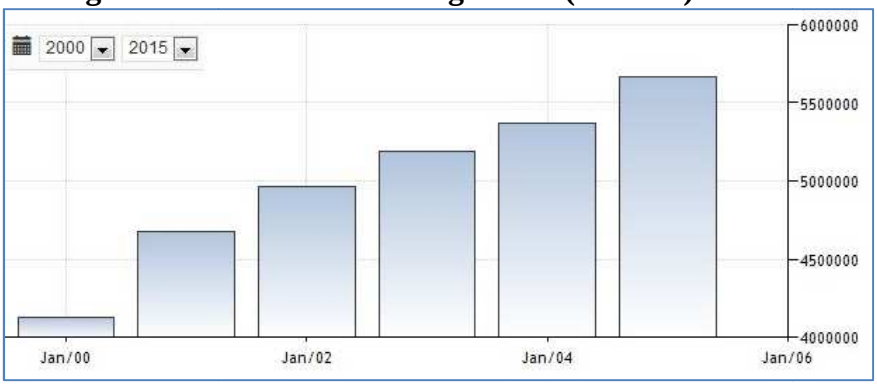
Source: The World Bank Group Data (2015)

Figure 5: Annual growth rates of the GDP (in %) from 2000 to 2013



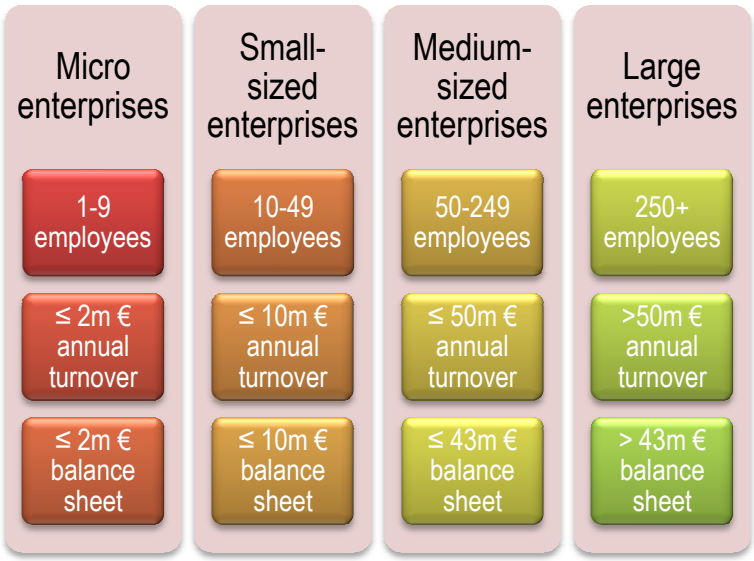
Source: author's computation based on the 2009 ES data set

Figure 6: Total businesses registered (number) in Brazil



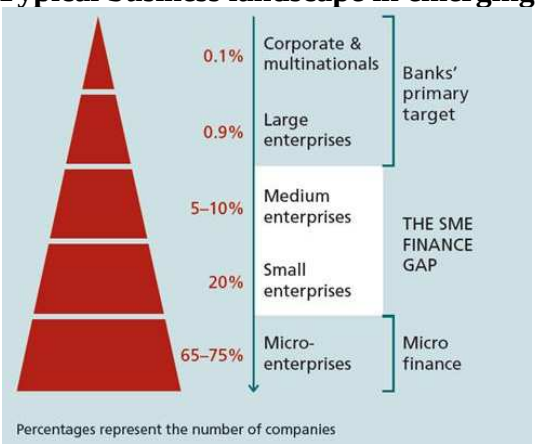
Source: TradingEconomics.com (2015b)

Figure 8: Criteria for the classification of different firm sizes



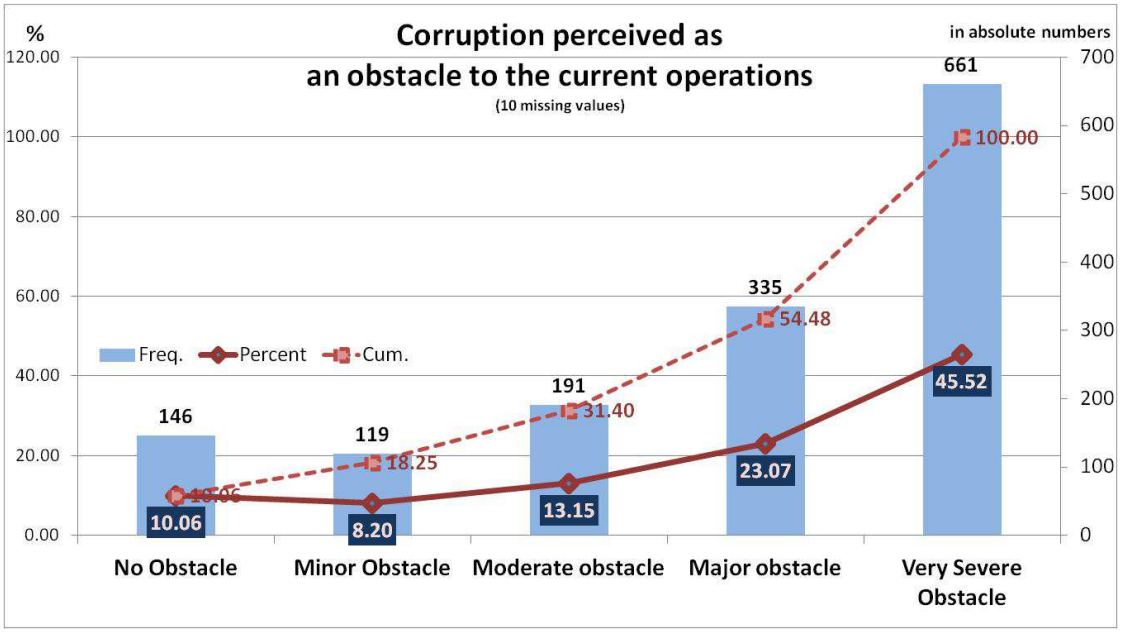
Source: authors calculation based on the definition of the OECD (2005)

Figure 9: Typical business landscape in emerging countries



Source: IFC (2010), which belongs to the World Bank Group

Figure 10: Corruption perceived as an obstacle to the enterprises in Brazil



Source: author's computation based on the 2009 ES data set

9.I.2 Tables

Table 1: Snapshot of Brazil's economy in 2007 and 2013

Brazil	2007	2013
Population (in million)	190.0	202.0
GDP (current US$ bn)	1,367	2,246
GDP per capita (current US$)	7,194	11,208
GDP per capita, PPP (current international $)	12,073	15,034
Inflation, consumer prices (annual %)	3.64	6.20
Corporate Tax Rate (in %)	34.00	34.00
Unemployment rate (% of the Labor Force)	8.1	5.9

source: World Bank Data, 2014

Table 2: information on economic sectors in Brazil in 2011

Sector	Share of the GDP	labor force occupation	main product
Service	68.10%	71%	financial services
Industry	26.40%	13.30%	automobile, machinery and textile industry
Agriculture	5.50%	15.70%	coffee and soybeans

source: CIA Factbook, 2014

Table 3: Distribution of firms, employees occupied, wages, and other remuneration according to the number of employees – Brazil, 2006

Personnel employed	Number of firms (%)	Personnel employed (%)	Wages and other remuneration (%)
Micro	79	20	10
Small	15	18	12
Medium	5	22	21
Large	1	40	57

Source: IBGE, 2007.

Source: Arroio (2009), the Role of SME in Brazil

Table 4: firms that reported zero bribes and positive bribe payments

bribe payment	absolut	%	cum.
zero (B=0)	1,255	85.84	85.84
positive (B>0)	207	14.16	100
Total	1,462	100	

Source: author's computation based on the 2009 ES data set

Table 5: firms paying no bribes or a little vs. firms paying more bribes

Bribes/Sales	bribes paid in % of sales							
	no / little bribes		more bribes / a lot bribes					
threshold	0.5%		1%		10%		50%	
# of firms	<	≥	<	≥	<	≥	<	≥
absolut	1,263	199	1,326	136	1,443	19	1,461	1
relative (in %)	86.39	13.61	90.70	9.30	98.70	1.30	99.93	0.07

Source: author's computation based on the 2009 ES data set

II. Empirical Analysis

9.II.1 Statistical theory

Gauss-Markov assumptions

Gauss-Markov assumptions (AS) are the criteria for an unbiased and consistent Ordinary Least Squares (OLS) estimator, $\hat{\beta}_{OLS}$. These four assumptions have to be met in order to get the **best linear and unbiased estimator (BLUE) (**Wooldridge, 2013). In the context of the OLS method *best* means that variance of the OLS estimator is minimized, i.e. smaller than the variance of any other estimator; *linear* means that if the relationship between the DV and regressor is not linear then the OLS is not applicable for study and *unbiased* means that the expected values of the β_0 and β_1 are equal to the true values that describes the relationship between *y* and *x*. the Gauss-Markov assumptions can be formally expressed as follows:

#1 (MEAN): the expected value of the error terms is zero for all observations,

i.e. E [u_i] = 0.

#2 (VARIANCE): Homoscedasticity: this means that the conditional variance of the error term is constant and finite across all observations. Homoscedasticity implies that the uncertainty of the model is identical across all observations, i.e. Var (u_i) = $\sigma^2 < \infty$

#3 (ERROR TERMS): the error terms are independently distributed and not correlated to each other. That is, there is no correlation between observations of the dependent variable, i.e. Cov (u_i, u_j) = 0, where $u, \neq u_j$.

#4 (REGRESSOR & ERROR TERM): x_i is uncorrelated with the error term since x_i is deterministic, i.e. Cov (x_i, u_i) = 0

The standard error (S.E.):

The S.E. is measure for the precision of the coefficient where a smaller S.E. value means a more precise coefficient. The standard errors of mean (SEM) is the standard deviation (std.dev.) of the sample mean estimate of a population mean. It is calculated by the sample estimate of the population std.dev. divided by the square root (sqrt) of the sample size (see formula below):

$$SEM = \frac{s}{\sqrt{n}}$$

where *"s"* is the sample standard deviation and *n* is the number of observations (the size) of the sample. The values in the sample are assumed to be statistically independent.

Standard Deviation of Mean:

Where s is the sample standard deviation of the mean which is computed with the following formula:

$$s = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(x_i - \bar{x})^2}$$

Where *s* is the sample std.dev., x_1, …, $x_N$is the sample data set, $\bar{x}$ is the mean of the sample data set and n is the size or the number of observations of the sample data set.

The control variables

Age of the firm (a3):

For this analysis, the age of the firm is defined by variable (a3) which says by definition the year when the firm started operating in the business. After rearranging we obtain the age of the firm in years for the FY 2007. firms with the calculated age of -1 year and zero years have been declared as outliers and as a consequence winsorized.

Trading/exporting firms (d3b) & (d3c):

The binary variable '*trade'* takes the value 0 if the firm does not trades at all. It takes the value 1 if the firm trades indirectly through a third party or directly or if it does trade in both ways. This classification is adopted from the paper by Svensson (2003).

Tax inspections (j3)

This variable is a binary variable, too, which takes the value 1 if the firm has been inspected by tax officials within the last 12 month and 0 otherwise.

Region (a3a):

The variable 'region' was created by the original variable (a3a) which contains information on that state in which the establishment has its residents. Variable (a3a) differentiated between 15 different states throughout the entire country of Brazil. According to the list of the IBGE (2014a) "Região do Brasil", '*region'* assigns firms that are located in the same area to one of the following five regions: "North" , "NorthEast", "Central-West", "SouthEast" and "South".

Sector (a4a):

All firms covered in the 2009 Enterprise Survey are operating in the non-agricultural economy. The 2009 survey data differs between 16 different non-agricultural sectors. For simplicity reasons, these 16 sectors are grouped together to: "Manufacturing", "Service", and "Others", according to the Implementation (2009).

Firm size (l1):

The variable 'size' has been generated by the variable (l1). To assign the firms to the correct size group the OECD (2005) criteria has been applied here. The new 'size' variable is a categorical variable consisting of four size groups: micro (1-9 employees), small-sized (10-49), medium-sized (50-249) and large (250+).

IV estimation (2SLS approach):

Since the problem, as described before, is that the regressor is correlated with the error term, i.e. $Cov\,(u_i\,, x_i) \neq 0$ we have to find an additional and **suitable instrument** ***(z_i)*** which is both uncorrelated with the error term (u_i), so **valid**, and correlated with the regressor, so **relevant**, i.e. $Cov\,(z_i\,, u_i) = 0$ and $Cov\,(z_i\,, x_i) \neq 0$. Using *(z_i)* as an instrument for (x_i) we achieve an unbiased OLS estimator $\hat{\beta}_{OLS}$.

The **Instrument Variable (IV) estimator** is most easily formulated as the **two-stage least squares (2SLS)** approach. The **intuition behind this 2SLS** approach is to "throw away the error term ε_i" and to go on with in the analysis with the fitted values of the regressor.

In the first stage, one regresses the variable (x_i) on the instrument *(z_i)* and calculates the fitted values:

$$x_i = \pi z_i + \varepsilon_i \tag{3.0}$$

Collect the fitted values (or "predicted values") of (x_i) from this regression:

$$\tilde{x}_i = \hat{\pi} z_i \tag{3.1}$$

In a second stage, we regress *(y_i)* on the fitted values $\tilde{x}_i$ (rather than on the actual values (x_i)).

$$y_i = \beta_0 + \beta_1 \tilde{x}_i + \varepsilon_i \tag{3.2}$$

Hence, the OLS estimator $\hat{\beta}_{OLS}$ in this regression is **now the IV estimator** of $\hat{\beta}_{IV}$ (or on the 2SLS IV estimator to be precise) which can be formally expressed as:

$$\widehat{\beta}_{\mathrm{IV}} = \frac{\mathrm{Cov}[z, y]}{\mathrm{Cov}[x, y]}$$

The first condition $Cov\ (z_i\ , u_i)\ = 0$ is referred to as validity. The instrument is valid if it is exogenous. The second one $Cov\ (z_i\ , x_i)\ \neq 0$ is referred to as relevance. The instrument is relevant if it is correlated with the regressor. The IV estimation depends crucially on both of these assumptions being satisfied.

This theory applied to our model it is as follows:

$$Bribe_i = \ \delta \ + \ \pi\ (gvt\_regul_i) + \ \varepsilon_i \qquad (3.3)$$

gvt_regul_i is z_i, the instrument variable

'gvt_regul 'is eligible since it is statistically significant correlated with '*Bribe'* at a 10% level, according to the t-statistic value of 0.2313 (and a p-value <0.01).
Collecting the fitted values:

$$\widehat{Bribe} = \hat{\pi} gvt\_regul \qquad (3.4)$$

where $\widehat{Bribe}$ is represented by the variable '*BribeIV'* in the descriptive statistics.
The first stage regression result (table 17 in the appendix) suggests with a value of 0.2313 that 'Bribe' will increase with '% of time spent with governmental regulations'. This correlation is statistically seen highly significant at a 99% level. According to a corresponding F-statistic with a value of 11.44, this instrument is not weak because the value is greater than the threshold of 10.

9.II.2 Statistics tables

Hint: All the tables in this statistical part of the appendix are created and based on the 2009 ES data set**.**

Table 5: Description of the variables of interest

category	origin var.	Variable name	Variable description
	l1	employ	Total number of full-time employees in 2007
Sales	d2	Sales	Total annual sales FY 2007
		sales07BRL	Total annual sales in R$
		sales07USD	Total annual sales in US$
		Sales_mio	Total annual sales in million US$
		(log)Sales	Total annual firm sales FY 2007 (log)
Bribe	j7a & j7b	Bribe	Total informal payments in tsd. BRL
		Bribe/Sales (in %)	ratio Bribes/Sales (in %)
		pos_paym	Positive informal payments ONLY
		paym	Kind of bribe payment (B.=0 | B.>0)
controls	l1	size	Size of the Firm (meas. by # of employees)
	b5	age	Age of the firm (in years)
	a3a	region	Region where firm is located
	a4a	sector	Sector to which the firm belongs
	d3b & d3c	trade	Does the firm export (in)directly?
	j3	tax_inspect	Last year, was this firm inspected by tax officials?
	j2	gvt_regul	% of senior manager's time spent dealing with gvt regulations

Table 6: summary statistics, sorted by firm size

by type	Variable	Mean	Median	Std.Dev.	Min	Max
Micro	**Employees**	6.62	7	1.9076	1	9
(N = 222)	**Sales (in mio US$)**	2.50	0	29.4299	0	438
	(log)Sales	11.70	12	1.9987	7	20
	Bribe (in tsd. US$)	0.99	0	8.5153	0	102
	Bribe/Sales (in %)	0.45	0	3.8985	0	56
	Size	1.00	1	0.0000	1	1
	Age	13.67	12	9.3084	1	51
	Sector	1.60	1	0.8159	1	3
	Region	3.51	4	1.1365	1	5
	Trade	0.05	0	0.2079	0	1
	Tax inspection	0.38	0	0.4861	0	1
	Gvt.regul. (% of time)	13.28	10	15.7937	0	90
SME	**Employees**	50.46	30	49.4649	10	245
(N = 1,097)	**Sales (in mio US$)**	4.71	1	15.2435	0	224
	(log)Sales	13.44	14	2.2638	7	19
	Bribe (in tsd. US$)	8.37	0	50.3144	0	843
	Bribe/Sales (in %)	0.55	0	2.9002	0	45
	Size	2.35	2	0.4775	2	3
	Age	18.91	15	14.8884	1	98
	Sector	1.35	1	0.7007	1	3
	Region	3.48	4	1.1767	1	5
	Trade	0.21	0	0.4079	0	1
	Tax inspection	0.47	0	0.4993	0	1
	Gvt.regul. (% of time)	19.78	10	21.0533	0	100
Large	**Employees**	1,038.20	560	1,142.4300	250	6,500
(N = 143)	**Sales (in mio US$)**	89.56	39	131.5491	0	569
	(log)Sales	16.83	17	2.3873	10	20
	Bribe (in tsd. US$)	21.77	0	102.2120	0	789
	Bribe/Sales (in %)	0.14	0	0.6820	0	6
	Size	4.00	4	0.0000	4	4
	Age	35.19	34	24.4448	1	127
	Sector	1.35	1	0.6946	1	3
	Region	3.71	4	1.1046	1	5
	Trade	0.57	1	0.4973	0	1
	Tax inspection	0.85	1	0.3621	0	1
	Gvt.regul. (% of time)	25.76	20	23.5884	0	100

Source: author's computation based on the 2009 ES data set

Table 7: summary statistics, sorted by bribe payments

by paym.	Variable	Mean	Median	Std.Dev.	Min	Max
Bribe <1% of sales (N = 1,326)	**Employees**	148.74	30	486.5782	1	6,500
	Sales (in mio US$)	13.70	1	53.7053	0	569
	(log)Sales	13.55	13	2.5958	7	20
	Bribe (in tsd. US$)	1.59	0	17.3079	0	467
	Bribe/Sales (in %)	0.03	0	0.1205	0	1
	Size	2.32	2	0.8601	1	4
	Age	19.74	15	16.4778	1	127
	Sector	1.38	1	0.7157	1	3
	Region	3.51	4	1.1576	1	5
	Trade	0.23	0	0.4186	0	1
	Tax inspection	0.49	0	0.5000	0	1
	Gvt.regul. (% of time)	19.04	10	20.5601	0	100
Bribe ≥ 1% of sales (N = 136)	**Employees**	59.21	31	102.9963	1	700
	Sales (in mio US$)	2.69	1	5.8334	0	45
	(log)Sales	13.12	13	2.2220	7	18
	Bribe (in tsd. US$)	78.08	19	155.0678	0	843
	Bribe/Sales (in %)	5.13	2	8.3633	1	56
	Size	2.23	2	0.6663	1	4
	Age	19.32	15	14.9641	1	77
	Sector	1.48	1	0.7978	1	3
	Region	3.49	4	1.2412	1	5
	Trade	0.16	0	0.3696	0	1
	Tax inspection	0.56	1	0.4984	0	1
	Gvt.regul. (% of time)	22.67	15	23.1677	0	100

Source: author's computation based on the 2009 ES data set

Table 8: summary statistics, sorted by refusal responses

by refusal	Variable	Mean	Median	Std.Dev.	Min	Max
no refuse (N = 1,440)	**Employees**	141.43	30	468.3850	1	6500
	Sales (in mio US$)	12.84	1	51.6443	0	569
	(log)Sales	13.53	13	2.5640	7	20
	Bribe (in tsd. US$)	8.51	0	54.5923	0	843
	Bribe/Sales (in %)	0.49	0	2.9667	0	56
	Size	2.31	2	0.8455	1	4
	Age	19.69	15	16.3196	1	127
	Sector	1.39	1	0.7208	1	3
	Region	3.51	4	1.1623	1	5
	Trade	0.22	0	0.4168	0	1
	Tax inspection	0.49	0	0.5001	0	1
	Gvt.regul. (% of time)	19.29	10	20.6119	0	100
refuse (N = 22)	**Employees**	73.77	24	125.7870	1	500
	Sales (in mio US$)	2.17	0	5.8683	0	26
	(log)Sales	12.15	12	2.3480	8	17
	Bribe (in tsd. US$)	21.68	2	58.6825	0	264
	Bribe/Sales (in %)	1.00	1	0.0000	1	1
	Size	2.27	2	0.7673	1	4
	Age	20.59	16	17.9196	1	71
	Sector	1.59	1	0.9081	1	3
	Region	3.50	4	1.3715	1	5
	Trade	0.00	0	0.0000	0	0
	Tax inspection	0.45	0	0.5096	0	1
	Gvt.regul. (% of time)	25.36	13	32.3839	0	100

Source: author's computation based on the 2009 ES data set

Table 9: Exchange rate USD to BRL

USD per 1 BRL	BRL per 1 USD
31 Dec 2007 00:00 UTC BRL/USD close:**0.56196**	31 Dec 2007 00:00 UTC USD/BRL close:**1.77950**

Source: xe.com, 2015

Table 10b: correlation matrix

# of obs. = 1,462	Employees	Sales (in mio US$)	(log)Sales	Bribe (in tsd. US$)	Bribe/Sales (in %)	Size	Age	Sector	Region	Trade	Tax inspection	Gvt.regul. (% of time)
Employees	1.0000											
Sales (in mio US$)	0.5592	1.0000										
(log)Sales	0.3651	0.4792	1.0000									
Bribe (in tsd. US$)	0.0143	0.0029	0.1257	1.0000								
Bribe/Sales (in %)	-0.0331	-0.0364	-0.0319	0.4755	1.0000							
Size	0.4733	0.3679	0.5811	0.0964	-0.0376	1.0000						
Age	0.3202	0.3169	0.3263	0.0597	0.0159	0.3441	1.0000					
Sector	-0.0470	-0.0378	-0.0654	-0.0085	0.0035	-0.1042	-0.0906	1.0000				
Region	0.0209	-0.0090	0.0105	0.0051	-0.0381	0.0195	0.0397	-0.0894	1.0000			
Trade	0.2269	0.1784	0.3993	0.0686	-0.0441	0.3933	0.2559	-0.1426	0.1038	1.0000		
Tax inspection	0.2031	0.1648	0.2125	0.0504	-0.0130	0.2522	0.1711	0.0017	-0.0569	0.1195	1.0000	
Gvt.regul. (% of time)	0.1146	0.1219	0.1513	0.0882	0.0448	0.1697	0.0564	0.0090	0.0231	0.0828	0.1026	1.0000

Source: author's computation based on the 2009 ES data set

Figure 12: White's test for heteroskedasticity

```
White's test for Ho: homoskedasticity
         against Ha: unrestricted heteroskedasticity

         chi2(2)      =     13.85
         Prob > chi2  =    0.0010

Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	13.85	2	0.0010
Skewness	3.59	1	0.0583
Kurtosis	4.20	1	0.0404
Total	21.64	4	0.0002

Source: author's computation based on the 2009 ES data set

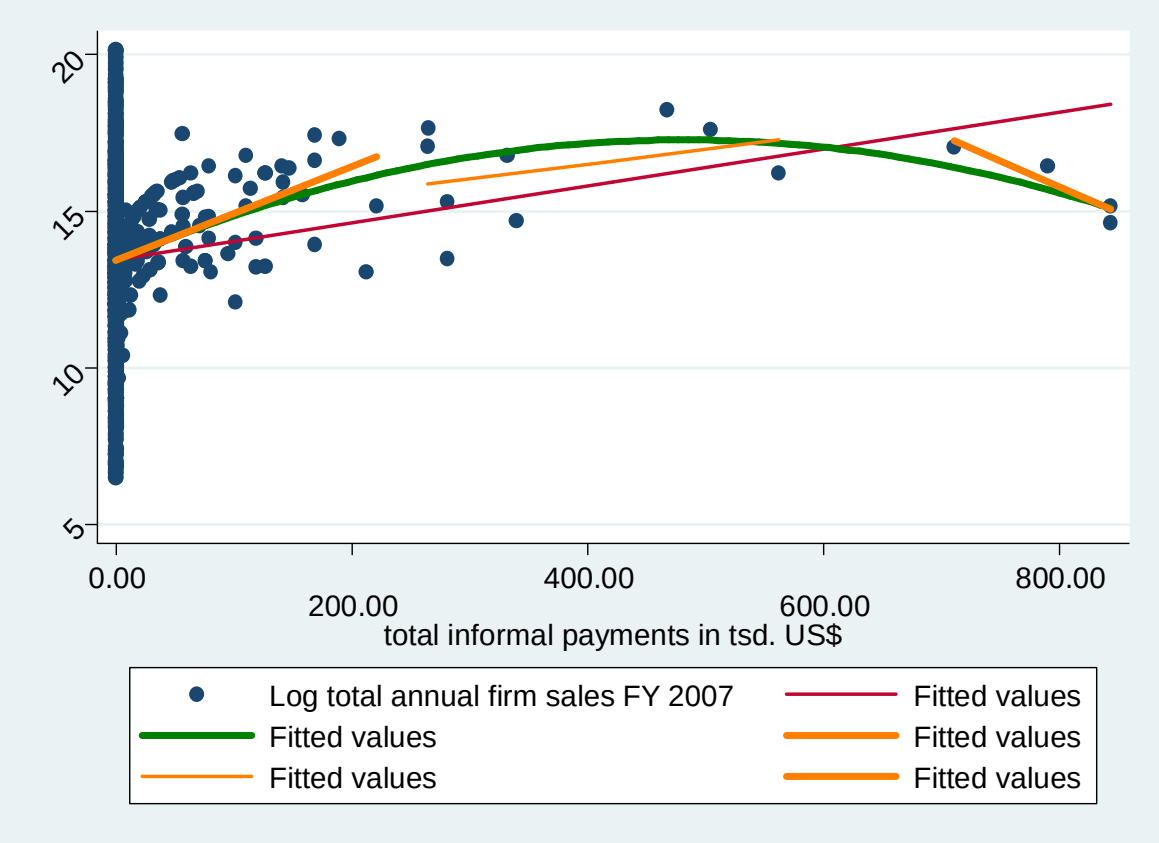
Table 11: baseline OLS regression results, sorted by bribe payments
Paying no or little bribes vs. 1% or more of sales

Dependent Variable: (log)Sales			
method	OLS		
	(1)	**(2)**	**(3)**
	bribes <1% of sales	bribes ≥1% of sales	bribes ≥1% of sales, no refusals
Bribe	0 .0173***	0.0071***	0.0063***
	[0.0041]	[0.0013]	[0.0013]
	(4.23)	(5.08)	(4.96)
C	13.520***	12.570***	12.747***
	[0.0714]	[0.1947]	[0.2133]
	(189.37)	(64.54)	(59.76)
N	1,326	136	114
R-squared	0.0132	0.2429	0.2348

The robust standard error is in the bracket.
The t-statistic is in the parantheses.
* p < 0.1, ** p < 0.05, *** p < 0.01
One unit in *'Bribe'* is = US$1,000
column (1) is the baseline regression considering all firms that paid no or less than 1% of their sales in bribes
column (2) is the baseline regression considering all firms that that paid at least 1% of their sales in bribes.
column (3) is the baseline regression considering all firms that paid at least 1% of their sales in bribes and that did not refuse to reply in j7b

Source: author's computation based on the 2009 ES data set

Figure 14: scatter plot plus
Linear fitted lines (in red and orange)
Quadratic fitted line (inverted U-shaped curve in green)



Source: author's computation based on the 2009 ES data set

Table 12: Bribe regressed on controls

Dependent Variable: Bribe

Regressor:	(1) age	(2) trade	(3) tax inspection	(4) region FE	(5) sector FE	(6) size FE	*IV* (7) % of time spent w/ gvt. regulat.
				["North" omitted]	["Manufacturing" omitted]	[micro (1-9) omitted]	*instrument variable*
				North-East	**Service**	**small (10-49)**	
	0.199**	9.042*	5.511*	-1.087	1.574	6.177***	0.231**
	[0.1003]	[4.6428]	[2.8681]	[5.1910]	[2.7325]	[1.9756]	[0.0913]
	(1.99)	(1.95)	(1.92)	(-0.21)	(0.57)	(3.13)	(2.53)
				Central-West	**Others**	**medium (50-249)**	
				-5.687	1.977	9.835***	
				[4.9832]	[6.5145]	[2.6246]	
				(-1.14)	(0.30)	(3.75)	
				South-East		**large (250+)**	
				-0.519		21.583**	
				[4.4616]		[8.6695]	
				(-0.11)		(2.49)	
				South			
				-0.7101			
				[4.8297]			
				(-0.15)			
C	4.769***	6.713***	5.986***	9.804**	7.313***	0.995*	4.221***
	[1.6020]	[1.3296]	[1.6900]	[4.0542]	[2.191]	[0.5710]	[1.5589]
	(2.98)	(5.05)	(3.54)	(2.42)	(3.34)	(1.74)	(2.71)
N	1,462	1,462	1,462	1,462	1,462	1,462	1,462
R-squared	0.0036	0.0050	0.0025	0.0006	0.0001	0.0101	0.0078

The robust standard error is in the bracket.
The t-statistic is in the parantheses.
* p < 0.1, ** p < 0.05, *** p < 0.01
Column (7) presents results to the variable that will be used as the instrument variable in the 2SLS approach.

Source: author's computation based on the 2009 ES data set

Table 13: (log)Sales regressed on controls

Dependent Variable: (log)Sales

Regressor:	(1) age	(2) trade	(3) tax inspection	(4) region FE	(5) sector FE	(6) size FE
				["North" omitted]	["Manufacturing" omitted]	[micro (1-9) omitted]
				North-East	**Service**	**small (10-49)**
	0.051***	2.471***	1.090***	0.168	0.438**	1.019***
	[0.038]	[0.1366]	[0.1315]	[0.2903]	[0.1890]	[0.1537]
	(13.14)	(17.70)	(8.29)	(0.58)	(2.28)	(6.63)
				Central-West	**Others**	**medium (50-249)**
				-0.639*	0.117	3.073***
				[0.3625]	[0.2525]	[0.1716]
				(-1.76)	(0.45)	(17.91)
				South-East		**large (250+)**
				-0.235		5.129***
				[0.2873]		[0.2401]
				(-0.82)		(21.36)
				South		
				0.408		
				[0.2905]		
				(1.41)		
C	12.492***	12.975***	12.970***	13.541***	13.165***	11.701***
	[0.0957]	[0.0712]	[0.0838]	[0.2639]	[0.1731]	[0.1340]
	(130.55)	(181.89)	(154.74)	(51.32)	(74.69)	(87.30)
N	1,462	1,462	1,462	1,462	1,462	1,462
R-squared	0.1064	0.1594	0.0452	0.0146	0.0044	0.3496

The robust standard error is in the bracket.
The t-statistic is in the parantheses.
* p < 0.1, ** p < 0.05, *** p < 0.01

Source: author's computation based on the 2009 ES data set

Table 15: OLS regressions, all firms (excl. refusals)

Dependent Variable: (log)Sales

no refusals

	(1)	(2)	(3)	(4)	(5)	(6)
model		**(2.0)**		**(2.1)**	**(2.2)**	**(2.3)**
Control for:	**age**	**trade**	**tax. insp.**	**region FE**	**sector FE**	**size FE**
Bribe	0.0047***	0.0038***	0.0036***	0.0036***	0.0036***	0.0028***
	[0.0010]	[0.0010]	[0.0010]	[0.0009]	[0.0009]	[0.0008]
	(4.46)	(3.85)	(3.90)	(3.88)	(3.90)	(3.74)
age	0.051***	0.038***	0.035***	0.036***	0.036***	0.022***
	[0.0039]	[0.0039]	[0.0038]	[0.0039]	[0.0038]	[0.0033]
	(13.14)	(9.66)	(9.06)	(9.15)	(9.14)	(6.54)
trade		2.033***	1.969***	1.965***	1.984***	1.481***
		[0.1406]	[0.1380]	[0.1386]	[0.1396]	[0.1381]
		(14.45)	(14.23)	(14.17)	(14.22)	(11.21)
tax inspections			0.670***	0.708***	0.681***	0.379***
			[0.1205]	[0.1204]	[0.1209]	[0.1137]
			(5.56)	(5.88)	(5.63)	(3.33)
fixed effects				**North**	**Manufacturing**	**Micro (1-9)**
				[omitted]	*[omitted]*	*[omitted]*
				North-East	**Service**	**SMEs (10-249)**
				-0.267	0.333*	1.333***
				[0.2776]	[0.1912]	[0.1530]
				(-0.96)	(1.75)	(8.66)
				Central-West	**Other**	**Large (250+)**
				-0.818**	-0.074	3.675***
				[0.3478]	[0.1825]	[0.2625]
				(-2.35)	(-0.41)	(14.00)
				South-East		
				-0.856***		
				[0.2787]		
				(-3.07)		
				South		
				-0.131		
				[0.2793]		
				(-0.47)		
C	12.477***	12.291***	12.037***	12.535***	11.994***	11.199***
	[0.0957]	[0.0921]	[0.0997]	[0.2708]	[0.1089]	[0.1460]
	(130.29)	(133.43)	(120.62)	(46.29)	(110.06)	(76.70)
N	1,440	1,440	1,440	1,440	1,440	1,440
R-squared	0.1209	0.2224	0.2389	0.2558	0.2407	0.3382

The robust standard error is in the bracket.

The t-statistic is in the parantheses.

* p < 0.1, ** p < 0.05, *** p < 0.01

One unit in *'Bribe'* is = US$1,000

Source: author's computation based on the 2009 ES data set

Table 16: OLS approach, FE separately

Table 16a: region FE

	Dependent Variable: (log)Sales			*region FE*
	(1) all firms	(2) <1% of sales	(3) ≥ 1% of sales	(4) ≥ 1% of sales, excl. refusals
Bribe	0.0058***	0.0179***	0.0070***	0.0062***
	[0.0011]	[0.0041]	[0.0015]	[0.0015]
	(5.38)	(4.34)	(4.69)	(4.26)
fixed effects				
North	*[omitted]*	*[omitted]*	*[omitted]*	*[omitted]*
North-East	0.174	0.102	-0.683	-0.597
	[0.2894]	[0.3249]	[0.5874]	[0.6969]
	(0.60)	(0.32)	(-1.16)	(-0.86)
Central-West	-0.606*	-0.602	-1.421*	-1.398
	[0.3616]	[0.3968]	[0.7876]	[0.8719]
	(-1.67)	(-1.52)	(-1.80)	(-1.60)
South-East	-0.232	-0.447	0.399	0.649
	[0.2864]	[0.3245]	[0.4856]	[0.5369]
	(-0.81)	(-1.38)	(0.82)	(1.21)
South	0.412	0.261	0.659	0.383
	[0.2896]	[0.3276]	[0.5020]	[0.5803]
	(1.42)	(0.80)	(1.31)	(0.66)
C	13.484***	13.688***	12.546***	12.669***
	[0.2637]	[0.3008]	[0.4299]	[0.5036]
	(51.12)	(45.50)	(29.18)	(25.16)
N	1,462	1,326	136	114
R-squared	0.0300	0.0287	0.3339	0.3385

The robust standard error is in the bracket.
The t-statistic is in the parantheses.
* p < 0.1, ** p < 0.05, *** p < 0.01
One unit in *'Bribe'* is = US$1,000

Table 16b: sector FE

	Dependent Variable: (log)Sales			*sector FE*
	(1) all firms	(2) <1% of sales	(3) ≥ 1% of sales	(4) ≥ 1% of sales, excl. refusals
Bribe	0.0059***	0.0172***	0.0071***	0.0063***
	[0.0011]	[0.0042]	[0.0014]	[0.0013]
	(5.20)	(4.09)	(4.98)	(4.82)
fixed effects				
Manufact.	*[omitted]*	*[omitted]*	*[omitted]*	*[omitted]*
Service	-0.324	-0.294	-0.541	-0.499
	[0.2019]	[0.2141]	[0.4840]	[0.5034]
	(-1.60)	(-1.37)	(-1.12)	(-0.99)
Others	-0.429**	-0.439**	-0.085	-0.122
	[0.1912]	[0.2091]	[0.3808]	[0.4106]
	(-2.25)	(-2.10)	(-0.23)	(-0.30)
C	13.552***	12.635***	12.635***	12.819***
	[0.0789]	[0.2363]	[0.2363]	[0.2575]
	(171.72)	(42.80)	(53.47)	(49.77)
N	1,462	1,326	136	114
R-squared	0.0201	0.0287	0.2479	0.2399

The robust standard error is in the bracket.
The t-statistic is in the parantheses.
* p < 0.1, ** p < 0.05, *** p < 0.01
One unit in *'Bribe'* is = US$1,000

Table 16c: size FE

	Dependent Variable: (log)Sales			*size FE*
	(1) all firms	(2) <1% of sales	(3) ≥ 1% of sales	(4) ≥ 1% of sales, excl. refusals
Bribe	0.0037***	0.0082***	0.0070***	0.0063***
	[0.0009]	[0.0035]	[0.0016]	[0.0016]
	(4.07)	(2.34)	(4.22)	(3.94)
fixed effects				
Micro (1-9)	*[omitted]*	*[omitted]*	*[omitted]*	*[omitted]*
SMEs (10-249)	1.712***	1.751***	1.294***	1.265**
	[0.1505]	[0.1572]	[0.4642]	[0.5248]
	(11.37)	(11.14)	(2.79)	(2.41)
Large (250+)	5.049***	5.148***	0.775	0.784
	[0.2432]	[0.2448]	[1.1024]	[1.1158]
	(20.76)	(21.03)	(0.70)	(0.70)
C	11.696***	11.709***	11.414***	11.613***
	[0.1339]	[0.1394]	[0.4240]	[0.4830]
	(87.33)	(83.97)	(26.92)	(24.04)
N	1,462	1,326	136	114
R-squared	0.2462	0.2580	0.2716	0.2634

The robust standard error is in the bracket.
The t-statistic is in the parantheses.
* p < 0.1, ** p < 0.05, *** p < 0.01
One unit in *'Bribe'* is = US$1,000

Source: author's computation based on the 2009 ES data set

Table 17: IV first stage regressions

	Dependent Variable: Bribe						*1st stage*
all firms							
model	**bivariate**	**multivariate**					
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Control for:	**instrument variable**	**age**	**trade**	**tax. insp.**	**region FE**	**sector FE**	**size FE**
Gvt. Regul. Time	0.2313***	0.2232***	0.2140***	0.2071***	0.2092***	0.2051***	0.1912***
	[0.0683]	[0.0684]	[0.0685]	[0.0688]	[0.0690]	[0.0689]	[0.0692]
	(3.38)	(3.26)	(3.12)	(3.01)	(3.03)	(2.98)	(2.76)
age		0.183**	0.140	0.126	0.123	0.129	0.075
		[0.0872]	[0.0901]	[0.0910]	[0.0916]	[0.0915]	[0.0939]
		(2.10)	(1.56)	(1.38)	(1.34)	(1.41)	(0.80)
trade			6.732*	6.437*	6.313*	6.545*	4.583
			[3.5571]	[3.5664]	[0.1309]	[3.6023]	[3.6629]
			(1.89)	(1.80)	(1.75)	(1.82)	(1.25)
tax inspections				3.284	3.508	3.359	2.194
				[2.9063]	[2.9401]	[2.9135]	[2.9509]
				(1.13)	(1.19)	(1.15)	(0.74)
fixed effects					**North**	**Manufacturing**	**Micro (1-9)**
					[omitted]	*[omitted]*	*[omitted]*
					North-East	**Service**	**SMEs (10-249)**
					-2.710	2.195	4.863
					[8.0426]	[4.777]	[4.0840]
					(-0.34)	(0.46)	(1.19)
					Central-West	**Others**	**Large (250+)**
					-7.069	-0.379	14.163**
					[8.9920]	[4.1366]	[6.4816]
					(-0.79)	(-0.09)	(2.19)
					South-East		
					-3.330		
					[7.8432]		
					(-0.42)		
					South		
					-2.318		
					[8.2181]		
					(-0.28)		
C	4.221**	0.760	0.304	-0.824	2.268	-1.093	-3.610
	[1.9457]	[2.5457]	[2.5549]	[2.7429]	[7.8090]	[2.9331]	[4.0673]
	(2.17)	(0.30)	(0.12)	(-0.30)	(0.29)	(-0.37)	(-0.89)
F-stat	11.4403	10.642	9.7515	9.0572	9.1917	8.8508	7.6399
(p-value)	(0.0007)	(0.0011)	(0.0018)	(0.0027)	(0.0025)	(0.0030)	(0.0058)
N	1,462	1,462	1,462	1,462	1,462	1,462	1,462
R-squared	0.0078	0.0094	0.0132	0.0141	0.0092	0.0102	0.0173

The robust standard error is in the bracket.
The t-statistic is in the parantheses.
* p < 0.1, ** p < 0.05, *** p < 0.01
F-stat is the corresponding first-stage *F*-statistic value to the test for weak instrumentation

Source: author's computation based on the 2009 ES data set

Table 18a: % of time spent dealing with govt. regulations

time spent dealing with gvt regulations	Freq.	Percent	Cum.
less than 10%	484	33.11	33.11
10%-25%	593	40.56	73.67
1/4 - 1/2	293	20.04	93.71
51%-75%	50	3.42	97.13
more than 3/4	42	2.87	100.00
Total	1,462	100.00	

Source: author's computation based on the 2009 ES data set

Table 18b: time spent dealing with govt. regulations, each firm size group separately

the size of the firm	% of time spent dealing with gvt regulations					
	<10%	10%-25%	26%-50%	51%-75%	>75%	Total
Micro	96	93	29	2	2	**222**
(1-9)	**43.24**	**41.89**	**13.06**	**0.90**	**0.90**	**100**
Small	253	284	133	23	19	**712**
(10-49)	**35.53**	**39.89**	**18.68**	**3.23**	**2.67**	**100**
Medium	100	162	92	17	14	**385**
(50-249)	**25.97**	**42.08**	**23.90**	**4.42**	**3.64**	**100**
Large	35	54	39	8	7	**143**
(500+)	**24.48**	**37.76**	**27.27**	**5.59**	**4.90**	**100**
Total	484	593	293	50	42	**1,462**
	33.11	**40.56**	**20.04**	**3.42**	**2.87**	**100**

Source: author's computation based on the 2009 ES data set

Table 20: 2SLS-IVapproach for all firms excluding refusals

Dependent Variable: (log)Sales

no refusals							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
model	**(5.0)**		**(6.0)**		**(6.1)**	**(6.2)**	**(6.3)**
Control for:	**bivariate**	**age**	**trade**	**tax. insp.**	**region FE**	**sector FE**	**size FE**
Bribe	0.0926***	0.0850***	0.0739***	0.0690**	0.0742**	0.0684**	0.0506*
	[0.0333]	[0.0324]	[0.0304]	[0.0299]	[0.0313]	[0.0302]	[0.0258]
	(2.78)	(2.62)	(2.43)	(2.31)	(2.37)	(2.27)	(1.96)
age		0.033***	0.026***	0.025***	0.025***	0.025***	0.016***
		[0.0106]	[0.0089]	[0.0083]	[0.0088]	[0.0084]	[0.0063]
		(3.18)	(2.95)	(3.01)	(2.92)	(2.99)	(2.65)
trade			1.495***	1.491***	1.448***	1.495***	1.219***
			[0.3723]	[0.3521]	[0.3728]	[0.3583]	[0.2662]
			(8.46)	(4.23)	(3.88)	(4.17)	(4.58)
tax inspections				0.441*	0.453*	0.448*	0.262
				[0.2486]	[0.2657]	[0.2492]	[0.1928]
				(1.77)	(1.71)	(1.80)	(1.36)
fixed effects					**North**	**Manufacturing**	**Micro (1-9)**
					[omitted]	*[omitted]*	*[omitted]*
					North-East	**Service**	**SMEs (10-249)**
					-0.076	0.108	1.058***
					[0.6725]	[0.3822]	[0.2915]
					(-0.11)	(0.28)	(3.63)
					Central-West	**Others**	**Large (250+)**
					-0.354	-0.076	3.014***
					[0.7711]	[0.3217]	[0.5353]
					(-0.46)	(-0.24)	(5.63)
					South-East		
					-0.643		
					[0.6574]		
					(-0.98)		
					South		
					0.128		
					[0.6916]		
					(0.18)		
C	12.741***	12.136***	12.043***	11.893***	12.148***	11.888***	11.274***
	[0.3173]	[0.2480]	[0.2141]	[0.2060]	[0.6666]	[0.2169]	[0.2491]
	(40.15)	(48.93)	(56.24)	(57.73)	(18.22)	(54.81)	(45.26)
F-stat	8.7972	8.0122	7.1859	6.6849	6.7465	6.4651	5.6262
(p-value)	(0.0031)	(0.0047)	(0.0074)	(0.0098)	(0.0095)	(0.0111)	(0.0178)
N	1,440	1,440	1,440	1,440	1,462	1,462	1,462
R-squared	0.0054	0.0083	0.0102	0.0102	0.0080	0.0090	0.0112

The robust standard error is in the bracket.
The t-statistic is in the parantheses.
* p < 0.1, ** p < 0.05, *** p < 0.01
One unit in *'Bribe'* is = US$1,000
F-stat is the corresponding first-stage *F*-statistic value to the test for weak instrumentation

Source: author's computation based on the 2009 ES data set

Table 21: IV approach, FE separately

Table 21a: region FE

Dependent Variable: (log)Sales — region FE

	(1) all firms	(2) <1% of sales	(3) ≥ 1% of sales	(4) ≥ 1% of sales, excl. refusals
Bribe	0.0842***	0.5167*	0.0122**	0.0114**
	[0.0268]	[0.3074]	[0.0055]	[0.0053]
	(3.13)	(1.68)	(2.21)	(2.13)
fixed effects				
North	*[omitted]*	*[omitted]*	*[omitted]*	*[omitted]*
North-East	0.259	-0.160	-0.974	-0.940
	[0.7312]	[1.4641]	[0.7911]	[0.8717]
	(0.35)	(-0.11)	(-1.23)	(-1.08)
Central-West	-0.159	-0.687	-1.337	-1.269
	[0.8350]	[1.6256]	[0.8375]	[0.8954]
	(-0.19)	(-0.42)	(-1.60)	(-1.42)
South-East	-0.191	-1.782	0.260	0.521
	[0.7106]	[1.6410]	[0.6950]	[0.7527]
	(-0.27)	(-1.09)	(0.38)	(0.69)
South	0.468	-0.358	0.521	0.282
	[0.7438]	[1.5298]	[0.7407]	[0.8030]
	(0.63)	(-0.23)	(0.70)	(0.35)
C	12.715***	13.676***	12.272***	12.338***
	[0.7319]	[1.3704]	[0.6892]	[0.7668]
	(17.37)	(9.98)	(17.81)	(16.09)
F-stat	11.4948	2.8574	5.3985	4.8889
(p-value)	(0.0007)	(0.0912)	(0.0217)	(0.0291)
N	1,462	1,326	136	114
R-squared	0.0085	0.0020	0.0193	0.0231

The robust standard error is in the bracket.
The t-statistic is in the parantheses.
* p < 0.1, ** p < 0.05, *** p < 0.01
One unit in *'Bribe'* is = US$1,000
F-stat is the corresponding first-stage *F*-statistic value to the test for weak instrumentation

Table 21b: sector FE

Dependent Variable: (log)Sales — sector FE

	(1) all firms	(2) <1% of sales	(3) ≥ 1% of sales	(4) ≥ 1% of sales, excl. refusals
Bribe	0.0812***	0.4630*	0.0139*	0.0136*
	[0.0263]	[0.2571]	[0.0071]	[0.0070]
	(3.09)	(1.80)	(1.96)	(1.93)
fixed effects				
Manufact.	*[omitted]*	*[omitted]*	*[omitted]*	*[omitted]*
Service	-0.354	0.262	-0.681	-0.638
	[0.4189]	[0.8026]	[0.6631]	[0.6987]
	(-0.85)	(0.33)	(-1.03)	(-0.91)
Others	-0.310	-0.631	0.186	0.160
	[0.3675]	[0.6627]	[0.5598]	[0.6176]
	(-0.85)	(-0.95)	(0.33)	(0.26)
C	12.881***	12.871***	12.060***	12.137***
	[0.2755]	[0.4981]	[0.6357]	[0.7048]
	(46.75)	(25.84)	(18.97)	(17.22)
F-stat	11.3987	3.3401	4.0212	3.6835
(p-value)	(0.0008)	(0.0678)	(0.0470)	(0.0575)
N	1,462	1,326	136	114
R-squared	0.0058	0.0009	0.0204	0.0163

The robust standard error is in the bracket.
The t-statistic is in the parantheses.
* p < 0.1, ** p < 0.05, *** p < 0.01
One unit in *'Bribe'* is = US$1,000
F-stat is the corresponding first-stage *F*-statistic value to the test for weak instrumentation

Table 21c: size FE

Dependent Variable: (log)Sales — size FE

	(1) all firms	(2) <1% of sales	(3) ≥ 1% of sales	(4) ≥ 1% of sales, excl. refusals
Bribe	0.0515**	0.3525	0.0146*	0.0126*
	[0.0217]	[0.2932]	[0.0087]	[0.0071]
	(2.36)	(1.20)	(1.67)	(1.76)
fixed effects				
Micro (1-9)	*[omitted]*	*[omitted]*	*[omitted]*	*[omitted]*
SMEs (10-249)	1.355***	1.421**	0.891	0.884
	[0.2997]	[0.5567]	[0.8062]	[0.8090]
	(4.52)	(2.55)	(1.11)	(1.09)
Large (250+)	4.017***	2.383	-1.794	-2.032
	[0.5964]	[2.4547]	[3.1453]	[3.4108]
	(6.74)	(0.97)	(-0.57)	(-0.60)
C	11.649***	11.691***	11.280***	11.480***
	[0.2307]	[0.4360]	[0.6474]	[0.6707]
	(50.48)	(26.81)	(17.42)	(17.12)
F-stat	8.3735	1.5727	3.0366	3.8151
(p-value)	(0.0039)	(0.2100)	(0.0837)	(0.0533)
N	1,462	1,326	136	114
R-squared	0.0130	0.0156	0.0225	0.2053

The robust standard error is in the bracket.
The t-statistic is in the parantheses.
* p < 0.1, ** p < 0.05, *** p < 0.01
One unit in *'Bribe'* is = US$1,000
F-stat is the corresponding first-stage *F*-statistic value to the test for weak instrumentation

Source: author's computation based on the 2009 ES data set

Table 22: OLS & IV regressions with controls and all FE together

Dependent Variable: (log)Sales				
	OLS		IV	
	(1)	(2)	(3)	(4)
	all firms	***no refusals***	**all firms**	***no refusals***
Bribe	0.0029***	0.0027***	0.0472**	0.0558**
	[0.0008]	[0.0008]	[0.0211]	[0.0278]
	(3.63)	(3.49)	(2.23)	(2.00)
Control for:				
age	0.023***	0.023***	0.019***	0.017***
	[0.0033]	[0.0034]	[0.0058]	[0.0068]
	(6.72)	(6.86)	(3.35)	(2.60)
trade	1.534***	1.503***	1.306***	1.195***
	[0.1322]	[0.1322]	[0.2423]	[0.2917]
	(11.59)	(11.37)	(5.39)	(4.10)
tax inspections	0.440***	0.419***	0.304	0.280
	[0.1132]	[0.1133]	[0.1858]	[0.2092]
	(3.89)	(3.74)	(1.64)	(1.34)
Fixed effects:				
region FE	[region "North" omitted]			
North-East	-0.175	-0.147	-0.089	-0.038
	[0.2398]	[0.2465]	[0.4752]	[0.5417]
	(-0.73)	(-0.60)	(-0.19)	(-0.07)
Central-West	-0.595*	-0.575*	-0.350	-0.274
	[0.3118]	[0.3172]	[0.5396]	[0.6176]
	(-1.91)	(-1.81)	(-0.65)	(-0.44)
South-East	-0.787**	-0.777***	-0.691	-0.646
	[0.2410]	[0.2485]	[0.4655]	[0.5317]
	(-3.27)	(-3.13)	(-1.49)	(-1.22)
South	-0.064	-0.085	0.022	0.091
	[0.2416]	[0.2498]	[0.4852]	[0.5579]
	(-0.27)	(-0.34)	(0.05)	(0.16)
sector FE	[sector "Manufacturing" omitted]			
Service	0.324*	0.324*	0.178	0.118
	[0.1783]	[0.1791]	[0.2891]	[0.3327]
	(1.82)	(1.81)	(0.62)	(0.36)
Others	-0.084	-0.068	-0.088	-0.093
	[0.1620]	[0.1632]	[0.2462]	[0.2790]
	(-0.52)	(-0.42)	(-0.36)	(-0.34)
size FE	["micro" (1-9 employees) omitted]			
SMEs (10-249)	1.314***	1.328***	1.046***	1.018***
	[0.1519]	[0.1532]	[0.2712]	[0.3142]
	(8.65)	(8.76)	(3.86)	(3.24)
large (250+)	3.608***	3.654***	2.910***	2.935***
	[0.2648]	[0.2620]	[0.5039]	[0.5685]
	(13.63)	(13.94)	(5.78)	(5.16)
C	11.567***	11.563***	11.552***	11.543***
	[0.2733]	[0.2825]	[0.5097]	[0.5810]
	(42.32)	(40.93)	(22.66)	(19.87)
F-stat			7.5602	5.4481
(p-value)			(0.0060)	(0.0197)
N	1,462	1,440	1,462	1,440
R-squared	0.3529	0.3555	0.0098	0.0078

The robust standard error is in the bracket.
The t-statistic is in the parantheses.
* p < 0.1, ** p < 0.05, *** p < 0.01
One unit in *'Bribe'* is = US$1,000
F-stat is the corresponding first-stage F-statistic value to the test for weak instrumentation

Source: author's computation based on the 2009 ES data set

III. Material

Work material

9.III.1 Survey questionnaire

Original survey questions to the "business-government relation" (corruption) section taken from the original core questionnaire which is together with the data set provided by the World Bank (WB, 2015).

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J. BUSINESS-GOVERNMENT RELATIONS

READ THE FOLLOWING TO THE RESPONDENT BEFORE PROCEEDING:
The following questions assess how establishments, such as this one, deal with government officials and their agencies.

J.1	I am going to read some statements that describe the courts and the way government officials interpret laws and regulations that affect this establishment's business. For each statement, please tell me if you Strongly disagree, Tend to disagree, Tend to agree, or Strongly agree. [READ EACH DESCRIPTION] Do you Strongly disagree, Tend to disagree, Tend to agree, or Strongly agree? INTERVIEWER: SHOW CARD J1

	Strongly disagree	Tend to disagree	Tend to agree	Strongly agree	Don't know
"The court system is fair, impartial and uncorrupted" h7a	1	2	3	4	-9
"Government officials' interpretations of the laws and regulations affecting this establishment are consistent and predictable." j1a	1	2	3	4	-9

J.2	In a typical week over the last 12 months, what percentage of total senior management's time was spent in dealing with requirements imposed by government regulations? [By senior management I mean managers, directors, and officers above direct supervisors of production/sales workers. Some examples of government regulations are taxes, customs, labor regulations, licensing and registration, including dealings with officials and completing forms]

	Percent
Senior management's time spent on dealing with regulations	j2 %
No time was spent	0
Don't know (spontaneous)	-9

J.3	Over the last 12 months, was this establishment visited and or inspected by tax officials?

Yes	1	
No	2	GO TO QUESTION J.6a
Don't know	-9	GO TO QUESTION J.6a
		j3

J.4	Over the last 12 months, How many times was this establishment either inspected by tax officials or required to meet with them?

	Number
Times inspected or met with tax officials	j4

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J.5	In any of these inspections or meetings was a gift or informal payment expected or requested?

Yes	1
No	2
Don't know	-9
REF	-8

j5

J.6a	Over the last 12 months, has this establishment secured a government contract or attempted to secure a contract with the government?

Yes	1	
No	2	GO TO QUESTION J.7
Don't know	-9	GO TO QUESTION J.7

j6a

J.6	When establishments like this one do business with the government, what percent of the contract value would be typically paid in informal payments or gifts to secure the contract?

	Percent
Percent of the contract value paid as informal payments or gifts	j6 %
No payments/gifts are paid	0
Don't know (spontaneous)	-9
Refusal (spontaneous)	-8

J.7	It is said that establishments are sometimes required to make gifts or informal payments to public officials to "get things done" with regard to customs, taxes, licenses, regulations, services etc. On average, what percent of total annual sales, or estimated total annual value, do establishments like this one pay in informal payments or gifts to public officials for this purpose?

	Percent
Percent of total annual sales paid as informal payment	j7a %
No payments/gifts are paid	0
Don't know (spontaneous)	-9
Refusal (spontaneous)	-8

PROVIDE EITHER ONE OR THE OTHER, NOT BOTH

	LCUs
Total annual informal payment	j7b
No payments/gifts are paid	0
Don't know (spontaneous)	-9
Refusal (spontaneous)	-8

J.10	Over the last two years, did this establishment submit an application to obtain an import license?

Yes	1	
No	2	GO TO QUESTION J.13
Don't know	-9	GO TO QUESTION J.13
		j10

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J.11	In reference to the application for an import license, approximately what was the wait, in days, experienced to obtain that license from the day this establishment applied for it to the day it was granted?

	Days
Wait for import license	j11
Less than one day	1
Still in process	-6
Application denied	-5
Don't know (spontaneous)	-9

J.12	In reference to that application for an import license, was an informal gift or payment expected or requested?

Yes	1
No	2
Don't know	-9
REF	-8

j12

J.13	Over the last two years, did this establishment submit an application to obtain an operating license?

Yes	1	
No	2	GO TO QUESTION J.30
Don't know	-9	GO TO QUESTION J.30

j13

J.14	In reference to the application for an operating license, approximately what was the wait, in days, experienced to obtain that license from the day this establishment applied for it to the day it was granted?

	Days
Wait for operating license	j14
Less than one day	1
Still in process	-6
Application denied	-5
Don't know (spontaneous)	-9

J.15	In reference to that application for an operating license, was an informal gift or payment expected or requested?

Yes	1
No	2
Don't know	-9
REF	-8

j15

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J.30	As I list some factors that can affect the current operations of a business, please look at this card and tell me if you think that each factor is No Obstacle, a Minor Obstacle, a Moderate Obstacle, a Major Obstacle, or a Very Severe Obstacle to the current operations of this establishment. **INTERVIEWER: SHOW CARD J30**

INTERVIEWER: ROTATE OPTIONS		No obstacle	Minor obstacle	Moderate obstacle	Major obstacle	Very Severe Obstacle	Do Not Know	Does Not Apply
Tax rates	j30a	0	1	2	3	4	-9	-7
Tax administration	j30b	0	1	2	3	4	-9	-7
Business licensing and permits	j30c	0	1	2	3	4	-9	-7
Political instability	j30e	0	1	2	3	4	-9	-7
Corruption	j30f	0	1	2	3	4	-9	-7
Courts	h30	0	1	2	3	4	-9	-7

[19] p.20 in the original WB questionnaire is left out because it is a blank page

9.III.2 World Bank Indicator Description 2014

Indicator [corr4]

CORRUPTION

[corr4] Percent of firms expected to give gifts to public officials (to get things done)

Description

Percentage of establishments that consider that firms with characteristics similar to theirs are making informal payments or giving gifts to public officials to "get things done" with regard to customs, taxes, licenses, regulations, services etc.

Survey Variable Used to Construct Indicator

This indicator is created from the variable J.7. If either j7a or j7b is positive, then the firm is considered to pay. If the respondent answers -8, it is also interpreted that the firm pays.

J.7	It is said that establishments are sometimes required to make gifts or informal payments to public officials to "get things done" with regard to customs, taxes, licenses, regulations, services etc. On average, what percentage of total annual sales, or estimated total annual value, do establishments like this one pay in informal payments or gifts to public officials for this purpose?

	Percent
Percentage of total annual sales paid as informal payment	j7a %
No payments or gifts are paid	0
Don't know (spontaneous)	-9
Refusal (spontaneous)	-8

PROVIDE EITHER ONE OR THE OTHER, NOT BOTH

	LCUs
Total annual informal payment	j7b
No payments or gifts are paid	0
Don't know (spontaneous)	-9
Refusal (spontaneous)	-8

Indicator Comparability

Indicators created following ES Global Methodology are comparable across countries and survey years. However, there also exists surveys that do not follow the Global Methodology and indicators created using these surveys are not comparable to other surveys.

Indicator Updates

September 7, 2010	Consideration of an answer of -8 (Refusal) as the firm pays informal payments
December 7, 2010	Treatment of -8 Change affected outlier treatment on the variable j7a
December 7, 2010	Treatment of -8 Change affected outlier treatment on the variable j7b
May 2, 2011	Changes to ECA 2002 & 2005 surveys

Back to List of Indicators