FUNDAÇÃO GETULIO VARGAS

ESCOLA DE ADMINISTRAÇÃO DE EMPRESAS DE SÃO PAULO

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DOES CORRUPTION INCREASE REWARDS IN LEGALLY REGISTERED FIRMS?

SÃO PAULO

2017

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Dissertação apresentado à Escola de Administração de Empresas de São Paulo, da Fundação Getulio Vargas como requisito para obtenção do título de Mestre em Administração de Empresas.

Linha de pesquisa: Estratégia Empresarial

Orientador: Prof. Dr. Paulo Roberto Arvate

SÃO PAULO

2017

Chambi, Karin Corina Huacantara.
Does corruption increase rewards in legally registered firms? / Chambi, Karin Corina Huacantara. - 2017.
78 f.

Orientador: Paulo Roberto Arvate
Dissertação (mestrado) - Escola de Administração de Empresas de São Paulo.

1. Empresas - Corrupção. 2. Sociedades comerciais - Corrupção. 3. Corrupção administrativa - Brasil. I. Arvate, Paulo Roberto. II. Dissertação (mestrado) - Escola de Administração de Empresas de São Paulo. III. Título.

CDU 343.352(81)

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Campo de conhecimento: Estratégia Empresarial

Data de aprovação: 20/02/2017

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Dedico este trabalho a Deus e a minha família por nunca ter me deixado desistir dos meus sonhos.

AGRADECIMENTOS

Agradeço a minha família, pelo apoio em todos os momentos da minha vida.

Ao meu orientador, Prof. Dr. Paulo Arvate, por me guiar no desenvolvimento deste trabalho.

Aos membros da banca examinadora, Prof. Dr. Klênio Barbosa e Prof. Dr. Rodrigo Bandeira de Mello, por suas importantes contribuições na construção desta dissertação.

À Escola de Administração de Empresas de São Paulo - EAESP-FGV, por confiar em mim e me dar a oportunidade de alcançar este objetivo. Meu agradecimento aos professores, amigos e colegas da FGV, pelo aprendizado e troca de experiências.

Ao Programa Estudantes-Convênio de Pós-Graduação – PEC-PG, da CAPES/CNPq, pela concessão da bolsa de estudos e a oportunidade de cursar este mestrado.

“The first sign of corruption in a society that is still alive is that the end justifies the means.”

(Georges Bernanos)

ABSTRACT

Recent research has highlighted the potential costs of corruption for firms. Empirical studies that investigated the impact of corruption on business activity have shown mixed results suggesting that the environment influences this relationship. On one hand, part of these studies has shown that corruption may improve business opportunities in poor governance environments. On the other hand, several studies have shown that, in general, corruption hurts the entrepreneurial activity and may have broader negative commercial effects.

The resource allocation is an essential part that allows firms to achieve specific goals associated with their performance; however, it may be affected by corruption. Thus, this study focuses on the resource allocation decisions within firms.

The aim of this study is to test the effect of corruption on the allocation of resources to employees in legally registered firms of Brazil. Following the Rational Choice Theory, we assume that private firms' employees will engage in government corruption if they perceive greater rewards than the expected utility of not engaging in corruption. Hence, corrupt firms would have to give rewards to employees engaged in corruption because they run the risk of being caught and punished. These rewards would be paid in the form of high compensations or job stability. In that sense, we argue that corruption increases the rewards paid to employees in legally registered firms. We test our assumption employing a large sample of more than 100, 000 firms located across 480 Brazilian municipalities that were audited in the period 2005-2008. The empirical strategy consists in estimating the differential effect of allocation of compensation and tenure between sectors associated and not associated with corruption, and then estimating the effect of the level of corruption in municipalities on that allocation.

Results suggest that firms from sectors associated with corruption pay higher compensation to their employees than those firms from sectors not associated with corruption. These results are specific to employees with compensation above the median compensation of employees in their firms. In addition, firms operating in more corrupt municipalities tend to allocate more compensation than those operating in less corrupt municipalities.

Keywords: corruption; allocation; rewards; compensation; job tenure.

RESUMO

Pesquisas recentes têm destacado os custos potenciais da corrupção para as empresas. Estudos empíricos que investigaram o impacto da corrupção na atividade empresarial apresentaram resultados mistos sugerindo que o ambiente influencia essa relação. Por um lado, parte desses estudos mostraram que a corrupção pode melhorar as oportunidades de negócios em ambientes com governança deficiente. Por outro lado, vários estudos mostraram que, em geral, a corrupção prejudica a atividade empresarial e pode ter efeitos comerciais negativos mais amplos.

A alocação de recursos é uma parte essencial que permite às empresas alcançar objetivos específicos associados ao seu desempenho; no entanto, pode ser afetada pela corrupção. Assim, o presente estudo concentra-se nas decisões de alocação de recursos dentro das empresas.

O objetivo deste estudo é testar o efeito da corrupção na alocação de recursos aos empregados de empresas legalmente registradas no Brasil. Seguindo a Teoria da Escolha Racional, assume-se que os empregados de empresas privadas irão se engajar em corrupção se perceberem recompensas maiores do que a utilidade esperada de não se engajar em corrupção. Assim, as empresas corruptas teriam que recompensar esses empregados porque correm o risco de serem descobertos e punidos. Essas recompensas seriam pagas sob a forma de altas remunerações ou estabilidade no emprego. Nesse sentido, argumentamos que a corrupção aumenta as recompensas pagas aos empregados em empresas legalmente registradas. O pressuposto é testado empregando uma grande amostra de mais de 100,000 empresas localizadas em 480 municípios brasileiros que foram auditados no período 2005-2008. A estratégia empírica consiste em estimar o efeito diferencial da alocação de remuneração e emprego entre os setores associados e não associados à corrupção, e estimar o efeito do nível de corrupção nos municípios nessa alocação.

Os resultados sugerem que as empresas dos setores associados à corrupção pagam uma remuneração mais elevada aos seus trabalhadores do que as empresas de setores não associados à corrupção. Estes resultados são específicos aos empregados com remunerações acima da remuneração mediana dos empregados em suas empresas. Além disso, em municípios mais corruptos, as empresas tendem a alocar mais remuneração do que aquelas empresas que operam em municípios menos corruptos.

Palavras-chave: corrupção; alocação; recompensas; remuneração; tempo de emprego.

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LIST OF ABBREVIATIONS

BNDES….National Bank for Economic and Social Development

CGU…....Office of the Comptroller General

CNAE…...National Classification of Economic Activities

GDP….....Gross Domestic Product

IBGE.....Brazilian Institute of Geography and Statistics

INEP……. National Institute for Educational Studies and Research "Anísio Teixeira"

IPEA……. Institute for Applied Economic Research

MTE……..Ministry of Labor and Employment of Brazil

OLS……...Ordinary Least Squares

RAIS….....Annual Report of Social Information

SEBRAE…Brazilian Service to Support Micro and Small Enterprises

TI……...Transparency International

TSE….....Superior Electoral Court

1. INTRODUCTION

The engagement of private agents in corrupt acts with government officials is a common problem in our society. Most arguments agree that firms become engaged in corruption in order to obtain some benefits (Collins, Uhlenbruck and Rodriguez, 2009; Iriyama, Kishore and Talukdar, 2016). Recent empirical studies on the effect of corruption on business activity have shown mixed results, where the environment has influenced them (Avnimelech, Zelekha and Sharabi, 2014; Bologna and Ross, 2015; Dreher and Gassebner, 2013; Dutta and Sobel, 2016). For example, Dreher and Gassebner (2013) find that corruption facilitates the firm entry in highly regulated economies. However, Avnimelech et al. (2014) find that corruption has a negative effect on entrepreneurship, but this effect is less strong in developing countries. Similarly, Dutta and Sobel (2016) agree that corruption hurts entrepreneurship, but it hurts less when a country has a bad business climate.

Although corruption may seem beneficial, by imposing additional taxes on firms it can distort the way that business decide to operate making them less efficient in terms of productivity (Olken and Pande, 2013). Scarce literature has shown that corruption may also have broader negative commercial effects affecting the efficiency of firms on indicators such as firm growth (Fisman and Svensson, 2007; Gaviria, 2002), productivity (Faruq, Webb and Yi, 2013) and management quality (Athanasouli and Goujard, 2015), but it has not shown how corruption may affect the allocation of resources to employees within firms. We investigate that impact by considering the allocation of compensation and tenure in legally registered firms of Brazil. Therefore, the aim of this study is to test the effect of corruption on the allocation of resources to employees (compensation and job tenure) in legally registered firms.

Following the Rational Choice Theory, we assume that employees of private firms will engage in corrupt practices with government officials if they receive greater rewards than the expected utility of not engaging in corruption, because they run the risk of being caught and convicted. These rewards would be paid in the form of high compensations or job stability (high tenure). Therefore, it is expected that corruption increases the rewards paid to employees, in any of the following forms: high compensations or high tenure in the companies. That is, firms from sectors associated with corruption, on average, allocate higher rewards than those from sectors not associated with corruption. In addition, in municipalities that presented more irregularities, on average, firms from sectors associated with corruption allocate more rewards to their

employees. In that sense, we intend to provide response to the next research question: Does corruption increase rewards in legally registered firms?

To address our research question, we use OLS robust regressions controlling for variables at the firm and municipality level for a large sample of firms operating across municipalities of Brazil. The sample was composed of more than 100,000 firms located throughout 480 municipalities (with up to 500,000 inhabitants) that were audited in the period 2005-2008, which corresponds to a four-year mandate for mayors of Brazilian municipalities.

Our database contains political, economic and social variables at the municipality-level, and socio-economic information at the firm level. The information at the firm-level was extracted carefully from the Annual Report of Social Information (RAIS) conducted by the Ministry of Labour and Employment of Brazil.

Another important information in this study is related to the measure of corruption that we employ. Most of the research that addresses the issue of corruption has faced challenges in relation to the measurement of this phenomenon due to their hidden nature and the reliance on perception-based measures, which may not measure corruption accurately (Olken and Pande, 2011). In order to overcome this issue, this study employs an objective measure of corruption based on audit reports carried out by the Office of the Comptroller General (CGU). Our corruption measure was developed by Arvate and Figueiredo (2016), and it is in line with those measures constructed by Ferraz and Finan (2008, 2011), Brollo, Nannicini, Perotti and Tabellini (2013) and Arvate and Tavares (2014). By using an observed corruption measure, we avoid reliability problems associated with measures of corruption based on perception.

Since municipalities can be audited multiple times (as part of the anti-corruption program carried out by the CGU), we consider the number of corruption events found the first year that municipalities were audited during our period of study (2005-2008) because this allowed us to use a greater number of municipalities which at least once were audited by the CGU. Each observation in the data corresponds to the year in which the municipality was audited. Thus, our data is cross-sectional.

The hypothesis is tested in the context of Brazil. This choice can be justified by three reasons. First, Brazil is one of the most decentralized among developing countries and it is expanding its presence in world markets. The total number of formal jobs grew by 65.7% from 2002 to 2012, and a large number of formal firms has been operating during that period. Second, since

2003 an anti-corruption program has been implemented in order to audit randomly selected municipal governments´ expenditures. Thus, it is important to rely on measures of corruption based on data from these audits. Third, this country has a representative number of states and municipalities (26 states, 1 federal district and more that 5,000 municipalities), which have autonomous administrations, follow not only state laws, but also federal laws, such as the Federal law 8666/1993, which regulates public procurements and prohibits public officials from engaging in corrupt practices.

Achieving the goal of this study is challenging, since there are a variety of factors influencing on decisions of firms. The problem of "omitted variables bias" and "selection bias" in observational data is a concern. We employ a large sample of firms located in municipalities that were randomly selected, which leads us to say that our sample was not selected subjectively. From this random selection, the economic activity sectors associated with corruption and the level of corruption of municipalities were defined. Moreover, we control extensively for observable variables both at the firm level and at the municipality level, including sector, audit-year, region and firm-size dummies, as well as interaction terms between firm size and sector in order to address the problem of omitted-variable bias. Unlike other studies that use some variables based on perception, this study relies on observable variables, which generally are not measured with error.

Our empirical strategy consists in identifying the differential effect of allocation of resources (compensation and tenure) between sectors associated and not associated with corruption (as classified in this study), and then verifying whether the level of corruption in municipalities interferes with that allocation of resources. In the first case we use a dummy variable indicating whether the sector of a firm was associated or not with corruption (as the main independent variable), while in the second case we consider the number of events of corruption found in the municipality.

Two indicators were considered as dependent variables to test our hypothesis: compensation and tenure. The estimates for the tenure variable did not show a robust effect. However, the results for the compensation variable were robust and statistically significant, which has supported our hypothesis. Moreover, receiving rewards in the form of high compensations would be more attractive for employees engaged in corrupt practices on behalf of their firms.

The findings show that firms from sectors associated with corruption allocate higher compensations to their employees than those firms from sectors not associated with corruption. That is, firms from sectors associated with corruption pay higher compensation (7.92% more or 0.13 more minimal wages) than those firms from sectors not associated with corruption. In addition, we find that the level of corruption in municipalities interferes with that compensation allocation. The compensation increases in 0.16% (or 0.002680 minimal wages), for a one unit increase in the number of corruption events committed in the municipality. That effect is small, but statistically significant. In other words, firms operating in more corrupt municipalities pay higher compensations to their employees than those operating in less corrupt municipalities. Moreover, when analyzed in terms of percentiles for the compensation distribution in firms (with others dependent variables based on percentiles), the effect remains robust and significant for employees with compensations above the median compensation of employees in their firms, which indicates that our results are specific for these employees. The results are also asymmetrically influenced by the firm size and the economic activity sectors (small and medium firms in some corrupt sectors pay more than the average compensation from their sector and vice versa).

In order to corroborate that the differential effect found between sectors classified as corrupt and non-corrupt was due to the corruption committed in municipalities, we do a placebo test assessing the differential effect in municipalities that were audited and no irregularities were observed. The results indicate that there is no robust evidence that the differential effect was merely due to a differential established between sectors. We observed that three of four sectors associated with corruption do not show evidence of being different from non-corrupt sectors. Unlike these results in municipalities that presented irregularities, the results in this test indicate that the compensation allocation in the corrupt sectors with the highest compensations (Construction and Services sectors) is not different statistically to those sectors not associated with corruption.

This study contributes to the literature of corruption and business management by evaluating the impact of corruption on allocation of resources to employees in legally registered firms. Literature shows the effect of corruption on different indicators, including entrepreneurship (Avnimelech et al., 2014; Bologna and Ross, 2015; Dreher and Gassebner, 2013; Dutta and Sobel, 2016), firm growth (Fisman and Svensson, 2007; Zhou and Peng, 2012), productivity (Faruq et al., 2013; McArthur and Teal, 2002) and management quality (Athanasouli and Goujard, 2015). While these studies evaluate the impact of corruption on commercial behavior

of firms, they do not consider how corruption affects the resource allocation decisions to employees within firms. Another contribution of this study has been the construction of a unique data set with variables at the firm and municipality level, containing measures of corruption based on audit reports of municipalities that were selected at random.

The rest of this study is structured as follows: Section 2 presents the institutional background of Brazil. Section 3 describes the literature review and the research hypothesis. Section 4 details the construction of some variables and the data used in this study, as well as the research design. Section 5 presents the main results and offers results of a placebo test. Finally, Section 6 shows the main conclusions of this study.

2. INSTITUTIONAL BACKGROUND

Brazil is a decentralized country composed of twenty-six states and one federal district (Brasília). It has 5,570 municipalities across states. The number of municipalities differs between states, being Roraima one state with 14 municipalities (the least subdivided) and Minas Gerais with 853 (the most subdivided). The average number of municipalities per state is 214. For purposes of this study, it is important to know that, according with IBGE, in 2005, this country had 5,564 municipalities, 5,529 (99%) of which had population less than or equal to 500,000 inhabitants.

States and municipalities have autonomous task, collect taxes from their residents and receive funds from the Union and their States respectively (Articles 18, 145 and 159, Brazilian Federal Constitution of 1988). States are headed by governors, and municipalities by mayors, all of them elected through a majoritarian system.

Governments must consider the Federal law 8666/1993 (one of the most important national law) when they allocate contracts to private firms. This law regulates public procurements, and prohibits public officials from engaging in corrupt practices, as well as encouraging competition between firms in order to benefit the consumer with the best products and services at the best price.

This country also is grouped in five regions: Northern, Northeast, Central-West, Southeast and Southern. Such classification has been useful for research purposes, but also to define the distribution of federal funds.

There are economic and social differences between regions. The economic inequality in Brazil is still a serious concern. According to World Bank, the Gini coefficient[1] in 2014 was 0.5148. The economic inequality among regions is also notorious. The Southeast and South regions are the most developed regions. These regions, in particular the Southeast (the richest region), are characterized by a high degree of industrialization and great concentration of population and riches, while the North and Northeast (the poorest region) are the less developed regions. The income inequality within regions (measured by Gini values) is as follows: North (0.504), Northeast (0.513, the most unequal region), Southeast (0.497), South (0.452) and Central-West (0.506).

In the last decades, Brazil reached an extremely large market size. It demonstrated its potential to ever further growth in the business sector. According to IBGE, the number of formal employees grew 65.7% from 2002 to 2012. There has been also an increasing number of companies. The number of companies during this period increased from 4 964 885 in 2002 to 5 195 250 in 2012 (Central Register of Enterprises (CEMPRE) of the IBGE).

Micro and Small enterprises play an important role in the economy of countries. According to Brazilian Service to Support Micro and Small Enterprises (SEBRAE), almost 99% of Brazilian companies are micro and small business. These small business account for more than a quarter of Gross Domestic Product (GDP) and there are nearly 9 million micro and small enterprises, which represent 27% of GDP. Brazilian small business also employee 52% of the formal labor force and account for 40% of the wage bill.

2.1. Corruption in Brazil

Corruption is a serious problem for economic development and it exists in all countries. It is widespread in developing countries and, Brazil is one of those countries that has experienced alarming scandals in recent years, involving government officials and business executives. According to Transparency International (TI), in 2015 Brazil worsened seven positions in the

[1] The Gini coefficient varies from zero (total equality) to one (extreme inequality).

ranking of perceived corruption in the world. That is, considering the scale from 0 (highly corrupt) to 100 (very clean), Brazil fall in the ranking, going from 43 points in 2014 to 38 points in 2015. Thus, in 2015 it was considered as one of the countries with the highest decreasing in the Corruption Perception Index (CPI), sliding to the 76th place (seven position down from 2014) among 168 countries.

Brazil, like many other Latin American countries, has suffered from high levels of corruption. Corruption has been a critical and persistent problem for many years, and has become a deep concern for governments, investors and citizens. Thus, in order to deal with this problem, since 2003, the Brazilian government has implemented an anticorruption program through of the Office of the Comptroller General (CGU or Controladoria Geral da União). Every year the CGU selects municipalities at random to audit their expenditures of federally transferred funds in different areas such as Education, Health, Agriculture, and Others. Then it makes available audit reports on the internet. The program actually considers municipalities with up to 500,000 inhabitants, which represent 99% of all Brazilian municipalities. According to CGU, 780 municipalities were audited in the period 2005-2008, many of which multiple times.

Ferraz and Finan (2008, 2011), Brollo, Nannicini, Perotti and Tabellini (2013), Arvate and Tavares (2014), and Arvate and Figueiredo (2016), based on these CGU´s audit reports, constructed and used new measures of corruption. By using observed corruption measures, it was avoided the use of perception-based measures, which are associated with reliability problems.

3. LITERATURE REVIEW AND HYPOTHESIS

3.1. Corruption and corrupt agents

Corruption has been defined in many ways. This study follows the definition of Macrae (1982), who refers to corruption as a private exchange arrangement between two parties (the "demander" and the "supplier"), which: (1) has an influence on the allocation of resources either immediately or in the future, and (2) involves the use or abuse of public or collective responsibility for private ends. He also refers that the conclusion of an "arrangement" implies

the expectation of a net gain for both parties, where the form of the gain varies considerably according to the circumstances of the negotiation.

Corruption can exist not only within activities of the public sector or private sector, but also within activities involving agents from both sides. Amundsen (1999) argues that corruption is a particular state-society relationship. Those parts involve on the one side public officials and on the other side any individual, firm, or non-governmental organization. In line with this argument, Ndikumana (2013) claims that corruption arises from both relations between the private sector and the public sector, similar to Rose-Ackerman (1997). Government usually is looking to contract the production of a good to a private firm, and during the procurement process, a firm may gain the government´s contract through bribes and/or agreements with public officials in order to get benefits. Ferraz and Finan (2008, 2011), based on audit reports on Brazilian local governments, find that the most common forms of irregularities are associated with fraud in procurements, diversion of funds, and over invoicing of public goods and services.

In this study, corruption refers to these practices mentioned above, which involve arrangements between local governments and private business actors who stand to benefit from gains resulting from corrupt agreements (e.g. corrupt transactions). This implies that corruption occurs when, on one side, one or more public officials accept or solicit bribes (private gains), and on the other side, one or more agents from private firms offer and/or give bribes to win government contracts or facilitate business operations. Nevertheless, corruption also occurs even if the bribe does not take place, that is, when public officials abuse the public office for private ends (e.g. political support) through patronage benefits such as the allocation of a public procurement contract to a private firm (World Bank, 2003).

Governments and private firms may be attracted to engage in corrupt practices, as long as they obtain benefits. Johnson (1975) argues that governments can use private firms to collect a corruption tax. According with him, "private firms will collect such a tax by obtaining monopoly rights *cum* special concessions from the government and will share in the tax proceeds by not handing over (as bribes, gifts, etc.) all the monopoly rents realized" (Johnson, 1975: 55). Such a situation would be beneficial for both parties. Thus, firms operating in corrupt environment will have more incentives to reward and promote employees who have a positive attitude toward corruption.

A number of studies have sought to understand which conditions lead firms to engage in corruption. Tonoyan, Strohmeyer, Habib, and Perlitz (2010) argue that poor enforcement and lower efficiency of economic institutions and legal institutions foster the entrepreneur's likelihood of engaging in corrupt practices. Dass, Nanda and Xiao, (2016) show that the local cultural environment in an important factor on economic activity. They show that managers of firms operating in places with more public corruption are likely to engage in more corrupt practices. Moreover, they suggest that firms located in corrupt environments are likely to engage in corrupt practices elsewhere, while researchers like Collins et al. (2009) find that firms whose executives have social ties with government officials are more likely to engage in corruption. Collins et al. (2009) state that executives are likely to rationalize such behavior as a necessity to make their company more competitive. They also argue that firms that engage in corrupt transactions seek to reduce the uncertainty in their environment. In addition, Iriyama, Kishore and Talukdar (2016) find that firms use corruption to gaining competitive advantage when they perceive threats from informal and foreign firm rivals.

Some works emphasize ethical situations in organizations associated with the belief that "the ends justify the means" (Campbell and Göritz, 2014; Charles, 2007; Tonoyan, Strohmeyer, Habib and Perlitz, 2010). These studies suggest that firms may also engage into corruption justified by the need for market dominance at any cost. However, employees in these firms may get involved in corruption, justified by the need to increase their incomes. It was noted that individuals at the helm of companies are self-interested and can be expected to engage in corruption (at the firm-level) in ways to maximize their personal benefits rather than the firm´s performance (Morrison and Milliken, 2004; Pinto, Leana and Pil, 2008).

Therefore, corrupt practices can benefit both the individual and the firm (Wheeler and Rothman, 1982). Employees in companies with aggressive bonus structures may be encouraged to involve in corrupt practices (i.e. offering bribes to secure contracts on behalf of the organization). These employees would be expected to seek to maximize their individual utilities, ignoring firm performance at the long run.

As we have seen, there may be many possibilities for corruption to take place; the environment, the poor enforcement and lower efficiency of economic institutions as well as the behavior and attitude to corruption of executives and managers of firms are crucial factors. Whatever the factors that lead firms to engage into corruption, the fact remains that corrupt agents seek to maximize benefits for their firms and themselves in some way.

3.2. Corruption and Business

Empirical studies on the effect of corruption on business activity have shown mixed results and the environment influences them (countries with weak and strong regulation, developed and developing countries).

Researchers have argued that corruption facilitates and helps to improve the entrepreneurial activity in countries where institutions are both weak and inefficient. By allowing private sector agents to avoid cumbersome regulations in exchange for bribes or dishonest agreements, corruption can promote efficiency and improve business opportunities (Huntington, 1968; Leff, 1964; Méon and Weill, 2010). This argument is known as the "grease the wheels" hypotheses, and some empirical studies have supported it (Denis and Parfait, 2014; Dreher and Gassebner, 2013). For example, based on information from 43 countries over the 2003-2005 period, Dreher and Gassebner (2013) find that a larger number of procedures required to start a business as well as larger minimum capital requirements are harmful to entrepreneurship. As their main contribution, they tested whether corruption can be an efficient grease reducing the negative impact of regulations on entrepreneurship. They observe that at the maximum level of regulation, government corruption increases entrepreneurial activity. In that way, they conclude that corruption facilitates firm entry in highly regulated economies.

On the other hand, literature suggests that, in general, corruption is harmful for entrepreneurial activity. This strand has revealed that corruption has negative and detrimental consequences on business activities (Avnimelech et al., 2014; Dutta and Sobel, 2016).

Avnimelech et al. (2014) using a data set for 176 countries, conclude that countries with high levels of corruption usually face low levels of productive entrepreneurship, and that this effect is stronger in developed countries than in developing countries. That is, corruption is less detrimental in developing countries. Similarly, Dutta and Sobel (2016) employing information about entrepreneurial initiatives for 104 countries, find that corruption hurts entrepreneurship, and that negative effect is smaller when business climates are bad. In other words, they find that corruption hurts entrepreneurship, but it hurts less when a country has a bad business climate.

Additionally, unlike those studies mentioned above, Bologna and Ross (2015) employing measures of corruption based on data from audit reports of Brazilian municipal governments[2], estimate the effect of corruption on changes in business activity in the short term (2003-2007 and 2008-2012) and in the long term (2003-2012). They observe that higher levels of corruption are generally associated with reductions in the number of business establishments in any interval of time, and that effect can be insignificant or positive conditional on the existence of low levels of institutional quality. That is, the negative effect of corruption is weaker at lower levels of institutional quality and becomes positive and significant with the worst indices of institutional quality[3] (1 and 1.4). For example, in municipalities with lower levels of institutional quality (1.4), a one-unit increase in corruption increases growth in the formal sector by about 5.9 establishments (considering changes over the 2008-2012 interval). The authors argue that these latest results are consistent with the "grease the wheel" hypothesis, since that corruption improves the business opportunities in environments with poor institutional quality.

These studies previously mentioned have addressed the issue of corruption on business activity from an external perspective (at macro level). However, it is important to know the microeconomic costs of corruption to business.

A small body of literature has also highlighted the microeconomic costs of doing business corruptly. In order to explore the potential costs of corruption at firm level, some studies has sought to quantify them. Svensson (2003), for instance, observes that in Uganda, the costs of paying bribes to government officials represent 8% of total costs of firms. For him, public officials act as price discriminators, and prices of public services are partly determined in a bargaining process, where firms' outside options matter.

Olken and Barron (2009) investigate 304 trips transporting goods to and from Aceh in Indonesia. They show that costs of paying bribes to public officials account for about 13% of the trip cost, which exceeds the total wages received by the truck drive and his assistant. They also show that corrupt public officials practice several types of price discrimination (e.g. according to the willingness to pay of truck drivers: newer trucks, carrying valuable cargo) as stressed by Svensson (2003) although for him corruption has not a significant effect on firms'

[2] Bologna and Ross (2015) employ measures of corruption constructed by Ferraz and Finan (2008, 2011) for a sample of 476 municipalities audited in 2003.

[3] These last results refer to interactions between corruption and institutional quality. Institutional quality takes values from 1 (poor institutions) to 6 (superior institutions). They show marginal effects when institutional quality takes 1, 1.4, 3, 4.5 and 6 values.

performance. Similarly, Sequeira and Djankov (2014) investigate the impact of corruption on firm-level trade costs in two ports: Maputo, Mozambique and Durban, South Africa. They observe that in Maputo, the bribe payments represent 14% of total shipping costs, while only 4% in Durban.

In spite of initial costs of corruption on firm profitability, corruption may not be harmful to firms´ performance, as found by Svensson (2003). For Svensson (2003), corruption may not be damaging for firm performance because more profitable firms may be more attractive for corrupt government officials. For Galang (2012) the fact that a firm benefits from government corruption does not mean that corruption can be benign.

A recent body of research suggests that corruption may have broader negative commercial effects for firms on indicators such as firm growth (Fisman and Svensson, 2007; Gaviria, 2002), productivity (Faruq et al., 2013; McArthur and Teal, 2002) and management quality (Athanasouli and Goujard, 2015).

Fisman and Svensson (2007) employing a data set for Ugandan firms, find that rate of taxation and bribery has a negative impact on firm growth (as measured by sales trends). Their results indicate that one-percentage point increase in the bribery rate reduce the firm growth by about 3.3 percentage points, while that one-percentage point increase in the rate of taxation reduce the firm growth by about 1.5 percentage points. Thus, they conclude that corruption has a stronger negative impact on firm growth than taxation. These results suggest that corruption imposes serious constraints for business.

In a similar vein, Faruq et al. (2013) using regression analysis with instrumental variable and employing a sample of 909 firms from manufacturing sectors over 12 years in Ghana, Kenya and Tanzania estimate the effects of corruption and bureaucratic quality on productivity of firms. They find that corruption has a greater negative impact on firm productivity than bureaucratic quality, and that firms operating in more corrupt countries are less efficient in terms of production than those firms in less corrupt countries. These results are in accordance with those of McArthur and Teal (2002), who find that corruption substantially reduces the productivity of African firms by 20% of the output per worker, and that firms located in countries with high level of corruption are about 70% less efficient than firms in countries with lowest levels of corruption.

Athanasouli and Goujard (2015), employing a sample of 1355 firms in 2009 investigate the impact of the regional corruption on the management quality of firms within the manufacturing sector in Central and Eastern Europe. They use data measuring management practices from the Management, Organization and Innovation (MOI) Survey, and measure of corruption based on the Business Environment and Enterprise Performance Survey (BEEPS) conducted by the EBRD and the World Bank. Their results suggest that firms located in more corrupt regions, tend to have lower management quality, a more centralized process, as well as a lower level of education among administrative staff. These latest studies suggest that corruption negatively affects the firm efficiency and, as consequence, the national productivity.

Studies showed that firms dependent on government contracts may adopt less efficient management practices in corrupt environments (Athanasouli and Goujard, 2015; Faruq et al., 2013). However, there may be some differences in the results when the effect of corruption on firm growth is evaluated considering the size of the firm (Zhou and Peng, 2012).

For Zhou and Peng (2012), bribery may hurt firm growth for small and medium firms, but not for large firms. They argue that large firms may strategically engage in corruption, while small firms are forced to do it. Similar to Fisman and Svensson (2007) and Gaviria (2002), Zhou and Peng (2012) also measure firm growth as the firms' sales growth. Their results are based on data from the World Business Environment Survey (WBES) implemented by the World Bank during 1999-2000. The sample they use contains 2,686 firms from 48 different countries around the world. These firms have different sizes and belong to different industries. They conclude that corruption is detrimental on firm growth only for small firms, but not for large firms.

Most studies in literature agree that corruption is detrimental to firms' efficiency. Initial costs of corruption for firms may be significant, as suggested by Olken and Barron (2009) and Sequeira and Djankov (2014), but in spite of this, these costs may not reflect the negative consequences of corruption on firm performance, as noted by Svensson (2003). Recent empirical studies that evaluated the effect of corruption on firm-level efficiency suggest that corruption has a negative effect. However, little is known about its influence on firms' decisions. As suggested by Olken, and Pande (2013), corruption may distort the way that companies decide to operate, by making them less efficient and productive. This study is going to evaluate the impact of corruption within firms, but considering the effect on the allocation of resources to employees in legally registered firms.

3.3. Corruption affecting the allocation of compensation and tenure within firms

Although the literature explores the effect of corruption on entrepreneurial activity and firm behavior, we did not find studies that analyze this effect within firms, more specifically the impact of corruption on allocation of compensation and tenure (employment duration) to employees within firms.

The allocation of resources is a fundamental activity that allows firms to achieve specific goals associated with their performance, but corruption can distort it. Private firm agents play an important role in these allocation decisions.

It is believed that firm-level corruption can occur if individuals, often those at the helm of a company are motivated to engage in corrupt acts in exchange for personal gains (Morrison and Milliken, 2004; Pinto, Leana and Pil, 2008). Executives, managers and other individuals may be involved in corrupt acts to attain firm-level goals that result in higher compensation for themselves, or that, in order to reach certain organizational goals, managers feel under pressure and motivate others employees to engage in corrupt acts in exchange for private benefits. Such private benefits would be granted to employees as a reward for participating in corrupt acts because corruption is an illegal activity, which is reprehensible.

Corruption is a crime in many countries (such as USA, UK, Germany, Peru, Brazil, Mexico and Chile), and corrupters and corruptees are punished. Brazil[4] is one of those countries where executives, managers and other employees were arrested for participating in corrupt practices (Connors, Jelmayer and Kiernan, 2015; Segal, 2015). However, it is important to consider that the corrupt practices are not always reported and offenders are not always convicted or punished severely. An effective judicial system is crucial to prosecute public officials and private firm agents involved in corruption.

The Rational Choice Theory emphasis that the crime decision is a rational process which the offender weights a risky choice in which the individual will engage on crime if the expected

[4] Corruption is a crime in Brazil. The law 8,666/1993 is one of the most important national law that provides for the accountability of both private parties and public officials. Under this law, offenders are subject to penalties. The Law 12,846/2013 is a recent Anti-Corruption law that provides for the accountability of companies and their managers. There are also other laws related to corruption in Brazil such as the Law 8,884/1994 (On repression of violations against the Economic Order), Law 1,079/1950 (On the Responsibility Crimes Procedural), and Law 9,034/1995 (On the prevention and repression of criminal organizations' activities).

utility from committing the crime is greater than the expected utility from refraining from committing the crime (Becker, 1968).[5] [6] The probability of detection and sanctions are mechanisms that increases the individual´s cost to commit a crime. If the individual is risk-averse, the effect of severity of the sanction is more effective for the reduction of crime than the probability of detection. We expect the contrary for risk-lovers.

In that way, following Becker (1968) approach, it is assumed that private firms' employees will engage in corrupt acts with government officials if they perceive greater rewards (high compensation or job stability) than the expected utility of not engaging in corruption. Hence, corrupt firms would have to reward workers who participated in corruption on behalf of the firm, because these employees run the risk of being caught and convicted. The rewards would be paid in the form of high compensations or high employment duration (job tenure). In that sense, corruption will affect the allocation decisions of firms in a non-efficient way, which is also in line with the literature that has suggested that corruption increases costs for firms and can affect their operational decisions, making them less efficient in terms of productivity (Faruq et al., 2013; Fisman and Svensson, 2007; McArthur and Teal, 2002).

In sum, the corruption is expected to increase the rewards paid to employees, in any of the following forms: high compensations and/or high tenure. The allocation of resources to employees will be affected in firms from private sector, in particular in firms from sectors associated with corruption. By allocating high compensation to those employees who participated in corrupt practices, on average, firms will present high compensations. By keeping the job of those employees who participated in corruption on behalf of the company and those employees who know the corrupt practices, on average, firms will have high tenure. Thus, the following hypothesis is suggested:

Hypothesis: Corruption increases the rewards paid to employees in legally registered firms.

[5] The criminology literature attributes to Cornish and Clarke (1986) the foundation of RCT. However, Loughran et al. (2016) emphasizes the seminal development of Becker (1968).

[6] The rational choice for an individual j can be seen by the equation: $E(Uj) = pjUj(Yj\text{-}fj) + (1\text{-}pj)U(Yj)$; where E(Uj) is the individual ´s expected utility of crime (j); p is the probability of detection; Yj are the benefits that individual obtain after the successful of crime; and f is the severity of sanction that the individual receives if it is apprehended.

4. DATA AND EMPIRICAL STRATEGY

4.1. Data and Sample

This study employs information at firm-level from the Annual Report of Social Information or Relação Anual de Informações Sociais (RAIS Migra) from the Ministry of Labour and Employment of Brazil, and information at municipality-level from INEP, CGU, IPEA, TSE and IBGE. RAIS Migra data was extracted carefully and logically before to be incorporated into our main database. Next sections detail the data extraction process from RAIS and the description of variables.

From GCU reports, we use corruption and mismanagement measures, which were developed by Arvate and Figueiredo (2016) in line with Ferraz and Finan (2008, 2011), Brollo, et al. (2013), and Arvate and Tavares (2014)[7]. Both, corruption and mismanagement measures followed the same methodology and were based on the same audit reports available on the CGU website (reports). Moreover, since municipalities can be audited multiple times, we consider the number of corruption events and mismanagement observed the first year that municipalities were audited during our period of study because this allowed us to use a greater number of municipalities, which at least once were audited by the CGU. Each observation in the data corresponds to the year in which the municipality was audited. Thus, our data is cross-sectional.

The considered period is from 2005 to 2008. We consider firms operating in municipalities that were audited in that period, which corresponds to a four-year mandate for mayors of Brazilian municipalities. The period was chosen because the data were complete and rich for that interval of time (RAIS data and corruption measure). Moreover, it was considered that CGU reports, which began to be produced in 2003 as part of the anti-corruption program, could have included more detailed information in the following years (since 2005).

Our full sample was composed of 144,444 firms with different sizes and economic activities, all of them located throughout 525 audited municipalities (with up to 500,000 inhabitants) and with business activity in the period 2005-2008. However, there were missing values for some characteristics of municipalities (information on mayor´s gender and level of education).

[7] Arvate and Tavares (2014), in line with the definition of corruption by Ferraz and Finan (2011), codified the irregularities into categories of corruption similar to those used by Brollo, et al. (2010), but they only considered some specific items to the Health sector. Arvate and Figueiredo (2016) re-classified those measures evaluating all sectors.

Excluding missing observations, our last sample was composed of 105,440 firms located throughout 480 audited municipalities from 2005 to 2008.

Of the total firms considered, 1,370 firms operated in more than one municipality. Thus, the breakdown of firms located in audited municipalities is as follows: 21,266 firms in 116 municipalities in 2005, 30,910 firms in 134 municipalities in 2006, 34,542 firms in 133 municipalities in 2007 and 18,796 firms in 97 municipalities in 2008. This information is consistent with all the data, which contains 105,514 observations.

4.1.1. RAIS Data extraction

The Annual Report of Social Information or Relação Anual de Informações Sociais (RAIS) is a matched employer-employee dataset from the Ministry of Labor and Employment of Brazil (MTE). It contains detailed information of all formal workers from Brazil. Each year, the MTE in order to regulate and control the Brazilian labor market, requires all legally registered firms to provide socioeconomic information on all formally employed workers. This declaration is mandatory for all companies including public administration organs and natural persons who have employed any worker in the previous year. Only the individual entrepreneur who did not employ workers the previous year is exempt from this declaration. Thus, a failure to deliver on these obligations is going to result in fines for the employer without exempting him from the obligation.

RAIS is also considered a census, which provides reliable statistical sources on the Brazilian formal labor market, for instance, the number of new formal jobs, which sector hired more workers, and other information on formal sector job.

Each year, employers report information on the characteristics of their workers as well as the characteristics of the job. All information is registered by worker, including a unique identifier for him. RAIS includes a unique identifier for the firm, as well as information about its economic activity, location and legal nature. Our main variables of interest are the compensation at December 31 expressed in number of minimal wages, the job tenure in months, the number of jobs for the worker during the year, the gender, the age, the economic activity of establishment classified according to National Classification of Economic Activities (CNAE 2.0) and the location of the worker´s establishment.

Taking into account the distribution of the firms by sectors is very important since there are sectors where the competition is intense and firms may need to reduce costs in order to improve their competitiveness.

The main information related to the economic activity of firms consists of two categorical variables: groups of economic activity sectors and economic activity sector (classification CNAE 2.0). Information about Groups of economic activity sectors includes six categories: Agriculture, Commerce, Construction, Industry, Services and Others/Ignored (auxiliary financial services, sales agents and representatives, maintenance and repair of vehicles, and other activities like recreational and sporting services). This classification groups all sectors of the economy, and it is used by the Statistics Brazilian System. The economic activity sector variable initially included nine sectors, but we excluded the public sector (Public Administration), because it was not considered part of the study. Then, we focus on eight sectors, which are Agriculture, Commerce, Construction, Mineral Extraction, Transformation Industry, Industrial Services of Public Utility, Services and Others/Ignored. In terms of groups of economic activity, the Industry group includes Mineral Extraction, Transformation Industry and Industrial Services of Public Utility sectors. The 08 sectors are also divided into 25 subgroups or subsectors, but in this study, economic activity sectors were considered according to available information for corrupt sector variable that will be explained in section 4.1.4.

Since there is a unique identifier for the firm, we extract our variables of interest for every firm in every year from 2005 to 2008. Moreover, firms that were not registered for all years during that period were excluded, as well as registered workers who were less than 14 years old.

In order to make good analyzes, different statistical measures were considered during the extraction process. For instance, we observed that some firms had registered more than one economic activity in their municipalities. To deal with these cases, and in order to extract summarized information by firm and by municipality, we calculate the mode of the economic activity for each firm, that is, the economic activity where the firm registered the highest number of employees.

To extract the compensation and the job tenure variables, it was considered that employees occupy different positions in a company, and that the job tenure varies among employees, and therefore, the distribution of both compensation and job tenure (employment duration) presents high variance among employees in a firm. In order to get a better view of the results using these

variables, we use different measures of location such as mean, median and others percentiles to extract both variables. That is, the mean and the ith percentile of both variables for the firm i located in the municipality j. The 90th percentile of the compensation variable indicates the compensation at which 90% of the employees in a firm have earning below it, and probably this value reflects the compensation of those employees with high positions in the firm. The 10th percentile of the tenure variable indicates the number of months at which 10% of the employees in the firm have months of being recruit below it, and this value reflects the tenure (employment duration) of those employees that were newly recruited in the firm.

To extract the number of jobs and age variables, we calculate the mean of these variables for each firm in each municipality similar to the other variables. Based on the gender variable, it was possible creates two new variables to know the number of male and female employees in each firm. To extract the location of the worker´s establishment, it was sufficient to keep the information of the first row because this information is the same for any employee in a firm.

Finally, once the variables were extracted for each firm in each municipality, all data was joined to the main database (data at the firm and municipality level). There were firms whose average compensation and job tenure were equal to zero. These firms were excluded, because it was considered information that could have been erroneously reported.

4.1.2. Firm expansion variable

As mentioned above, RAIS includes a unique identifier for the firm. This identifier allows us track whether the firm operates in different municipalities and/or states. Based on this identifier, we create a new dummy variable, which indicates 1 if the firm operates in two or more municipalities of Brazil, and 0 otherwise.

4.1.3. Firm size variable

Firm size is an important factor that may influence the allocation of resources in firms. To create this variable, it was important to consider the most common criteria for the classification of firms in Brazil. There are two most common criteria to classify companies. BNDES, SEBRAE and IBGE adopted criteria that are commonly used as national reference. According with these criteria, companies are classified by the number of employees or by the annual gross operating revenue. The BNDES (National Bank for Economic and Social Development) has adopted the classification by the annual gross operating revenue. This is an important parameter to define a

company´s size. However, the classification by the number of employees adopted by the Brazilian Institute of Geography and Statistics (IBGE) and the Brazilian Service to Support Micro and Small Enterprises (SEBRAE) is used most often for research purposes. This classification would be advantageous due that the number of employees tends to be more easily available information and perhaps less constrained. Tables 1 and 2 show the business classification according to the two above-mentioned criteria.

Table 1. Classification of the size of companies according to their Annual Gross Operating Revenue or Annual Income.

Classification	**Annual Gross Operating Revenue or Annual Income.**
Micro	Up to BRL 2.4 million.
Small	Over BRL 2.4 million and less than BRL 16 million.
Medium	Over BRL 16 million and less than BRL 90 million.
Medium-Large	Over BRL 90 million and less than BRL 300 million.
Large	Over BRL 300 million.

Source: Website from BNDES. Consult in 10.11.2016

http://www.bndes.gov.br/wps/portal/site/home/financiamento/guia/quem-pode-ser-cliente

Table 2. Classification of the size of companies according to the number of employees.

Classification	**Sector**	
	Industry	**Commerce / Services**
Micro	Up to 19	Up to 9
Small	From 20 to 99	From 10 to 49
Medium	From 100 to 499	From 50 to 99
Large	500 or more	100 or more

Source: Website from SEBRAE and IBGE. Consult in 10.11.2016

http://www.sebrae-sc.com.br/leis/default.asp?vcdtexto=4154

In several of the studies, the number of employees was used as the measure of firm size (Hancock, Allen, Bosco, McDaniel and Pierce, 2013; Nguyen, Le and Bryant, 2013; Devicienti,

Fanfani and Maida; 2016). In this study, the number of employees was used to measure firm size. To create this variable, it was adopted the criteria of classification proposed by the IBGE/SEBRAE, as detailed above. This classification considers not only the number of employees, but also the economic activity sector of the firm, which is useful to distinguish companies with more similar characteristics.

Taking into account the classification by the number of employees detailed in table 2, and considering the six groups of economic activity mentioned in section 4.1.1. (Agriculture, Commerce, Construction, Industry, Services and Others/Ignored), it was created the "Firm Size" variable. The groups of economic activity sectors "Construction", "Agriculture" and "Others/Ignored" were classify in the same way as the Industry group. The number of firms according to their size and sector can be found in appendix A.

4.1.4. Corrupt sector variable

The data used to create this variable were based on a sub-sample of firms involved in corruption, which were listed in CGU audit reports (those reports that were used in the construction of our measure of corruption). We looked at 156 municipal audit reports carried out by CGU, 111 of which reported in 2005 and 45 in 2006. In these reports, we found 350 firms involved in corrupt acts, but in data RAIS it was possible to identify the economic sectors for 259 firms. Descriptive statistics for the sector and size of these firms are presented in appendix B.

As mentioned previously, information about sector of economic activity in RAIS database refers to eight sectors (excluding the Public Administration sector), which are divided into 25 subsectors (by IBGE). We focus on these sectors and create a dummy variable that equals one if a sector is associated with corruption, and zero otherwise.

Descriptive statistics reveal that the economic sectors of the sub-sample of firms involved in corrupt practices are Commerce (56.7%), Construction (30.1%), Services (8.1%) and Industry Transformation (5.0%) (for more detail please see "Appendix B"). Information about the subsectors is scattered across firms (259 firms), which does not allow us to classify properly taking into account sub sectors. Descriptive statistics also reveal that firms involved in corruption could be of different sizes (micro, small, medium and large).

Once we had identified the economic activity sectors of firms, we created the dummy variable, in which the four economic sectors associated with corruption (Commerce, Construction, Services and Industry Transformation) took the value of 1, and 0 otherwise.

The value of 0 was assigned to any of the remaining four sectors not associated with corruption. These sectors are Agriculture, Mineral Extraction, Industrial Services of Public Utility and Others/Ignored (auxiliary financial services, sales agents and representatives, maintenance and repair of vehicles, and other activities).

4.2. Variables

Estimating the effect of local corruption on the resource allocation of firms is complicated because it is influenced by a variety of factors, which are connected with the situation of a given country, the financial situation of companies, and other factors influencing on decisions of firms. We use valuable information and control for variables at the firm and municipality level.

4.2.1. Dependent variables

To estimate the effect of corruption on resources' allocation, two dependent variables were considered at the firm-level. The first variable is the average compensation expressed in number of minimal wages at December, 31, and the second depended variable is the average tenure expressed in number of months. Both variables were extracted from RAIS, and for further analysis, depending of first results, we will use the ith percentile of the compensation distribution in firms (as mentioned in section 4.1.1).

In order to get a better fit of our proposed regression model, we use the logarithmic transformation for both dependent variables (natural logarithm). By transforming the dependent variable when residuals have skewed distribution, it is possible to use ordinary least-squares estimators (OLS), greatly reducing the concern about the normality assumptions for linear regression. The purpose of a transformation is to obtain residuals that are approximately symmetrically distributed (Wooldridge, 2015).

4.2.2. Main independent variables

For the first analysis, we use as main independent variable a dummy variable that indicates whether the economic activity sector of a firm is associated or not with corruption. Corrupt sectors are Commerce, Construction, Services and Industry Transformation. In these analyses, we also consider disaggregated sectors as main independent variables.

For secondary analysis, the main independent variable is the number of corruption events or irregularities detected in the municipality. Arvate and Figueiredo (2016), as mentioned above, developed this variable. Their measure of corruption is based on randomized audit reports from an anticorruption program implemented by the CGU (as mentioned in Section 4.1).

4.2.3. Covariates

Covariates at the firm-level were included in order to control for heterogeneity across firms. Larger firms may pay higher wages for employees (Gomez-Mejia et al., 1987; Dahl and Klepper, 2015). Studies has found that larger firms are more efficient (Oczkowski and Sharma, 2005) and contract features are influenced by determinants such as firm characteristics, economic activity sector and tenure (Stathopoulos, Espenlaub and Walker, 2004; Tran, 2011).

The information at the firm-level was collected from the Annual Report of Social Information or Relação Anual de Informações Sociais (RAIS Migra). They include: the average number of jobs of employees during the year, the number of men and women employees, the average age of employees, the firm expansion, the economic activity sector of the firm (a set of dummy variables indicating the economic activity sector of the firm), and the firm size (a set of dummy variables indicating the firm size).

Characteristics at the municipality-level were considered in order to control for economic, social and political differences among municipalities. This information came from different sources, INEP, IPEA, TSE, IBGE and CGU.

The number of enrolled children in school (from the 1st to 8th grade) came from the National Institute for Educational Studies and Research "Anísio Teixeira" (INEP). We use this variable as a proxy for the provision of educational services (Arvate and Figueiredo, 2016).

Two variables came from the Institute for Applied Economic Research (IPEAData): the number of beneficiaries of Bolsa Familia Program and the gross domestic product (GDP). These

variables provide important information about socioeconomic characteristics of each municipality, which can influence on the labor market.

Political variables were collected from the Superior Electoral Court or Tribunal Superior Eleitoral (TSE). They are the gender and the level of education of mayors, which were chosen because they are important control variables.

The number of mismanagement events is another important control variable, which may influence on resource allocation in firms, since that excessive procurement prices paid by public bodies can be due to their inefficiency or mismanagement. Separating mismanagement and corruption measures came from Bandiera, Prat and Valletti (2009) who find a distinction between passive waste (inefficiency due to red tape or mismanagement in this research) and active waste (bribery or corruption) as referring that public bodies with lower passive waste do not have higher active waste.

Finally, we use more sets of dummy variables for the year when the municipality was audited (2005-2008), and for the region where the municipality is located (North, Northeast, Central-West, Southeast and South). Table 3 reports the description and source for each one of the above-mentioned variables. Table 4 presents descriptive statistics of variables, Table 4A and 4B show descriptive statistics according to year of audit of municipalities, and Table 5 presents the correlation matrix.

Table 3. Description of variables

Variables	Description	Source
Dependent variables		
Compensation	Average compensation at December, 31 expressed in number of minimal wages. It was log-transformed.	RAIS[(a)]
Tenure	Average number of months on the job for employees. It was log-transformed.	RAIS[(a)]
Main independent variables		
Corrupt Sector	A dummy variable that takes 1 if the economic activity sector of the firm is corrupt, and 0 otherwise.	CGU[(b)]
Corruption	Number of corruption events found in the municipality (level of corruption).	CGU[(b)]
Covariates		
Number of jobs	Average number of jobs during the year for employees in the firm	RAIS[(a)]
Number of men	Number of employed men per firm	RAIS[(a)]
Number of women	Number of employed women per firm	RAIS[(a)]
Employee age	Average age of employees per firm	RAIS[(a)]
Firm expansion	A dummy variable that takes 1 if the firm operate in two or more municipalities, and 0 otherwise.	RAIS[(a)]
School Enrollment	Number of enrolled children from the 1st to 8th grade.	INEP[(c)]
BF program	Number of beneficiaries of Bolsa Familia Program.	IPEA[(d)]
Woman mayor	A dummy variable that takes 1 if the mayor of municipality is a woman and 0 otherwise.	TSE[(e)]
Education mayor	The level of education of the mayor. It consists of three dummy variables: primary, secondary and tertiary level of education.	TSE[(e)]
GDP	Municipal gross domestic product (GDP) in real values.	IPEA[(d)]
Mismanagement	Number of mismanagement events found in the municipality.	CGU[(b)]

(a) Annual Social Information Report (Relação Anual de Informações Sociais - RAIS).
(b) Office of the Comptroller General (Controladoria Geral da União - CGU).
(c) National Institute for Educational Studies and Research "Anísio Teixeira" (Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira - INEP).
(d) Institute for Applied Economic Research (IPEA).
(e) Superior Electoral Court (Tribunal Superior Eleitoral - TSE).

Table 4. Descriptive statistics

Variable	Observations	Mean	Std. Dev.	Minimum	Maximum
Compensation	105,514	1.63	1.73	0.01	112.53
Tenure	105,514	55.30	52.39	0.17	652.40
Corrupt Sector	105,514	0.83	0.38	0.00	1.00
Corruption	105,514	9.28	7.73	0.00	61.00
Number of jobs	105,514	1.07	0.18	1.00	8.36
Number of men	105,514	9.31	72.36	0.00	8,871.00
Number of women	105,514	4.52	35.85	0.00	5,339.00
Employee age	105,514	34.12	8.90	14.00	95.00
School enrollment	105,514	7,248.40	7,612.81	193.00	35,726.00
BF program	105,514	3,517.00	2,947.31	9.00	12,589.00
GDP	105,514	11,823.26	13,292.53	78.49	59,677.43
Mismanagement	105,514	17.33	9.79	0.00	62.00

Table 4A. Descriptive statistics according to year of audit.

Audit year:	2005			2006		
Variable	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
Compensation	21,266	1.63	1.49	30,910	1.70	1.95
Tenure	21,266	46.17	49.32	30,910	52.37	50.30
Corrupt Sector	21,266	0.79	0.41	30,910	0.85	0.36
Corruption	21,266	10.20	6.74	30,910	11.70	8.69
Number of jobs	21,266	1.09	0.21	30,910	1.07	0.16
Number of men	21,266	8.78	52.30	30,910	9.31	74.80
Number of women	21,266	4.20	39.12	30,910	4.91	42.25
Employee age	21,266	33.62	8.98	30,910	33.91	8.77
School enrollment	21,266	6,968.05	5,615.06	30,910	12,538.87	11,533.80
BF program	21,266	2,979.86	3,351.31	30,910	3,733.98	2,423.50
GDP	21,266	6,044.89	6,129.71	30,910	17,653.59	19,207.34
Mismanagement	21,266	16.66	7.75	30,910	20.14	9.29

Table 4B. Descriptive statistics according to year of audit.

Audit year:	2007			2008		
Variables	Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.
Compensation	34,542	1.63	1.79	18,796	1.55	1.48
Tenure	34,542	58.44	52.10	18,796	64.69	57.36
Corrupt Sector	34,542	0.84	0.37	18,796	0.82	0.39
Corruption	34,542	6.87	6.80	18,796	8.69	7.30
Number of jobs	34,542	1.07	0.16	18,796	1.08	0.18
Number of men	34,542	10.13	89.53	18,796	8.40	48.63
Number of women	34,542	4.46	25.55	18,796	4.35	36.69
Employee age	34,542	34.21	8.77	18,796	34.83	9.17
School enrollment	34,542	4,293.38	116.62	18,796	4,295.95	0.00
BF program	34,542	3,881.82	3,207.73	18,796	3,097.45	2,581.73
GDP	34,542	11,364.67	9,568.79	18,796	9,615.78	8,688.84
Mismanagement	34,542	14.81	9.20	18,796	18.10	12.10

Table 5. Correlation matrix.

	1	2	3	4	5	6	7	8	9	10	11	12
1. Compensation	1.000											
2. Tenure	0.236	1.000										
3. Corrupt Sector	0.052	-0.094	1.000									
4. Corruption	-0.014	0.007	0.007	1.000								
5. Number of jobs	0.030	-0.215	0.048	-0.034	1.000							
6. Number of men	0.029	-0.030	0.011	-0.002	0.072	1.000						
7. Number of women	0.009	-0.034	0.039	-0.006	0.058	0.572	1.000					
8. Employee age	0.128	0.379	-0.233	-0.013	-0.090	-0.010	-0.027	1.000				
9. School enrollment	0.057	-0.016	0.136	0.149	0.001	0.008	0.017	-0.029	1.000			
10. BF program	-0.014	0.019	0.160	0.180	-0.033	0.009	0.007	-0.048	0.451	1.000		
11. GDP	0.104	0.001	0.217	-0.091	0.032	0.014	0.032	-0.020	0.755	0.430	1.000	
12. Mismanagement	-0.016	0.007	0.033	0.665	-0.006	-0.005	-0.005	-0.011	0.212	0.152	-0.014	1.000

4.3. Empirical strategy

This study aims to test the effect of corruption on resource allocation to employees (compensation and tenure) in firms located in municipalities of Brazil. It is a challenge to achieve this purpose because it is difficult to know what happened with respect to decisions of resource allocation in these firms. Ideally, we would have identified in contracts of municipalities all firms involved in corruption, and some other characteristics of firms, such as the compensation system of employees and the attitudes toward corruption of employees, but we did not have that information. However, taking into account as much information as possible at the firm-level and municipality-level, and using econometric techniques it is possible to approach this challenge.

We start by verifying whether there is a difference of allocation of resources between firms from corrupt and non-corrupt sectors, and then we check whether the level of corruption in municipalities interferes with that allocation.

To test whether there is a difference of allocation of resources (compensation and tenure) between corrupt and non-corrupt sectors, we estimate the following OLS regression model:

$$Y_{ij} = \beta_0 + \beta_1 Corrupt\_Sector_i + \delta XF_{ij} + \sigma XM_j + \rho_t + \nu_r + \lambda_m + \varepsilon_{ij} \qquad (1)$$

where Y_{ij} is the natural logarithm of the average compensation paid by the firm i in municipality j. The log-transformation was found suitable in order to overcome the skewed distribution of residuals found in an initial regression analysis. $Corrupt\_Sector_i$ is a dummy variable that indicates whether the economic activity sector of the firm i is corrupt and zero otherwise. XF_{ij} and XM_j are characteristics at the firm-level and municipality-level respectively. Characteristics at the firm-level include the average number of jobs for employees, the number of employees (men and women), the average age of employees, and the firm-expansion. Characteristics at the municipality-level include school enrollment, number of beneficiaries for Bolsa Familia Program, mayor´s gender and level of education, GDP, and mismanagement events found in each municipality. ρ_t is a vector of audit-year dummies, ν_r is a vector of region dummies, λ_m is a vector of firm-size dummies, and finally, εij is the error term. Similarly, to estimate the effect on the tenure in firms, we use the same model described above, but using the natural logarithm of the average "tenure" as the dependent variable.

Next, we estimate the effect of level of corruption on resources allocation. The specification is as follows:

$$Y_{ij} = \beta_0 + \beta_1 Corruption_j + \delta XF_{ij} + \sigma XM_j + \rho_t + \nu_r + \gamma_s + \lambda_m + \varepsilon_{ij} \quad (2)$$

where Y_{ij} is the natural logarithm of the average compensation paid by the firm i in municipality j. $Corruption_j$ is the number of corruption events found in the municipality j. XFij and XMj are characteristics at the firm-level and municipality-level respectively. Variables at the firm-level and municipality-level[8] are the same as in equation (1), ρt is a vector of audit-year dummies, ν_r is a vector of region dummies, γs is a vector of sector dummies, λm is a vector of firm-size dummies, and εij is the error term. Similarly, to estimate the effect of level of corruption on the tenure, we use the equation (2), but using the natural logarithm of the average tenure as the dependent variable.

In many applications, especially with observational data, the biggest problem is related to omitted-variables bias. This problem occurs when omitted variables affect the relationship between the dependent variable and the explanatory variables included in the model, leading to biased estimates of the parameters. Furthermore, given the cross-sectional nature of our data, our estimates may be affected by this problem.

In this study, we use a sample of firms located in municipalities that were randomly selected, which leads us to say that our sample was not selected subjectively. The definitions of our main independent variables were generated using audit reports of these municipalities. That is, the same draw allowed us to know which economic activity sectors were associated with corruption, and which was the level of corruption found in each municipality. Moreover, we control extensively for observable socio-economic and political variables at the firm and municipality level, which are also important considerations to deal with the endogeneity problem in the form of omitted-variable bias.

[8] A preliminary analysis regression included federal income transfer and Population as variables at the municipality level in equation 1 and 2. Both variables presented strong association with GDP (0.943 and 0.886 respectively). Moreover, when examined multicollinearity by the variance inflation factor (VIF), the VIF values were larger than 15. Thus, both variables were excluded in order to avoid standard errors of coefficients estimate inflated by multicollinearity. After excluded these variables, the variance inflation factor indicated no problems of multicollinearity. All VIFs of variables were less than 4.4, which is lower than the suggested threshold value of 10 (Cohen et al., 2003, Hair, et.al, 2010).

Another important consideration is that we use an effective tool to avoid biased estimates of coefficients and standard errors. By including many sets of dummy variables, we control the differences between firms in the sample. However, the standard OLS regression may suffer some possible failures to meet OLS assumptions (normality, heteroscedasticity or observations with high leverage values). To better understanding, the standard OLS regression assumes that the residuals are independent. Our data contains 105,440 firms located throughout 480 audited municipalities. The observations within each municipality may not be independent, leading to correlated residuals within municipalities. To deal with these concerns, it was necessary to use regression with robust standard errors[9]. By using dummy variables in the regression, we keep the assumption of zero correlation across groups (municipalities), but errors may be correlated within groups. In order to overcome this potential problem, standard errors were clustered by municipality in all the regressions. According with Angrist and Pischke (2008), these standard errors are known as "robust standard errors" and they provide accurate hypothesis tests in large enough samples.

5. MAIN RESULTS

A first set of results is presented to verify whether there is a difference of allocation of resources between corrupt and non-corrupt sectors, followed by a second set of results showing the effect of level of corruption on resources allocation, as well as a placebo test to check the robustness of the results.

5.1. The effect of an economic activity sector being corrupt or non-corrupt on compensation and tenure.

Tables 6 and 7 report our first set of results. We run regressions on the full sample controlling for audit-year, region and firm-size dummies. Columns (1) and (3) include results to verify whether there is statistical difference of resources allocation between corrupt sectors (Commerce, Construction, Services and Transformation Industry) and non-corrupt sectors (Agriculture, Mineral Extraction, Industrial Services of Public Utility and Others/Ignored), while columns (2) and (4) report disaggregated results of each corrupt sector. In columns (1)

[9] This tool is available in some popular statistical packages such as Stata and R.

and (3), the reference group for "Corrupt Sector" is "Non-Corrupt Sector" (those sectors whose firms were not associated with corruption). Columns (2) and (4) present regressions for each one of corrupt sectors (disaggregated) and have as reference to the Non-corrupt Sectors. Micro firm is the reference of firm size. Column (3) extends the specification in column (1) by including firm-size dummies, while Column (4) extends the specification in column (2) by adding interaction terms between corrupt sectors and firm size. In Column (2´) of Table 6 is reported a placebo test that will further justify our identification strategy.

In table 6, we estimate the difference of allocation of compensation between corrupt sectors and non-corrupt sectors. Results suggest that firms from corrupt sectors, on average, pay higher compensations than those from non-corrupt sectors. This effect is consistently positive and statistically significant at the 1% level[10]. The results also remain robust to changes in the regression specifications (e.g. without the mismanagement variable). According with Column (3), results indicate that, on average, legally registered firms from sectors associated with corruption pay higher compensations (7.92% more or 0.13 more minimal wages) than firms from sectors not associated with corruption, while all the other variables are held constant.

Column (4) in Table 6 shows estimates for interactions between corrupt sectors and firm size. Results indicate that firms from Commerce sector pay 5,50% (geometric average) more than those firms from non-corrupt sectors. Small, Medium, and Large firms does not pay more compensation compared to micro firms (the reference category) on average. In addition, Medium firms from the same sector pay more compensation than the average of firms in this sector. That is, firms from Commerce sector (corrupt) pay 5,50% more compensation but if the firm is Medium, the compensation is higher (0.1096-0.0550=0.0546), at 5.46% more than the average compensation of the sector.

Firms from Construction sector pay 14,19% (geometric average) more than those firms from non-corrupt sectors. Small, Medium, and Large firms does not pay more compensation compared to micro firms (the reference category) on average. However, small and medium firms from that Construction sector pay less compensation than the average of firms from sector. For example, Construction sector (corrupt) pays 14,19% more compensation, but if the firm is small, the compensation is lower (0.1419-0.1728=-0.0309). In other terms, small firms of construction sector pay less 3,09. In the same way, the same logic indicates that there is not

[10] Preliminary results with non-transformed dependent variables were also significant, but it was necessary to use the log-transformation to deal with skewed residuals (to the right).

difference when we are talking about medium firms into of sector. Therefore, there is asymmetric results influenced by size of firm.

With regard to firms in the Transformation Industry sector, results indicate that, on average, firms of this sector pay 7,72% more compensation than those firms from non-corrupt sectors. Moreover, if the firm in this sector is Medium, the compensation is higher (0.2158-0.0772=0.1386), at 13.86%, while if the firm is Large, the compensation is 16.4% more than the average compensation of this sector.

Finally, results for services sector, indicate that, on average, firms of this sector pay 8,55% more compensation than those from non-corrupt sectors. Specifically, Small firms pay 1,63% (0.1018-0.0855=0.0163) more compensation than the average compensation of this sector, and Medium firms pay 5,32% more compensation than the average compensation in their sector. Thus, we find again asymmetric results influenced by size of firm.

5.1.1. Is the compensation different between corrupt and non-corrupt sectors in municipalities without corruption cases?

In order to corroborate that the differential effect between sectors classified as corrupt and non-corrupt was due to the corruption committed in municipalities, we verify whether that differential effect exists in municipalities that were audited and no irregularities were found (municipalities with a level of corruption equal to 0). It is assumed that firms that operate in municipalities without corruption cases do not allocate rewards (high compensations) to their employees for participating in corrupt practices. Therefore, it is expected that compensation in firms of sectors associated with corruption are not different from those not associated with corruption in these municipalities.

In column (2´) of Table 6, results are reported for a sub sample containing 5775 firms with different sizes and economic activities across 18 municipalities where no irregularities were reported. The results indicate that there is no robust evidence that the differential effect was merely due to a differential established between corrupt and non-corrupt sectors. Three of the four sectors associated with corruption do not show clear evidence of being different from non-corrupt sectors. Even the difference between the commerce sector and the non-corrupt sectors (base) was significant at the 10% level, but this difference is not robust adding dummies for the firm size (see Column (3´e) in Appendix C).

Additionally, it is interesting to note that the estimated coefficients for the Construction and Services sectors, the corrupt sectors with the highest compensations, were not significant in municipalities that did not present irregularities.

Table 6. The effect of an economic activity sector being corrupt or non-corrupt on employees' compensation.

Dependent variable: The logarithm of the average compensation at December, 31 (Ln Compensation).

	(1)	(2)	(3)	(4)	(2´ - Placebo) Municipalities with zero of observed corruption
	Ln(Com.)	Ln(Com.)	Ln(Com.)	Ln(Com.)	Ln(Com.)
Corrupt_Sector	0.0864***		0.0792***		
	(0.0085)		(0.0087)		
Commerce_sector		0.0612***		0.0550***	0.0364*
		(0.0086)		(0.0087)	(0.0193)
Construction_sector		0.1154***		0.1419***	0.0403
		(0.0138)		(0.0157)	(0.0369)
Transf.Industry_sector		0.0936***		0.0772***	0.0903***
		(0.0144)		(0.0127)	(0.0208)
Services_sector		0.1096***		0.0855***	0.0566
		(0.0090)		(0.0100)	(0.0387)
2.Firm_Small			0.0512***	0.0072	
			(0.0057)	(0.0253)	
3.Firm_Medium			0.1316***	-0.0009	
			(0.0181)	(0.0470)	
4.Firm_Large			0.1630***	0.0980	
			(0.0258)	(0.1033)	
Commerce*Firm_Small				0.0231	
				(0.0252)	
Commerce*Firm_Medium				0.1096**	
				(0.0489)	
Commerce*Firm_Large				0.0617	
				(0.1050)	
Construction*Firm_Small				-0.1728***	
				(0.0396)	
Construction*Firm_Medium				-0.1420**	
				(0.0598)	
Construction*Firm_Large				-0.2531	
				(0.1591)	
Tranf.Industry*Firm_Small				0.0358	
				(0.0255)	
Tranf.Industry*Firm_Medium				0.2158***	

(continued)

	(1)	(2)	(3)	(4)	(2´ - Placebo) Municipalities with zero of observed corruption
	Ln(Com.)	Ln(Com.)	Ln(Com.)	Ln(Com.)	Ln(Com.)
				(0.0545)	
Tranf.Industry*Firm_Large				0.2412**	
				(0.1106)	
Services*Firm_Small				0.1018***	
				(0.0268)	
Services*Firm_Medium				0.1387**	
				(0.0554)	
Services*Firm_Large				0.0518	
				(0.1042)	
Constant	0.5176***	0.5392***	0.5424***	0.5615***	0.6169***
	(0.0234)	(0.0228)	(0.0237)	(0.0225)	(0.0750)
Covariates(a)	Yes	Yes	Yes	Yes	Yes
Audit year dummies(b)	Yes	Yes	Yes	Yes	Yes
Region dummies (c)	Yes	Yes	Yes	Yes	Yes
R2	.0818753	.0851145	.0876046	.0946818	.0940117
Observations	105514	105514	105514	105514	5775

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
Robust standard errors in parentheses clustered by municipality.
(a) Covariates are: Number of jobs, Number of men, Number of women, Employee age, Firm expansion, School enrollment, BF program, Woman mayor, Education mayor, Gdp and Mismanagement.
(b) Dummies for audit year (2005 – 2008).
(c) Dummies for region (by IBGE).

In Table C1 of appendix C, we extend the results of the placebo tests (municipalities that were audited and no irregularities were found) for each sector associated with corruption. Columns in this table present regressions for each one of the corrupt sectors (disaggregated) and have as reference to the non-corrupt Sectors (references or base). The results remain robust and confirm that the allocation of compensation in firms is influenced by corruption.

Appendix D reports the results for the same effect, but around the year of the audit. Specifications are the same as in column 3 and 4 of Table 6, but without interaction terms. For example, for municipalities that were audited in 2008, regressions include lags variables (at the firm-level) for one, two and three years prior to the audit year (See Columns (5) and (6) of Table D1). In the same way, Columns (7) and (8) of Table D2 present results for municipalities that were audited in 2005. Regressions include leads variables at one, two and three years after to the audit year of municipalities. These results remain robust and significant, which suggest

that the allocation of compensation was not due to stigmatization of sectors (caused by the disclosure of audit results). Moreover, since compensation refers to the sum of the contractual salary and others additional payments, results suggest that there was an increase of wages because the effect is significant before and after the audit year.

In table 7, we report the results of regressions with the same specifications as those reported in Columns (1)-(4) of Table 6, but instead using the tenure variable as the dependent variable. As can be seen, results are not robust. Columns (2) and (4) show some positive and negative effects for corrupt sectors, but the joint effect of these sectors (reported in Columns (1) and (3)), although positive, is not statistically significant. Therefore, we interpret results for compensation variable.

The results up to this point indicate that firms from sectors associated with corruption pay higher compensations to their employees (as a reward for engaging in corrupt practices for the organization´s benefit) than those from non-corrupt sectors.

Table 7. The effect of an economic activity sector being corrupt or non-corrupt on tenure.

Dependent variable: The logarithm of the average number of months on the job (Tenure).

	(1) Ln(Tenure)	(2) Ln(Tenure)	(3) Ln(Tenure)	(4) Ln(Tenure)
Corrupt_Sector	0.0165		0.0314	
	(0.0192)		(0.0197)	
Commerce_sector		-0.0516**		-0.0471**
		(0.0201)		(0.0203)
Construction_sector		0.0842***		0.1679***
		(0.0239)		(0.0235)
Transf.Industry_sector		0.0782***		0.0926***
		(0.0217)		(0.0225)
Services_sector		0.0598***		0.0506***
		(0.0204)		(0.0191)
2.Firm_Small			-0.1345***	-0.2252***
			(0.0166)	(0.0480)
3.Firm_Medium			-0.0519*	-0.3081***
			(0.0292)	(0.0782)
4.Firm_Large			-0.0340	-0.2210*
			(0.0511)	(0.1326)
Commerce*Firm_Small				0.0925*
				(0.0479)
Commerce*Firm_Medium				0.2906***
				(0.0826)
Commerce*Firm_Large				0.1745

(continued)

	(1) Ln(Tenure)	(2) Ln(Tenure)	(3) Ln(Tenure)	(4) Ln(Tenure)
				(0.1377)
Construction*Firm_Small				-0.4542***
				(0.0729)
Construction*Firm_Medium				-0.4583***
				(0.1074)
Construction*Firm_Large				-0.7941***
				(0.2242)
Tranf.Industry*Firm_Small				0.0240
				(0.0460)
Tranf.Industry*Firm_Medium				0.3320***
				(0.0825)
Tranf.Industry*Firm_Large				0.5021***
				(0.1414)
Services*Firm_Small				0.1782***
				(0.0495)
Services*Firm_Medium				0.2708***
				(0.0882)
Services*Firm_Large				0.1728
				(0.1330)
Constant	3.7454***	3.7978***	3.7088***	3.7546***
	(0.0624)	(0.0623)	(0.0617)	(0.0624)
Covariates(a)	Yes	Yes	Yes	Yes
Audit year dummies(b)	Yes	Yes	Yes	Yes
Region dummies (c)	Yes	Yes	Yes	Yes
R2	.2459739	.2494984	.2488902	.2552404
Observations	105514	105514	105514	105514

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
Robust standard errors in parentheses clustered by municipality.
(a) Covariates are: Number of jobs, Number of men, Number of women, Employee age, Firm expansion, School enrollment, BF program, Woman mayor, Education mayor, Gdp and Mismanagement.
(b) Dummies for audit year (2005 – 2008).
(c) Dummies for region (by IBGE).

5.1.2. The effect of an economic activity sector being corrupt or non-corrupt on the ith percentile of the compensation distribution.

Since that, a specific pay probably reflects the position of employees in a rank hierarchy, we use statistical measures of location of the compensation distributions in firms. That is, the k^{th} percentile of the compensation variable instead of the average compensation as used in regressions of Table 6. We verify whether the effect of corruption varies across percentiles of the compensation distribution among employees in firms (as a way to see whether corruption varies across the positions of employees).

Tables 8, 9 and 10 report estimates using the 10^{th}, 50^{th} (median), and 90^{th} percentiles respectively of the compensation distribution. As was mentioned in Section 4.1, the 90th percentile of the compensation variable indicates the compensation at which 90% of the employees in a firm have earning below it, and probably this value reflects the compensation of those employees with high positions in a firm. The i^{th} percentile of the compensation distribution in firms refers to the level of position of employees, for example, the 90^{th} percentile as compared with the compensation of those employees with high-level positions in firms, and so for the other percentiles (following the same logic).

Results for the 10^{th} percentile of the compensation distribution in firms are not robust, while results for the 50^{th} and 90^{th} percentiles are robust and significant at the 1% level. Therefore, with reference to those employees that gain above the median compensation in their firms, results indicate that, on average, firms from corrupt sectors pay higher compensations than those from non-corrupt sectors.

Considering the results for those employees with the highest compensations in their firms (the 90^{th} percentile of the compensation distribution in firms), we can observe that, on average, Small, Medium, and Large firms pay more compensation compared to micro firms. In the Construction sector firms pay 16,36% (geometric average) more than those firms from non-corrupt sectors. In addition, small and medium firms in this sector pay less compensation than the average of firms from sector. That is, if the firm is small, the compensation is lower (0.1636-0.1756=-0.012), at 1,2%, and if the firm is medium, the compensation is less 1,62% than the average compensation in this sector.

However, firms from Services sector pay 9.73% more than those firms from non-corrupt sectors, and small and medium firms pay more compensation than the average compensation in this sector.

Column (2´) of Tables 8, 9 and 10 (placebo tests) reports similar results to those in table 6 (main results). Once again, the estimated coefficients for the Construction and Services sectors (the corrupt sectors with the highest compensations) are not significant in municipalities without corruption cases, as listed in CGU audit reports. Therefore, the differential effect between corrupt and non-corrupt sectors is considered due to corruption.

Table 8. The effect of an economic activity sector being corrupt or non-corrupt on the 10th percentile of the compensation distribution.

Dependent variable: The logarithm of the 10th percentile of the compensation distribution (Ln Compensation).

	(1)	(2)	(3)	(4)	(2´ - Placebo) Municipalities with zero of observed corruption
	Ln(Com.)	Ln(Com.)	Ln(Com.)	Ln(Com.)	Ln(Com.)
Corrupt_Sector	-0.0076		0.0329***		
	(0.0081)		(0.0077)		
Commerce_sector		-0.0135		0.0219**	0.0097
		(0.0086)		(0.0086)	(0.0209)
Construction_sector		0.0976***		0.1423***	0.0555
		(0.0187)		(0.0197)	(0.0391)
Transf.Industry_sector		-0.1019***		-0.0663***	-0.0769***
		(0.0106)		(0.0110)	(0.0264)
Services_sector		0.0314***		0.0686***	0.0336
		(0.0095)		(0.0102)	(0.0339)
2.Firm_Small			-0.3368***	-0.3870***	
			(0.0082)	(0.0136)	
3.Firm_Medium			-0.4034***	-0.3841***	
			(0.0135)	(0.0324)	
4.Firm_Large			-0.3548***	-0.3087***	
			(0.0254)	(0.0714)	
Commerce*Firm_Small				0.0420**	
				(0.0166)	
Commerce*Firm_Medium				-0.0506	
				(0.0348)	
Commerce*Firm_Large				-0.1189*	
				(0.0670)	
Construction*Firm_Small				-0.1674***	
				(0.0313)	
Construction*Firm_Medium				-0.1973***	
				(0.0430)	
Construction*Firm_Large				-0.2209**	
				(0.0867)	
Tranf.Industry*Firm_Small				0.0696***	
				(0.0175)	
Tranf.Industry*Firm_Medium				0.0725*	
				(0.0378)	
Tranf.Industry*Firm_Large				0.1225*	
				(0.0659)	
Services*Firm_Small				0.0818***	
				(0.0192)	
Services*Firm_Medium				-0.0211	
				(0.0402)	

(continued)

	(1)	(2)	(3)	(4)	(2´ - Placebo) Municipalities with zero of observed corruption
	Ln(Com.)	Ln(Com.)	Ln(Com.)	Ln(Com.)	Ln(Com.)
Services*Firm_Large				-0.0627	
				(0.0700)	
Constant	0.6417***	0.6630***	0.5265***	0.5474***	0.7342***
	(0.0390)	(0.0387)	(0.0337)	(0.0329)	(0.1388)
Covariates(a)	Yes	Yes	Yes	Yes	Yes
Audit year dummies(b)	Yes	Yes	Yes	Yes	Yes
Region dummies (c)	Yes	Yes	Yes	Yes	Yes
R2	.0532822	.0616079	.1218397	.1308777	.077984
Observations	105514	105514	105514	105514	5775

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
Robust standard errors in parentheses clustered by municipality.
(a) Covariates are: Number of jobs, Number of men, Number of women, Employee age, Firm expansion, School enrollment, BF program, Woman mayor, Education mayor, Gdp and Mismanagement.
(b) Dummies for audit year (2005 – 2008).
(c) Dummies for region (by IBGE).

Table 9. The effect of an economic activity sector being corrupt or non-corrupt on the 50th percentile of the compensation distribution.

Dependent variable: The logarithm of the 50th percentile of the compensation distribution (Ln Compensation).

	(1)	(2)	(3)	(4)	(2´ - Placebo) Municipalities with zero of observed corruption
	Ln(Com.)	Ln(Com.)	Ln(Com.)	Ln(Com.)	Ln(Com.)
Corrupt_Sector	0.0850***		0.0799***		
	(0.0082)		(0.0084)		
Commerce_sector		0.0680***		0.0552***	0.0296*
		(0.0084)		(0.0081)	(0.0165)
Construction_sector		0.0898***		0.1212***	-0.0063
		(0.0145)		(0.0156)	(0.0286)
Transf.Industry_sector		0.0833***		0.0645***	0.0585***
		(0.0134)		(0.0119)	(0.0160)
Services_sector		0.1056***		0.0834***	0.0467
		(0.0089)		(0.0095)	(0.0374)
2.Firm_Small			0.0383***	-0.0592*	
			(0.0060)	(0.0303)	
3.Firm_Medium			0.0739***	-0.1155**	
			(0.0156)	(0.0524)	

(continued)

	(1)	(2)	(3)	(4)	(2´ - Placebo) Municipalities with zero of observed corruption
	Ln(Com.)	Ln(Com.)	Ln(Com.)	Ln(Com.)	Ln(Com.)
4.Firm_Large			0.1002***	-0.0840	
			(0.0236)	(0.1190)	
Commerce*Firm_Small				0.0957***	
				(0.0298)	
Commerce*Firm_Medium				0.1991***	
				(0.0537)	
Commerce*Firm_Large				0.2168*	
				(0.1173)	
Construction*Firm_Small				-0.1807***	
				(0.0464)	
Construction*Firm_Medium				-0.1152*	
				(0.0678)	
Construction*Firm_Large				-0.1444	
				(0.1919)	
Tranf.Industry*Firm_Small				0.0967***	
				(0.0306)	
Tranf.Industry*Firm_Medium				0.2698***	
				(0.0578)	
Tranf.Industry*Firm_Large				0.3069**	
				(0.1218)	
Services*Firm_Small				0.1403***	
				(0.0316)	
Services*Firm_Medium				0.1953***	
				(0.0600)	
Services*Firm_Large				0.1568	
				(0.1176)	
Constant	0.5635***	0.5782***	0.5800***	0.5943***	0.7082***
	(0.0235)	(0.0228)	(0.0238)	(0.0224)	(0.0651)
Covariates(a)	Yes	Yes	Yes	Yes	Yes
Audit year dummies(b)	Yes	Yes	Yes	Yes	Yes
Region dummies (c)	Yes	Yes	Yes	Yes	Yes
R2	.0636864	.0653424	.0660057	.0722123	.0617365
Observations	105514	105514	105514	105514	5775

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Robust standard errors in parentheses clustered by municipality.

(a) Covariates are: Number of jobs, Number of men, Number of women, Employee age, Firm expansion, School enrollment, BF program, Woman mayor, Education mayor, Gdp and Mismanagement.

(b) Dummies for audit year (2005 – 2008).

(c) Dummies for region (by IBGE).

Table 10. The effect of an economic activity sector being corrupt or non-corrupt on the 90th percentile of the compensation distribution.

Dependent variable: The logarithm of the 90th percentile of the compensation distribution (Ln Compensation).

	(1)	(2)	(3)	(4)	(2´ - Placebo) Municipalities with zero of observed corruption
	Ln(Com.)	Ln(Com.)	Ln(Com.)	Ln(Com.)	Ln(Com.)
Corrupt_Sector	0.1272***		0.1023***		
	(0.0108)		(0.0107)		
Commerce_sector		0.0898***		0.0740***	0.0585**
		(0.0109)		(0.0111)	(0.0276)
Construction_sector		0.1471***		0.1636***	0.0730
		(0.0154)		(0.0175)	(0.0525)
Transf.Industry_sector		0.1794***		0.1560***	0.1787***
		(0.0188)		(0.0169)	(0.0327)
Services_sector		0.1444***		0.0973***	0.0770
		(0.0111)		(0.0124)	(0.0445)
2.Firm_Small			0.1969***	0.1997***	
			(0.0066)	(0.0265)	
3.Firm_Medium			0.3160***	0.2121***	
			(0.0224)	(0.0549)	
4.Firm_Large			0.3255***	0.2747**	
			(0.0301)	(0.1255)	
Commerce*Firm_Small				-0.0369	
				(0.0259)	
Commerce*Firm_Medium				0.0550	
				(0.0590)	
Commerce*Firm_Large				0.0422	
				(0.1277)	
Construction*Firm_Small				-0.1756***	
				(0.0400)	
Construction*Firm_Medium				-0.1474*	
				(0.0759)	
Construction*Firm_Large				-0.2545	
				(0.1759)	
Tranf.Industry*Firm_Small				-0.0556**	
				(0.0264)	
Tranf.Industry*Firm_Medium				0.1449**	
				(0.0625)	
Tranf.Industry*Firm_Large				0.1750	
				(0.1337)	
Services*Firm_Small				0.0814***	
				(0.0274)	
Services*Firm_Medium				0.1322**	
				(0.0652)	

(continued)

	(1)	(2)	(3)	(4)	(2´ - Placebo) Municipalities with zero of observed corruption
	Ln(Com.)	Ln(Com.)	Ln(Com.)	Ln(Com.)	Ln(Com.)
Services*Firm_Large				0.0623	
				(0.1277)	
Constant	0.4772***	0.5030***	0.5527***	0.5744***	0.5400***
	(0.0270)	(0.0257)	(0.0261)	(0.0245)	(0.0840)
Covariates(a)	Yes	Yes	Yes	Yes	Yes
Audit year dummies(b)	Yes	Yes	Yes	Yes	Yes
Region dummies (c)	Yes	Yes	Yes	Yes	Yes
R2	.1000181	.1051551	.1347098	.1423935	.1329811
Observations	105514	105514	105514	105514	5775

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
Robust standard errors in parentheses clustered by municipality.
(a) Covariates are: Number of jobs, Number of men, Number of women, Employee age, Firm expansion, School enrollment, BF program, Woman mayor, Education mayor, Gdp and Mismanagement.
(b) Dummies for audit year (2005 – 2008).
(c) Dummies for region (by IBGE).

Results for the difference of tenure (employment duration) between firms from corrupt and non-corrupt sectors were not significant. Therefore, our focus will be on the compensation variable. We find that firms from corrupt sectors, on average, pay higher compensations to their employees than those firms from non-corrupt sectors. These results provide support for our hypothesis, which argues that corruption increases the rewards paid to employees in legally registered firms in any of the following forms: high compensations or high tenure.

5.2. The effect of the level of corruption on compensation.

We verify whether the level of corruption of municipalities interferes with the allocation of compensation, but focusing on firms from corrupt sectors (Commerce, Construction, Services and Transformation Industry). Table 11 contains results for the effect of the level of corruption on employees′ compensation. Column (3) extends the specification in column (1) and (2) by including sectors and firm-size dummies, while Column (4) extends the specification in column (3) by adding interaction terms between sector and firm size. The reference group for sector (disaggregated) is Commerce and for firm size is micro-firm.

As can be seen in Table 11, results for the effect of the level of corruption on compensation are robust. Coefficients remain positive and significant in all columns. The effect is small, but statistically significant at the 5% level. Thus, we find that, on average, the compensation in legally registered firms increases in 0.16% (or 0.002680 minimal wages), for a one unit increase in the number of corruption events committed in the municipality, while all the other variables are held constant. These results suggest that firms in more corrupt municipalities pay more compensation to their employees, as a reward (compensation) for participating in corrupt practices on behalf of the company.

In addition, results in column (4) indicate that, on average, Small, Medium and Large firms pay more compensation compared to micro firms (the reference category). Firms from Construction sector pay 7,95% (geometric average) more than those firms from Commerce sector (the base or reference). However, Small, Medium and Large firms from this sector pay less compensation than the average compensation of firms from sector. For example, firms from Construction sector pay 7,95% more, but if the firm is small, the compensation is less 11,75% (0.0795-0.1970=-0.1175) than the average compensation of firms from sector.

Results for the Transformation Industry sector indicate that firms in this sector pay 1,99% more than those in Commerce sector. In addition, Medium and Large firms in Transformation Industry pay more compensation than the average compensation of firms in the sector. Finally, results for Services sector indicate that firms in this sector pay 2,63% more than those from Commerce sector (the reference category), and that only small firms pay more compensation than the average compensation in this sector.

Table 11. The effect of the level of corruption on compensation.

Dependent variable: Ln Average compensation at December, 31 (Ln Compensation).

	(1)	(2)	(3)	(4)
	Ln(Com.)	Ln(Com.)	Ln(Com.)	Ln(Com.)
Corruption	0.0017**	0.0017**	0.0016**	0.0016**
	(0.0007)	(0.0007)	(0.0007)	(0.0007)
Construction	0.0466***		0.0490***	0.0795***
	(0.0106)		(0.0105)	(0.0117)
Transf.Industry	0.0300***		0.0268***	0.0199**
	(0.0107)		(0.0104)	(0.0083)
Services	0.0439***		0.0410***	0.0263***
	(0.0073)		(0.0074)	(0.0087)
2.Firm_Small		0.0536***	0.0532***	0.0297***
		(0.0053)	(0.0053)	(0.0052)
3.Firm_Medium		0.1407***	0.1358***	0.1066***

(continued)

		(0.0189)	(0.0187)	(0.0195)
4.Firm_Large		0.1576***	0.1516***	0.1564***
		(0.0266)	(0.0267)	(0.0205)
Construction*Firm_Small				-0.1970***
				(0.0297)
Construction*Firm_Medium				-0.2545***
				(0.0411)
Construction*Firm_Large				-0.3182**
				(0.1317)
Tranf.Industry*Firm_Small				0.0123
				(0.0150)
Tranf.Industry*Firm_Medium				0.1060***
				(0.0379)
Tranf.Industry*Firm_Large				0.1769***
				(0.0552)
Services*Firm_Small				0.0775***
				(0.0107)
Services* Firm_Medium				0.0257
				(0.0289)
Services* Firm_Large				-0.0136
				(0.0324)
Constant	0.5273***	0.5477***	0.5481***	0.5468***
	(0.0294)	(0.0307)	(0.0297)	(0.0288)
Covariates(a)	Yes	Yes	Yes	Yes
Audit year dummies(b)	Yes	Yes	Yes	Yes
Region dummies (c)	Yes	Yes	Yes	Yes
R2	.0907693	.0944702	.0971744	.1014881
Observations	87299	87299	87299	87299

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
Robust standard errors in parentheses clustered by municipality.
(a) Covariates are: Number of jobs, Number of men, Number of women, Employee age, Firm expansion, School enrollment, BF program, Woman mayor, Education mayor, Gdp and Mismanagement.
(b) Dummies for audit year (2005 – 2008).
(c) Dummies for region (by IBGE).

5.2.1. The effect of the level of corruption on the ith percentile of the compensation distribution.

We show in the following tables the results for the effect of corruption on percentiles of the compensation distribution, as a way to see whether corruption varies across the positions of employees. Specifications are the same as in table 11.

Tables 12, 13 and 14 report estimates using the 10^{th}, 50^{th}, and 90^{th} percentiles respectively. Results are similar to those presented in order to verify whether there is a difference of allocation of compensation between corrupt sector and non-corrupt sectors. That is, results for

the 10th percentile are not robust, while results for the 50th and 90th percentiles are robust and significant, but at the 5% level.

In Column (4) of Table 13, results indicate that a unit increase in the level of corruption in municipalities leads to an increase of 0.13% (or 0.0021 minimal wages) in the compensation of employees with earnings above the median compensation in their firms. Similarly, in Column (4) of Table 14, results show that a unit increase in the level of corruption increases the compensation by 0,22% for those employees with the highest compensations (above the 90th percentile) in their firms. Therefore, firms in more corrupt municipalities pay more compensation to employees with high positions (high incomes). However, in Table 12, the results are not robust suggesting that employees with low incomes (probably those employees with low positions in their firms) do not receive benefits coming from corruption.

Table 12. The effect of the level of corruption on the 10th percentile of the compensation distribution.

Dependent variable: The logarithm of the 10th percentile of the compensation distribution (Ln Compensation).

	(1) Ln(Com.)	(2) Ln(Com.)	(3) Ln(Com.)	(4) Ln(Com.)
Corruption	0.0008	0.0009	0.0009*	0.0009*
	(0.0006)	(0.0006)	(0.0006)	(0.0006)
Construction	0.1089***		0.0895***	0.1185***
	(0.0181)		(0.0166)	(0.0190)
Transf.Industry	-0.0887***		-0.0775***	-0.0877***
	(0.0078)		(0.0077)	(0.0078)
Services	0.0441***		0.0539***	0.0460***
	(0.0061)		(0.0059)	(0.0082)
2.Firm_Small		-0.3353***	-0.3341***	-0.3465***
		(0.0089)	(0.0088)	(0.0096)
3.Firm_Medium		-0.4102***	-0.3992***	-0.4384***
		(0.0145)	(0.0152)	(0.0139)
4.Firm_Large		-0.3646***	-0.3907***	-0.4337***
		(0.0254)	(0.0232)	(0.0196)
Construction*Firm_Small				-0.2130***
				(0.0274)
Construction*Firm_Medium				-0.1523***
				(0.0285)
Construction*Firm_Large				-0.1206*
				(0.0652)
Tranf.Industry*Firm_Small				0.0264***
				(0.0102)
Tranf.Industry*Firm_Medium				0.1211***
				(0.0231)

(continued)

	(1) Ln(Com.)	(2) Ln(Com.)	(3) Ln(Com.)	(4) Ln(Com.)
Tranf.Industry*Firm_Large				0.2276***
				(0.0479)
Services*Firm_Small				0.0389***
				(0.0139)
Services* Firm_Medium				0.0271
				(0.0248)
Services* Firm_Large				0.0530*
				(0.0274)
Constant	0.6211***	0.5161***	0.5333***	0.5306***
	(0.0424)	(0.0374)	(0.0366)	(0.0359)
Covariates(a)	Yes	Yes	Yes	Yes
Audit year dummies(b)	Yes	Yes	Yes	Yes
Region dummies (c)	Yes	Yes	Yes	Yes
R2	.0602791	.1254004	.1342227	.1357049
Observations	87299	87299	87299	87299

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Robust standard errors in parentheses clustered by municipality.

(a) Covariates are: Number of jobs, Number of men, Number of women, Employee age, Firm expansion, School enrollment, BF program, Woman mayor, Education mayor, Gdp and Mismanagement.

(b) Dummies for audit year (2005 – 2008).

(c) Dummies for region (by IBGE).

Table 13. The effect of the level of corruption on the 50th percentile of the compensation distribution.

Dependent variable: The logarithm of the 50th percentile of the compensation distribution (Ln Compensation).

	(1) Ln(Com.)	(2) Ln(Com.)	(3) Ln(Com.)	(4) Ln(Com.)
Corruption	0.0013**	0.0013**	0.0013**	0.0013**
	(0.0006)	(0.0006)	(0.0006)	(0.0006)
Construction	0.0154		0.0176	0.0597***
	(0.0117)		(0.0117)	(0.0123)
Transf.Industry	0.0134		0.0112	0.0076
	(0.0099)		(0.0097)	(0.0078)
Services	0.0338***		0.0319***	0.0246***
	(0.0072)		(0.0073)	(0.0085)
2.Firm_Small		0.0447***	0.0441***	0.0359***
		(0.0054)	(0.0055)	(0.0050)
3.Firm_Medium		0.0887***	0.0865***	0.0816***
		(0.0161)	(0.0161)	(0.0148)
4.Firm_Large		0.0973***	0.0902***	0.1296***
		(0.0241)	(0.0242)	(0.0177)
Construction*Firm_Small				-0.2773***
				(0.0362)
Construction*Firm_Medium				-0.3164***
				(0.0470)
Construction*Firm_Large				-0.3608**

(continued)

	(1) Ln(Com.)	(2) Ln(Com.)	(3) Ln(Com.)	(4) Ln(Com.)
				(0.1601)
Tranf.Industry*Firm_Small				0.0004
				(0.0140)
Tranf.Industry*Firm_Medium				0.0705**
				(0.0302)
Tranf.Industry*Firm_Large				0.0883*
				(0.0532)
Services*Firm_Small				0.0435***
				(0.0113)
Services* Firm_Medium				-0.0070
				(0.0279)
Services* Firm_Large				-0.0637**
				(0.0265)
Constant	0.5799***	0.5943***	0.5946***	0.5879***
	(0.0293)	(0.0302)	(0.0294)	(0.0284)
Covariates(a)	Yes	Yes	Yes	Yes
Audit year dummies(b)	Yes	Yes	Yes	Yes
Region dummies (c)	Yes	Yes	Yes	Yes
R2	.0679344	.0697323	.0711339	.0752149
Observations	87299	87299	87299	87299

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
Robust standard errors in parentheses clustered by municipality.
(a) Covariates are: Number of jobs, Number of men, Number of women, Employee age, Firm expansion, School enrollment, BF program, Woman mayor, Education mayor, Gdp and Mismanagement.
(b) Dummies for audit year (2005 – 2008).
(c) Dummies for region (by IBGE).

Table 14. The effect of the level of corruption on the 90th percentile of the compensation distribution.

Dependent variable: The logarithm of the 90th percentile of the compensation distribution (Ln Compensation).

	(1) Ln(Com.)	(2) Ln(Com.)	(3) Ln(Com.)	(4) Ln(Com.)
Corruption	0.0023**	0.0023**	0.0022**	0.0022**
	(0.0010)	(0.0010)	(0.0009)	(0.0009)
Construction	0.0462***		0.0569***	0.0788***
	(0.0114)		(0.0111)	(0.0119)
Transf.Industry	0.0856***		0.0776***	0.0779***
	(0.0147)		(0.0139)	(0.0125)
Services	0.0477***		0.0406***	0.0171*
	(0.0085)		(0.0085)	(0.0096)
2.Firm_Small		0.1965***	0.1958***	0.1627***
		(0.0062)	(0.0061)	(0.0070)
3.Firm_Medium		0.3232***	0.3102***	0.2661***

(continued)

	(1) Ln(Com.)	(2) Ln(Com.)	(3) Ln(Com.)	(4) Ln(Com.)
		(0.0234)	(0.0223)	(0.0285)
4.Firm_Large		0.3222***	0.3255***	0.3155***
		(0.0311)	(0.0308)	(0.0265)
Construction*Firm_Small				-0.1384***
				(0.0305)
Construction*Firm_Medium				-0.2040***
				(0.0578)
Construction*Firm_Large				-0.2929**
				(0.1364)
Tranf.Industry*Firm_Small				-0.0184
				(0.0183)
Tranf.Industry*Firm_Medium				0.0910*
				(0.0494)
Tranf.Industry*Firm_Large				0.1391*
				(0.0739)
Services*Firm_Small				0.1169***
				(0.0121)
Services* Firm_Medium				0.0734**
				(0.0363)
Services* Firm_Large				0.0168
				(0.0398)
Constant	0.4985***	0.5631***	0.5572***	0.5606***
	(0.0331)	(0.0335)	(0.0323)	(0.0317)
Covariates(a)	Yes	Yes	Yes	Yes
Audit year dummies(b)	Yes	Yes	Yes	Yes
Region dummies (c)	Yes	Yes	Yes	Yes
R2	.1078037	.1401915	.1443744	.1481266
Observations	87299	87299	87299	87299

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
Robust standard errors in parentheses clustered by municipality.
(a) Covariates are: Number of jobs, Number of men, Number of women, Employee age, Firm expansion, School enrollment, BF program, Woman mayor, Education mayor, Gdp and Mismanagement.
(b) Dummies for audit year (2005 – 2008).
(c) Dummies for region (by IBGE).

6. DISCUSSION AND CONCLUSION

This study tested the effect of corruption on allocation of resources to employees in private firms, including compensation and job tenure. Following Becker (1968) approach, it was assumed that private-firm employees will engage in corrupt practices with government officials if they receive rewards in the form of high compensations or job stability for participating in such activities on behalf of their organization. Hence, firms engaged in corruption would have

to reward these employees with high compensations and/or keep them in the job, because they run the risk of being caught and punished.

Using information of firms operating in Brazilian municipalities, we test our assumption by estimating the differential effect of the allocation of compensation and tenure between sectors classified as corrupt and non-corrupt (as coded in this study), and then by estimating the effect of the level of corruption found in municipalities on that resource allocation.

We show that firms from sectors associated with corruption allocate higher compensations to their employees than those from sectors not associated with corruption. In addition, results suggest that firms operating in more corrupt municipalities allocate more compensation to their employees than those operating in less corrupt municipalities. When analyzing results in terms of percentiles for the compensation distribution in firms (with other dependent variables), this effect is robust and significant for employees with compensations above the percentile 50 of the compensation distribution in their firms, which probably refers to top-level employees (high positions). This makes sense because the decisions that lead to firms to engage in government corruption depend on decisions of people at the head of firms (executives and managers), who are going to require other employees below the top to carry out corrupt activities.

We also find asymmetric results influenced by the firm size and the economic activity sector. For example, in the Construction sector, small and medium firms, on average, pay less compensation than the average compensation of firms in that sector; while the opposite is true for firms from the Services sector (small and medium firms pay more compensation). Therefore, corruption can affect the resource allocation for firms of any size.

Our hypothesis was that, corruption increases the rewards paid to employees in legally registered firms in any of the following forms: high compensations or high tenure. Results did not show a robust effect for the tenure variable. A possible explanation of this may be due to differences in the time of firms' operation (new and old companies). However, the results were robust and statistically significant for the compensation variable, which has given a crucial support to our hypothesis. Moreover, receiving rewards in the form of high compensations would be more attractive for employees involved in corruption on behalf of their company.

A placebo test was carried out to verify whether the differential effect between sectors classified as corrupt and non-corrupt exists in municipalities that were audited and no irregularities were found (as listed in CGU audit reports). The results in this placebo test are in line with our

expectation. Compensations in the Construction and Services sectors (the corrupt sectors with the highest compensations) are not different statistically from those sectors not associated with corruption. Even, for the commerce sector (the corrupt sector with the lowest compensation), the difference we found with respect to those non-corrupt sectors is not robust (see appendix C). Thus, the results suggest that the allocation of compensation in firms is influenced by corruption.

Another analysis was carried out in order to verify whether there are differences of allocation of compensations around the year of the audit of municipalities. The results remain robust and statistically significant suggesting that the effect of corruption on the allocation of compensation was not due to stigmatization of sectors, caused by the disclosure of audit results.

The findings of this study suggest that corruption tends to affect firm efficiency by increasing their costs. Corruption imposes initial costs for firms (costs of bribes) (Olken and Barron 2009; Sequeira and Djankov, 2014) and then, it increases the allocation of compensation, as found in this study. The findings are in line with previous studies suggesting that corruption can distort the operational decisions of firms, making them less efficient (Fisman and Svensson, 2007; Faruq et al., 2013; Olken, and Pande, 2013). In more corrupt environment, firms could not only suffer from inefficient allocation of human capital as noted by Athanasouli and Goujard (2015), but also from inefficient allocation of compensation to their employees.

De Rosa, Gooroochurn and Görg, (2015) argue that corruption is more harmful for firms' productivity in countries where corruption is more persistent and the legal system is weaker. This research is based on a developing country context (Brazil). Therefore, since corruption is more persistent in developing countries (Svensson, 2005), and Brazil has reported weaknesses in the quality of their institutions (as indicated by The Global Competitiveness Report 2004-2005), the results of this study point out that corruption tends to affect firms' efficiency by increasing their costs.

Our results suggest that corruption raises costs for firms from sectors associated with corruption and that these costs increase in more corrupt environment (municipalities). However, we cannot identify which firms were involved in corruption. The main results of this study refer to the average effect of an economic activity sector being corrupt or non-corrupt on resource allocation (using a dummy variable as the main independent variable for whether the sector is associated or not with corruption). These results also show the average effect for each corrupt

sector (disaggregated). The complementary results refer to the average effect of corruption on resource allocation (using the level of corruption as the main independent variable).

This research has important implications for the literature. Previous research has focused on the entrepreneurial and commercial consequences of corruption, specifically on entrepreneurship (Avnimelech et al., 2014; Bologna and Ross, 2015; Dreher and Gassebner, 2013; Dutta and Sobel, 2016), firm growth (Fisman and Svensson, 2007; Gaviria, 2002), firm productivity (Faruq et al., 2013; McArthur and Teal, 2002), and management quality of firms (Athanasouli and Goujard, 2015). This study focuses on the allocation of resources to employees in private firms, and it has provided empirical evidence to support our assumption that corruption increases the rewards paid to employees in legally registered firms (firms from sectors that depend on government contracts). Moreover, our findings illustrate the importance of considering initial and future costs (high compensations) for firms, in addition to the costs of having a bad reputation when they engage in corruption.

Future studies could develop datasets with a representative sample of firms involved in corruption and extend our analyses considering sub-sectors of economic activity. These firms could be identified in a large number of audit reports. Making a comparison with firms not engaged in corruption and/or firms operating in municipalities where no irregularities were observed will be important to support the results. Information about the compensation system would be interesting for a better analysis. It would also be interesting to consider the gender of managers whose firms were involved in government corruption, since a number of studies have suggested that women tend to be more risk-averse (Eckel and Grossman, 1998; Schulze and Frank, 2003).

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INEP. National Institute for Educational Studies and Research "Anísio Teixeira". http://inep.gov.br/

IPEA. Institute for Applied Economic Research. http://www.ipeadata.gov.br/

SEBRAE. Brazilian Service to Support Micro and Small Enterprises. http://www.sebrae-sc.com.br/

The World Economic Forum. http://reports.weforum.org/global-competitiveness-index/

TSE. Superior Electoral Court. http://www.tse.jus.br/

Appendix A - Descriptive statistics for the sector and size of firms.

Table A1. Number of firms according to their size and sector of economic activity.

Firm size	Sector								Total Frequency and Percent
	Agriculture	Commerce	Construction	Mineral Extr.	Transf. Industry	Others/Ignored	Ind. Serv. PU	Services	
Micro	16,024	31,948	2,764	443	11,536	181	316	22,001	85,213
	18.8	37.49	3.24	0.52	13.54	0.21	0.37	25.82	100
Small	864	7,309	358	106	2,890	0	62	5,582	17,171
	5.03	42.57	2.08	0.62	16.83	0	0.36	32.51	100
Medium	159	518	109	13	720	0	22	642	2,183
	7.28	23.73	4.99	0.6	32.98	0	1.01	29.41	100
Large	21	245	11	3	125	0	1	541	947
	2.22	25.87	1.16	0.32	13.2	0	0.11	57.13	100
Total	17,068	40,020	3,242	565	15,271	181	401	28,766	105,514
	16.18	37.93	3.07	0.54	14.47	0.17	0.38	27.26	100

Appendix B - Descriptive statistics for the sector and size of firms involved in corrupt practices according to a sub-sample of CGU reports.

Table B1. Number of firms involved in corrupt practices according to the sector of economic activity.

Sector	Freq. (2005)	Freq. (2006)	Total Freq.	Percent
Commerce	63	84	147	56.76
Construction	55	23	78	30.12
Transformation Industry	8	5	13	5.02
Services	13	8	21	8.11
Total	139	120	259	100

Table B2. Number of firms involved in corrupt practices according to the subsector of economic activity.

Sub sector	Commerce	Construction	Transf. Industry	Services	Total Freq.	Percent
Technical and professional administration				8	8	3.09
Food and Drink			1		1	0.39
Accommodation and communications				3	3	1.16
Rubber, tobacco and leather			2		2	0.77
Wholesales	33				33	12.74
Retail	114				114	44.02
Construction		78			78	30.12
Education				1	1	0.39
Mechanical Industry			2		2	0.77
Metal Industry			1		1	0.39
Transport equipment			3		3	1.16
Medical, dental and veterinary				3	3	1.16
Paper and printing			4		4	1.54
Transport and communication				6	6	2.32
Total					259	100

Table B3. Number of firms involved in corrupt practices according to the size of the firm.

Size	Freq.	Percent
Micro	159	61.39
Small	69	26.64
Medium	19	7.34
Large	12	4.63
Total	259	100

Appendix C - Placebo test: The effect of an economic activity sector being corrupt on employees' compensation in municipalities that were audited and no irregularities were found.

Table C1. The effect of an economic activity sector being corrupt on employees' compensation in audited municipalities where no irregularities were found.

Dependent variable: The logarithm of the average compensation at December, 31 (Ln Compensation).

	(2´a - Placebo) Ln(Com.)	(3´a - Placebo) Ln(Com.)	(2´b - Placebo) Ln(Com.)	(3´b - Placebo) Ln(Com.)	(2´c - Placebo) Ln(Com.)	(3´c - Placebo) Ln(Com.)	(2´d - Placebo) Ln(Com.)	(3´d - Placebo) Ln(Com.)	(2´e - Placebo) Ln(Com.)	(3´e - Placebo) Ln(Com.)
Commerce	0.0281	0.0244							0.0364*	0.0313
	(0.0182)	(0.0189)							(0.0193)	(0.0202)
Construction			0.0614	0.0612					0.0403	0.0357
			(0.0467)	(0.0461)					(0.0369)	(0.0370)
Transf. Industry					0.0293*	0.0223			0.0903***	0.0813***
					(0.0162)	(0.0168)			(0.0208)	(0.0196)
Services_sector							0.0775*	0.0668	0.0566	0.0523
							(0.0431)	(0.0458)	(0.0387)	(0.0391)
Covariates[(a)]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm size dummies [(b)]	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Audit year dummies [(c)]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region dummies [(d)]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	.1223492	.124507	.1268893	.127254	.1756231	.189878	.0429509	.0586047	.0940117	.1009108
Observations	2901	2901	830	830	1846	1846	2148	2148	5775	5775

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Robust standard errors in parentheses clustered by municipality.

(a) Covariates are: Number of jobs, Number of men, Number of women, Employee age, Firm expansion, School enrollment, BF program, Woman mayor, Education mayor, Gdp and Mismanagement.

(b) Dummies for firm size (micro, small, medium and large).

(c) Dummies for audit year (2005 – 2008).
(d) Dummies for region (by IBGE).

Appendix D. The effect of an economic activity sector being corrupt or non-corrupt on employees' compensation around of audit year.

Table D1. The effect of an economic activity sector being corrupt or non-corrupt on employees' compensation a few years prior to the audit year.

Dependent variable: The logarithm of the average compensation at the time t, t-1, t-2 and t-3 years prior to the audit year t (Ln Compensation).

	(1) Ln(Com.) (t-1)	(2) Ln(Com.) (t-1)	(3) Ln(Com.) (t-2)	(4) Ln(Com.) (t-2)	(5) Ln(Com.) (t-3)	(6) Ln(Com.) (t-3)
Corrupt_sector	0.0770***		0.0818***		0.0540**	
	(0.0108)		(0.0134)		(0.0207)	
Commerce_sector		0.0540***		0.0529***		0.0345*
		(0.0110)		(0.0138)		(0.0190)
Construction_sector		0.0970***		0.0992***		0.0718**
		(0.0177)		(0.0206)		(0.0297)
Transf.Industry_sector		0.0902***		0.0888***		0.0423
		(0.0173)		(0.0200)		(0.0270)
Services_sector		0.0962***		0.1113***		0.0807***
		(0.0114)		(0.0141)		(0.0237)
Municipality level covariates[(a)]	Yes	Yes	Yes	Yes	Yes	Yes
Firm level covariates (t-1) [(b)]	Yes	Yes	No	No	No	No
Firm level covariates (t-2) [(c)]	No	No	Yes	Yes	No	No
Firm level covariates (t-3) [(d)]	No	No	No	No	Yes	Yes
Firm size dummies [(e)]	Yes	Yes	Yes	Yes	Yes	Yes
Audit year dummies [(f)]	Yes	Yes	Yes	Yes	Yes	Yes
Region dummies [(g)]	Yes	Yes	Yes	Yes	Yes	Yes
R^2	.1149158	.1174107	.1153896	.1196695	.1100505	.1130403
Observations	84248	84248	53338	53338	18796	18796

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
Robust standard errors in parentheses clustered by municipality.
(a) Covariates at municipality level are School enrollment, BF program, Woman mayor, Education mayor, Gdp and Mismanagement.
(b) Leads covariates at firm level are Number of jobs, Number of men, Number of women, Employee age, and Firm expansion, but at time t-1 prior to the audit year.
(c) Leads covariates at firm level are the same variables as in (b) of this table, but at time t-2 prior to the audit year.
(d) Leads covariates at firm level are the same variables as in (b) of this table, but at time t-3 prior to the audit year.
(e) Dummies for firm size (micro, small, medium and large).
(f) Dummies for audit year (2005 – 2008).
(g) Dummies for region (by IBGE).
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Table D2. The effect of an economic activity sector being corrupt or non-corrupt on employees' compensation a few years after the audit year.

Dependent variable: The logarithm of the average compensation at the time t, t+1, t+2 and t+3 years after the audit year t (Ln Compensation).

	(1) Ln(Com.) (t)	(2) Ln(Com.) (t)	(3) Ln(Com.) (t+1)	(4) Ln(Com.) (t+1)	(5) Ln(Com.) (t+2)	(6) Ln(Com.) (t+2)	(7) Ln(Com.) (t+3)	(8) Ln(Com.) (t+3)
Corrupt_Sector	0.0792***		0.0838***		0.0687***		0.0695***	
	(0.0087)		(0.0084)		(0.0094)		(0.0119)	
Commerce_sector		0.0554***		0.0601***		0.0496***		0.0467***
		(0.0087)		(0.0086)		(0.0104)		(0.0119)
Construction_sector		0.1121***		0.1207***		0.1111***		0.1136***
		(0.0140)		(0.0154)		(0.0256)		(0.0203)
Transf.Industry_sector		0.0852***		0.0901***		0.0735***		0.0403***
		(0.0140)		(0.0141)		(0.0164)		(0.0126)
Services_sector		0.1010***		0.1052***		0.0853***		0.1073***
		(0.0094)		(0.0099)		(0.0101)		(0.0162)
Municipality level covariates[(a)]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm level covariates[(b)]	Yes	Yes	No	No	No	No	No	No
Firm level covariates (t+1) [(c)]	No	No	Yes	Yes	No	No	No	No
Firm level covariates (t+2) [(d)]	No	No	No	No	Yes	Yes	No	No
Firm level covariates (t+3) [(e)]	No	No	No	No	No	No	Yes	Yes
Firm size dummies [(f)]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Audit year dummies [(g)]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region dummies [(h)]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	.0876046	.0905332	.0866995	.0896209	.0813595	.0834027	.0544498	.0607217
Observations	105514	105514	86718	86718	52176	52176	21266	21266

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
Robust standard errors in parentheses clustered by municipality.
(a) Covariates at municipality level are School enrollment, BF program, Woman mayor, Education mayor, Gdp and Mismanagement.
(b) Covariates at firm level are Number of jobs, Number of men, Number of women, Employee age, and Firm expansion.
(c) Leads covariates at firm level are the same variables as in (b) of this table, but at time t+1 after the audit year.
(d) Leads covariates at firm level are the same variables as in (b) of this table, but at time t+2 after the audit year.
(e) Leads covariates at firm level are the same variables as in (b) of this table, but at time t+3 after the audit year.
(f) Dummies for firm size (micro, small, medium and large).
(g) Dummies for audit year (2005 – 2008).
(h) Dummies for region (by IBGE).