Department of Economics

Working Paper Series

Corruption and Entrepreneurship: Evidence from a Random Audit Program

Jamie Bologna and Amanda Ross

Working Paper No. 15-05

This paper can be found at the College of Business and Economics Working Paper Series homepage:

http://be.wvu.edu/phd_economics/working-papers.htm

Corruption and Entrepreneurship: Evidence from a Random Audit Program

Jamie Bologna
Department of Economics
West Virginia University
Morgantown, WV 26506
Phone: 724-882-0074
Email: jbologna@mix.wvu.edu

and

Amanda Ross*
Department of Economics
West Virginia University
Morgantown, WV 26506
Phone: 304-293-7869
Email: Amanda.ross@mail.wvu.edu

March 30, 2015

Abstract

In this paper, we examine the effect of corruption on business activity in Brazilian municipalities. Previous research that has examined the impact of corruption has relied primarily on survey or conviction data, which may be problematic as these measures likely to be biased. We use a new measure of corruption that draws upon random audit data of municipal governments' finances in Brazil. We find that higher levels of corruption cause reductions in the number of businesses operating in an area. Furthermore, we find that these effects become larger over time, suggesting that corruption is more detrimental to long-run economic activity. However, we find that if institutional quality is poor, then higher levels of corruption result in more businesses locating in a jurisdiction. This supports the argument that if there are poor institutions operating in an area, corruption can "grease the wheels" and is an alternative mechanism to help new businesses in the area.

Keywords: Entrepreneurship; Corruption; Institutions
JEL Classifications: R1, R5

*Corresponding Author

1. Introduction

Institutional quality is considered to be an important determinant of entrepreneurial activity. Baumol (1990) argued that the total supply of entrepreneurs is fixed and institutions determine if these entrepreneurs engage in productive, unproductive, or even destructive activities. As a result of this hypothesis, researchers have shown empirically that higher quality institutions are conducive to productive entrepreneurial activity (Kreft and Sobel, 2005; Sobel et al., 2007; Nyström, 2008; Bjørnskov and Foss, 2008; Sobel, 2008; Wiseman and Young, 2013).[1] These papers use measures of economic freedom as a proxy for institutions, which is consistent with the definition and enforcement of property rights, as well as institutions that have a limited size and scope of government (Gwartney et al., 2014; Stansel et al., 2014).

While there has been an extensive literature examining the relationship between institutional quality and entrepreneurship, there has been less research thus far examining the relationship between corruption and entrepreneurship.[2] One likely reason for this gap in the literature is that measuring corruption is difficult, and obtaining data on corruption is equally challenging. In this paper, we use data from a random audit program that was conducted in Brazilian municipalities to determine the effect of corruption on business activity. In 2003, the President of Brazil implemented a random audit program of municipal governments' expenditures to determine what percentage of funds were tied to corrupt activities (Ferraz and Finan, 2008; Ferraz and Finan, 2011). We use the data from this audit program to determine the probability of corruption in a given municipality and then estimate the effect of corruption on entrepreneurship.

[1] The focus of this paper is on productive entrepreneurial activity, namely entrepreneurial activities that are likely conducive to economic growth.

[2] Those papers that have examined this relationship have found that corruption deters entrepreneurship (Desai et al., 2003; Ovaska and Sobel,2005; Avnimelech, Zelekha, and Sarabi, 2011; Boudreaux, 2014; Farzana, Terjesen, and Audretsch, 2014)

In addition to looking at the direct effect of corruption on business activity, we also consider that there may be important differences depending on the quality of institutions in the area. Some scholars argue that corruption can actually help firms overcome inefficient rules and regulations in areas that have low quality institutions (Leff, 1964; Huntington, 1968). This is known as the "grease the wheels" hypothesis which has been tested empirically in the literature with mixed results.[3] However, Dreher and Gassebner (2013) argue that it should not be surprising that the "grease the wheels" hypothesis is difficult to support when looking at economic growth overall, as there are many channels through which corruption may impact growth.[4] For example, in most theories arguing there is a negative link between corruption and economic growth, the primary costs of corruption stem from misallocation problems, not the act of corruption itself (Svensson, 2005). Thus, corruption may benefit some areas by allowing firms to operate despite poor institutional quality, but these firms may be inefficient. As a result, we may see an increase in firm growth, while economic growth as a whole is declining. In this paper we will consider at how the effect of corruption on business activity may vary based on the quality of institutions in the area.

While there is interest in the relationship between corruption and entrepreneurship, measuring corruption is problematic and existing measures are potentially biased. For example, corruption measured using perception indices is likely affected by factors such as the country's current income or education levels (Donchev and Ujhelyi, 2014). Other studies have utilized

[3] Heckelman and Powell (2010) find that corruption has a negative effect in areas with high levels of economic freedom, but this negative effect decreases in magnitude as the level of economic freedom falls. Méon and Sekkat (2005) use an alternative definition of institutional quality and find evidence of a "sand the wheels" hypothesis, suggesting that the negative effects of corruption become larger when there are lower quality institutions. However, most studies do not find evidence of any relationship (Campos et al., 2010).

[4] Antunes and Cavalcanti (2007) argue that regulations and higher start-up costs may just end up driving entrepreneurs into the underground economy.

experienced-based data to develop corruption measures (Fisman and Svensson, 2007).[5] While experienced-based measures are an improvement upon perception-based measures (Olken and Pande, 2012), they may still be biased as respondents may be hesitant to admit to paying a bribe or engaging in corrupt acts. Other work has used federal corruption conviction rates in the U.S. as a measure of corruption (Mitchell and Campbell, 2009; Wiseman, 2014). Corruption convictions include only acts of corruption in which the individual was actually caught and convicted, which may be biased by political factors (Bologna, 2015). In addition, the corruption convictions used in these papers include minor acts of misconduct not normally considered to be corruption (Cordis and Milyo, 2013).

We improve upon these measures of corruption by drawing upon information that is based on the observation of corrupt activities, which Olken and Pande (2012) noted is the best way to measure corruption. In 2003, the president of Brazil decided that to combat corruption he would randomly audit approximately one percent of municipalities with populations below 500,000. Ferraz and Finan (2008, 2011) used these reports to construct a new measure of corruption, the amount of corrupt funds found through the audit program. By using this measure of the probability that funds are obtained from corrupt activities, our measure of corruption is not subject to reporting biases or political biases that could affect the amount of corruption detected.

We find that corruption deters business activity in Brazilian municipalities. Looking first at cross-sectional effects from 2003 to 2012, we find that the deterrent effect of corruption on business activity increases over time. This result is consistent with Aidt (2009), who stated that while corruption may be beneficial in the short-run, it is not beneficial for long-run growth. We look at the impact of corruption on firms of all sizes, as well as only small firms, where small firms are those establishments with ten or fewer employees. The results across both samples are

[5] Researchers also use a measure of corruption experience across countries from World Bank Enterprise Surveys.

consistent, and slightly larger for small firms, suggesting that these small establishments are especially sensitive to corrupt activities.

We then look at how corruption in 2003 affects the change in business activity. We look at these effects over different intervals, specifically two four-year intervals, from 2003 to 2007 2008 to 2012, and one nine-year interval, from 2003 to 2012. This allows us to further investigate how the effect of corruption may vary over time. We continue to find that corruption has a negative effect on the change in businesses, and that the effect is larger in the long-term. This pattern is especially large and persistent when we consider small firms.

Next, we consider how the effect of corruption on business activity may vary across sectors. We find that the deterrent effect is concentrated in those sectors that are generally considered to be the most corrupt – extractive industries, manufacturing, construction, and transportation and communications (OECD Foreign Bribery Report, 2014).[6] In particular, we find that these effects are the largest when we look at the effect in the long-term versus the short-term change in the number of businesses. Furthermore, we do not find an effect on public administration or utilities, which is not unsurprising given that these industries tend to be government-run and thus are at least partially insulated from market forces.

Finally, we examine how the effect of corruption on business activity may vary based on the institutional quality of the area. Dreher and Gassebner (2013) argued that corruption may be beneficial to entrepreneurs if the area has poor institutions because corruption allows firms to "grease the wheels" and get around the issues created by the low-quality institutions. We test this hypothesis to see if these mechanisms are present in Brazil. We find that this hypothesis is true for our all firm sample, and is especially true when we focus on small firms. This suggests

[6] The OECD report actually lists the transportation and communication industries as separate groups, however, they are included as one group in this paper as this is how they are categorized in the Brazilian classification system.

that corruption may not be completely bad if the institutions of a municipality are of a poorer quality, as corruption is one mechanism for entrepreneurs to by-pass government regulations.

The rest of the paper will proceed as follows. Section 2 will describe in more detail the history of corruption in Brazil. In Section 3 we describe our empirical strategy and data. Results are presented in Section 4. We conclude and discuss policy implications in Section 5.

2. Corruption and Institutional Quality in Brazil

Brazil is commonly recognized as suffering from high levels of corruption even after transitioning to democracy in 1985 (Geddes and Neto, 1992; da Silva, 1999). Each of the first five presidential administrations surveyed in Power and Taylor (2011) since democratization have been accused of corruption. One of these accusations even resulted in presidential impeachment. Thus, it does not appear that democracy has cured the problem of chronic corruption in Brazil yet (da Silva, 1999).

To combat corruption and increase the accountability of government, President Luiz Inácio Lula da Silva implemented a random auditing program of municipal governments' expenditures in May of 2003 (Ferraz and Finan, 2008; Ferraz and Finan, 2011). This program randomly selects approximately one percent of all municipalities with a population below 500,000 people (Controladoria-Geral da União (CGU)). The CGU auditors collect information on all federal funds transferred to municipal governments, inspects public work construction, and consults with the general population through community councils regarding misconduct complaints. This information is organized into a report and made available to the public. As noted in Power and Taylor (2001), the CGU has been an important oversight body since its creation.

In a series of papers, Ferraz and Finan (2008; 2011) used these reports to construct measures of corruption in the audited municipalities. This paper uses the corruption indicators developed in the 2011 paper where the authors use audits from the first year of the program only, while excluding the first month of the audit, resulting in a sample of 476 municipalities.[7] Ferraz and Finan (2011) focus on three different types of corruption that could be found in these audit reports: fraud in the public procurement of goods and services, diversion of funds, and the over invoicing of goods and services. They estimate that corruption in this sample of local governments amounts to approximately $550 million per year, with about 80 percent of municipalities experiencing at least one instance of corruption.

As shown in Figure 1, there is variability in corruption across municipalities. When looking at the share of resources audited that were involved corruption, we see in Table 1 that on average 6% of these resources were corrupt. However, some municipalities have as little as 0% to as much as 80% of their resources involved in corruption. Thus, even though corruption is relatively common in Brazil, it seems that some municipalities experience far more corruption than others, potentially explaining differences in economic outcomes across the country.

In addition to corruption, municipal governments in Brazil face other issues. As noted in Naritomi et al. (2007), municipalities closer to the equator tend to have lower per-capita incomes than those further away. Specifically, Naritomi et al. (2007) find that the current institutions in areas subject to some specific historical events tend to have a lower quality of municipal governance, as measured by an index made available from the Brazilian Census Bureau (IBGE).[8] This index broadly measures the efficiency of municipal governments using four components:

[7] Bologna (2014b) also uses this audit data to examine the effect of corruption on GDP and income.
[8] Naritomi et al. (2007) find that municipalities with a sugar-cane colonial origin have less equally distributed land today, while municipalities with a gold cycle colonial origin have a worse governance and justice system. The likelihood that the municipalities came from either colonial origin depend greatly on their location.

the year in which the database of the tax on urban property was updated, property tax payment rate, number of administrative instruments (e.g., existence of district administration), and the number of planning instruments (e.g., existence of master plans).[9]

Therefore, differences in economic outcomes across municipalities may not only depend on corruption, but also differences in the efficiency of local governments. Furthermore, given that both institutional quality and corruption differ across the country, we may see that corruption has differing effects depending on the level of institutional quality of the municipality. Thus, we not only test if entrepreneurial activity in Brazilian municipalities is affected by corruption, but we also test if this effect varies based on the efficiency of local governments.

3. Empirical Methodology and Data

Empirical Methodology

We first estimate the relationship between corruption and entrepreneurial activity through the following equation:

(3.1) $$BUSINESSACT_{i,j,} = \beta_1 CORRUPT_j + \theta X_j + \gamma_i + \lambda_t + \iota_s + \varepsilon_{i,j}$$

where i and j index industrial sector and municipality, respectively. $BUSINESSACT_{ij}$ initially represents the total number of establishments in each industry in a given municipality, $CORRUPT_j$ represents the probability of corrupt funds, and X_j is a matrix of municipal controls. γ_i represents industrial sector fixed effects; λ_t represents lottery fixed effects[10]; ι_s represents state fixed effects; and $\varepsilon_{i,j}$ is a stochastic error term.[11] We estimate equation (3.1) using all businesses

[9] This index is actually a subcomponent of a larger institutional quality index constructed by the IBGE. This index will be discussed further in the data section of the paper.

[10] As not all municipalities in the sample are selected in the same lottery, thus we include lottery fixed effects to control for any timing differences due to the lottery.

[11] We keep our unit of observation at the sector level, rather than combining all establishments into a single measure, as some sectors may be more sensitive to corruption than others.

in the area, as well as small firms with 10 or fewer employees. We also estimate the effect of corruption on the change in the number of establishments. Considering the effect on the change in the number of establishments provides additional information on how corruption impacts entrepreneurial activity in an area.[12]

Given that institutional quality varies across Brazilian municipalities, it is possible that corruption may "grease the wheels" of growth in municipalities with lower quality institutions, resulting in a positive effect of corruption on growth in the number of establishments. Following Dreher and Gassebner (2013), we see if the effect of corruption on the change in the number of businesses depends on the overall institutional environment.[13] We estimate:

(3.2) $GROWTH_{i,j,,} = \alpha + \delta_1 INSTITUTION_j + \delta_2 CORRUPT_j + \delta_3 CORRUPT \times INSTITUTION_j + \theta X_j + \gamma_i + \lambda_t + \imath_s + \varepsilon_{i,j}$

where $CORRUPT \times INSTITUTION$ is the interaction between the level of corruption and institutional quality. A negative value of δ_3 indicates that the effect of corruption worsens in areas with better institutions, while a positive value indicates that the effect of corruption is more positive in areas with better institutions. Therefore, if $\delta_2 > 0$ and $\delta_3 < 0$, then we can conclude that corruption may "grease the wheels" of entrepreneurial activity by providing entrepreneurs an alternative method to begin operating in areas with poor institutions.[14]

Given that corruption may have differing short-run and long-run effects, we estimate all three relationships over a variety of different time periods. As argued in Aidt (2009), corruption is almost certainly bad for economic growth in the long-run, even if corruption has a positive

[12] Ideally, one would be able to separate out firm births and deaths, however, given data availability this is not possible for our analysis.
[13] As in Dreher and Gassebner (2013), we note that when interpreting these results one must proceed with caution as while corruption may allow entrepreneurs to get around inefficient regulations, corruption may also increase these regulations in the long-run. Separating these mechanisms is impossible given the data available.
[14] The case where $\delta_1 < 0$ and $\delta_2 < 0$, does not necessarily go against the "grease the wheels" hypothesis. This would simply suggest that corruption is more harmful in areas with high quality institutions.

short-run effect. In addition, since the results of the audit reports are publically available, entrepreneurs may become more aware of the corruption levels in each municipality over time and adjust their behavior, possibly resulting in a lower bound estimate of these relationships.

Data

The data for this paper comes from four sources: Relação Anual de Informações Sociais (Annual Social Information Report - RAIS), Instituto Brasileiro de Geografia e Estatística (Brazilian Institute of Geography and Statistics - IBGE), Instituto de Pesquisa Econômica Aplicada (Institute of Applied Economic Research – IPEA), and Ferraz and Finan (2011). The dependent variables come from the individual establishment data provided by the Ministry of Labor and Employment's RAIS. All control variables, other than the measure of corruption, are from either IBGE or IPEA. The corruption measures were obtained from Ferraz and Finan (2011). Descriptions and summary statistics of all variables are given in Tables 1 and 2.

RAIS is an annual record of all formal establishments across Brazilian municipalities. We use this data from 2003 to 2012, since the audits did not begin until 2003. This dataset categorizes each establishment by industry and employment size. Using this information, we calculate the total number of local establishments within each of the 17 sector categories provided by the Comissão Nacional de Classificação (CONCLA) Classificação Nacional de Atividades Econômicas (CNAE) Version 1.0 for each year. Summary statistics on the average number of establishments in each sector are presented in Table 3. Throughout the paper, we consider the effect of corruption on all firms, as well as those with ten employees or less.

In addition to the total number of local establishments per year, we examine how the number of establishments within each municipality changes over time. To do so, we construct

two additional measures: the change in the number of local establishments of all employment sizes and the change in the number of local establishments with 10 employees or less. We do this for three periods to allow for differing short-term and long-term effects: 2003-2007 and 2008-2012, as well as 2003-2012.

The corruption variable we use, from Ferraz and Finan (2011), is the share of audited resources found to be involved in corrupt activities. Municipalities are randomly selected via a monthly lottery and auditors gather information on all federal funds transferred to these municipal governments from 2001 onwards. As mentioned above, the audit program began in May of 2003 and is still in existence today. We only use the audits conducted in the first year of the program because the audit reports represent not only the existence of corruption but also the ability of municipal governments to hide their corruption from the auditors (Olken and Pande, 2012). This bias is minimized when only the first year of audits is used.

Since the dataset used to construct the business activity variable only includes formal establishments, it should be noted that the effect we estimate may be due to entrepreneurs moving underground if corruption and the underground economy are complementary (Antunes and Cavalcanti, 2007). As noted in Dreher and Schneider (2010), this is likely the case for lower-income countries. Therefore, we use IBGE Census 2000 data to control for the size of the informal sector. We define the size of the informal sector as the total number of employees without a formal contract divided by the total number of employees.

In addition, entrepreneurial activity is often impacted by the quality of institutions in the area. As mentioned above, numerous researchers have shown that there is more productive entrepreneurial activity in areas with higher quality institutions. Although there is no index of economic freedom available across Brazilian municipalities, the IBGE does provide a broad

measure of institutional quality, the Municipal Institutional Quality Indicator (Indicador de Qualidade Institucional Municipal - IQIM), which is used by the Ministry of Planning. This index broadly measures the overall efficiency of municipal governments from 1997-2000.

The IQIM index is broken into three categories: (1) degree of (political) participation; (2) financial capacity; (3) management capacity. The first category captures participation in the municipal administration. For example, it includes measures of the existence of municipal councils as well as municipal councils that manage funds. These councils allow Brazilian citizens to oversee the municipal government. Financial capacity, measures the financial constraints of a local government by looking at its ability to coordinate with nearby municipalities to provide certain public services more efficiently, its ratio of debt to revenue, and its real savings per capita. Management capacity measures the overall efficiency of the municipal government, including efficiency of the tax system and the number of planning and administrative tools available to municipal governments. A higher score in the IQIM index represents more efficient municipal governments providing higher quality public services.

We control for an additional variables commonly considered to influence entrepreneurial activity, including population, demographic controls, education levels (Kreft and Sobel, 2006; Rosenthal and Ross, 2010), measures of industrial structure (Bologna, 2014a), and the distance from municipal headquarters to São Paulo, Brazil's economic center (Resende, 2013). Only two of these variables are available annually – the municipal GDP and population density. Therefore, GDP and population density will be the relevant year for the level regressions and the average value over the relevant years for the growth regressions.[15] For example, when looking at how corruption impacts growth from 2003-2007, we include the average level of GDP per-capita and

[15] However, GDP is only available until the year 2010. Therefore for all years past 2010, the value of GDP per-capita from 2010 is used as a proxy.

population density from 2003-2007. All other variables are from the IBGE Census 2000, except for the distance to São Paulo variable which comes from the IPEA Data.

4. Results

Effect of Corruption on Entrepreneurship

We first estimate the effect of corruption on the total number of establishments, as well as only those establishments with ten or fewer employees, using equation 3.1. These results are presented in Table 4. We consider separately small firms because establishments of different sizes may react differently to differences in institutional quality (Sobel, 2008). Due to financial constraints, small establishments may be more sensitive to corruption than larger establishments. Given that our measure of corruption is based on data collected in 2003, we rely on cross-sectional analysis and estimate the effect of a higher percentage of corrupt funds on the number of businesses each year from 2003 to 2012.

We see in Table 4 that corruption has a consistent negative effect on the number of businesses in an area for both the total number of firms as well as those firms with ten or fewer employees. Interestingly, corruption has a consistently negative effect on the number of businesses operating in an area and the magnitude of the effect has increased steadily over time. One might think that the effects of corruption will vary based on business cycle patterns, but our findings in Table 4 suggest that corruption has a lasting effect on business activity in the area.

In Table 5, we look at the effect of corruption on the change in the number of establishments. We first look at the shorter periods in Panel A, from 2003 to 2007 and then 2008 to 2012, and then look at the effect over the longer period in Panel B, from 2003 to 2012. Again, we see consistent negative effects on growth that are increasing over time for all firms, as well as

those establishments with ten or fewer employees. Overall, our results indicate that corruption is not just detrimental to business growth in the current period, but that corruption has lasting effects on the number of businesses in a municipality.

Effect of Corruption on Entrepreneurship by Industrial Sector

Next, we estimate all equations for different industrial sectors to determine the effect of corruption across industries. We focus first on the effect of corruption on the four sectors that are considered to experience the most corruption internationally (OECD Foreign Bribery Report, 2014): (1) extractive industries,[16] (2) manufacturing industries, (3) construction industries, and (4) transportation and communication. Results from the cross-sectional regressions across industries are presented in Table 6, where Panel A contains the results for extractive industries, Panel B manufacturing, Panel C construction, and Panel D transportation and communications. We only show the effects in years 2003, 2008, and 2012, as the effects in the other years follow the same patterns.

As we see in Table 6, the effect of corruption on the number of firms in all industries is consistently negative, significant, and increasing over time. A one standard deviation increase in corruption (10 percentage point increase) explains about 10 percent of a standard deviation decrease in the number of firms in the extractive, manufacturing, and transportation and communication industries. However, it does appear that the construction industry is slightly more responsive to corruption with a standard deviation increase in corruption explaining about 13 percent of a standard deviation decrease in the number of firms.

[16] Extractive industries include oil, gas, and mining industries. These industries focus on the removal of these minerals from the ground, not the distribution of these resources.

In Table 7, we use the effect of corruption on the change in the number of establishments in each of these industries as the dependent variable, using the same time period changes as Table 5. In Panels A and B, we find that the effect on extractive industries and manufacturing only has a statistically significant effect over the nine-year panel, which suggests that the effect of corruption in these industries takes more time to have an impact. This is not surprising, given that these are likely more capital-intensive industries, which would suggest that it takes longer to adjust given the fixed costs associated with these industries.

In Panels C and D in Table 7, we find a more consistent pattern regarding a deterrent effect of corruption on the construction and transportation and communications industries. While the effect of the 2003 measure of corruption did not have an effect on the four year difference from 2003 to 2007, we find statistically significant decreases in the number of businesses for the nine-year difference from 2003 to 2012, as well as the four-year difference from 2008 to 2012. These firms are likely to be more labor-intensive, but still have some notable capital expenses. Therefore, it is not unsurprising that we find more evidence of an effect on the change in businesses over the panels, but that there is still a lag before we find an effect.

In Tables 8 and 9, we consider the effect of corruption on the number of businesses operating in a municipality in public administration and the utilities industry. Both these industries are effectively run by the government, and therefore are not subject to the same market forces as other industries like manufacturing and construction. In both tables, Panel A presents the results for public administration and Panel B presents results for the utilities industry. The tables follow the same structure as Tables 6 and 7.

When we look at Tables 8 and 9, we find no statistically significant impact of corruption on either industry. This is not surprising, given that these industries are not subject to the same

market forces as other businesses, and are likely dealing the most with the corrupt individuals. It should also be noted that there are other industries in the data. Of all industries in our sample, these two industries, as well as agriculture, fishing, and "other" services[17] are the only ones that are not negatively affected by corruption. The lack of an effect on agriculture and fishing is not surprising, as these industries are most likely affected primarily by geographic considerations, like how harvestable the land is and how close the jurisdiction is to water. Therefore, these industries do not have the same options when selecting where to operate.

Testing the "Grease the Wheels" Hypothesis

In Table 10, we estimate equation 3.2 but focus on the change in the number of establishments over our two four-year periods and one nine-year period. This specification includes a measure of institutional quality, as well as an interaction between our corruption measure and institutional quality. The "grease the wheels" hypothesis argues that in areas with poor institutions, corruption may be beneficial because it is a way for these businesses to begin operating and bypass the issues created by inefficiency from the institutions. We present results for all firms, as well as those with ten or fewer employees, as we have done previously.

In all specifications, we find a positive direct effect of corruption and institutional quality on the change in establishments. However, we find a consistent negative effect on the interaction term. This negative value for the interaction term indicates that the effect of corruption is worse in areas with better institutions. Furthermore, the positive direct effect of corruption with the negative interaction term between corruption and institutions suggests that

[17] Other services includes non-hazardous waste collection, treatment and disposal of hazardous waste, composting plants, sound recording studios, radio programs, television activities, ticketing agencies for shows, sound services related to the management of concert halls, dance academies, clubs, discos and the link, independent journalist, production and promotion of sporting events and sports and recreational fishing, lottery, saunas, and aesthetic clinics. Given how many industries are included in this measure, it is not unsurprising that we do not find an effect.

corruption can "grease the wheels" of entrepreneurial activity by increasing establishment growth in areas with poor institutions.

In Table 11, we look at how these effects vary across industrial sectors. We focus again on the industries considered to be the most corrupt, extractive industries, manufacturing, construction, and transportation and communication. For each industry, we look at the effect on all firms as well as on those firms with ten or fewer employees. Panel A presents the results of the 2003 to 2007 difference in the number of establishments, Panel B contains the results from 2008 to 2012, and Panel C contains the nine-year difference from 2003 to 2012.

Looking first at Panel A, we do not find statistically significant effects in any industry. This is consistent with our prior results, which suggested that it takes time for corruption to affect these industries. In Panel B, we estimate a negative coefficient on the interaction term for manufacturing and transportation and communications, both for all sizes of firms as well as small firms only. We also find a positive direct effect of corruption in these industries, providing support for the "grease the wheels" hypothesis in these industries. One explanation for these results is that these industries may have higher start-up costs and regulations, making corruption a way to bypass the government regulations.

Over the nine-year panel, we find evidence of this "grease the wheels" effect for transportation and communications and construction. This is likely due to the fact that one of the three components of the institutional quality index used measures a municipality's "management capacity," and attempts to measure the ability of municipalities to implement and use "planning" tools, such as zoning laws or building codes. It is likely these industries are impacted by these planning tools because, for example, they influence how roads and buildings can be built. It is less likely, though, that these planning tools will impact the other two industries as strongly.

5. Conclusions

In this paper, we estimated the effect of corruption on business activity in Brazilian municipalities. Using a unique data set based on audit data of local governments, we are able to measure corruption more objectively than previous research which has relied primarily on survey data or corruption convictions, both of which may be biased (Donchev and Ujhelyi, 2014; Bologna, 2015). We find that corruption deters business activity in Brazilian municipalities. Using the 2003 measure of corruption from Ferraz and Finan (2011), we find that over time corrupt activities in 2003 has an increasingly large effect on business activity. This holds true for all firm sizes, as well as those establishments with ten or fewer employees.

Furthermore, we find that these effects are concentrated in those industries that are considered to be the most corrupt – extractive industries, manufacturing, construction, and transportation and communications (OECD Foreign Bribery Report, 2014). In particular, we find that these effects are the largest in the long-term. This is consistent with Aidt (2009), who argued that while corruption may be beneficial in the short-run, it cannot be beneficial to long-run economic growth. We do not find an effect on public administration or utilities, which is not unsurprising given that these industries tend to be government-run.

Finally, we consider how the effect of corruption may vary based on the institutional quality of the area. As argued by Dreher and Gassebner (2013), corruption may be beneficial if the area has poor institutions because corruption allows firms to "grease the wheels" and get around the issues created by the low-quality institutions. We find evidence that this hypothesis is true in Brazil across all types of firms, but it is especially true for the transportation and communications industries.

We are the first paper to use this unique audit data to look at the effect of corruption on business activity. We hope that future work will continue to find and develop improved data sets to expand upon our analysis. For example, our study is only cross-sectional, given that we only have the corruption measure for 2003. Future research should create a similar measure for additional years and see how changes in corruption affect business activity. In addition, we only have data on the total number of businesses in each year. Ideally, we would be able to determine if these effects are driven by fewer new establishments or if this is caused by more firms going out of business. Finally, we cannot track these firms over time. It would be interesting to obtain panel data of firms to determine if there are spatial effects of corruption, specifically if higher levels of corruption in one area cause firms to move to another area.

References

Antunes, A.R. and Cavalcanti, TVV. 2007. Start-up costs, enforcement, and the hidden economy. *European Economic Review*, 51(1), 203-224.

Avnimelech, G., Zelekha, Y., Sarabi, E. 2011. The effect of corruption on entrepreneurship. Working Paper.

Baumol, W. J. 1990. Entrepreneurship: productive, unproductive, and destructive. *Journal of Political Economy*, 98(5), 893 – 921.

Bjørnskov, C., Foss, N. 2008. Economic freedom and entrepreneurial activity: some cross-country evidence. *Public Choice*, 134(3), 307 – 328.

Bologna, J. 2014a. Corruption: the good, the bad, and the uncertain. *Mimeo*.

Bologna, J. 2014b. The effect of information employment and corruption on income levels in Brazil. *Mimeo.*

Bologna, J. 2015. Executive Influence over Federal Corruption Convictions: Are Conviction Rates a Biased Measure of US State-Level Corruption? *Mimeo*.

Campos, N. F., Estrin, S., Proto, E. 2010. Corruption as a barrier to entry: theory and evidence. CEPR Discussion Paper No. DP8061.

Cordis, A., Milyo, J. 2013. Measuring public corruption from the United States: Evidence from administrative records of federal prosecutions. University of Missouri – Columbia Working Paper Series No. 13-22.

da Silva, M. F. 1999. The political economy of corruption in Brazil. *Revista de Administração de Empresas*, 39(3), 26-41.

Desai, M., Gompers, P., Lerner, J. 2003. Institutions, capital constraints and entrepreneurial firm dynamics: evidence from Europe. NBER Working Paper No. 10165.

Donchev, D., Ujhelyi, G. 2014. What do corruption indices measure? *Economics & Politics,* 26(2), 309 – 331.

Dreher, A., Gassebner, M. 2013. Greasing the wheels? The impact of regulations and corruption on firm entry. *Public Choice,* 155(3 – 4), 413 – 432.

Dreher, A., Schneider, F. 2010. Corruption and the shadow economy: an empirical analysis. *Public Choice,* 144(1 – 2), 215 – 238.

Farzana, C., Terjesen, S., Audretsch, D. 2014. Varieties of Entrepreneurship: Institutional Drivers across Entrepreneurial Activity and Country. *European Journal of Law and Economics.*

Ferraz, C., Finan, F. 2008. Exposing corrupt politicians: the effects of Brazil's publicly released audits on electoral outcomes. *The Quarterly Journal of Economics,* 123(2), 703-745.

Ferraz, C., Finan, F. 2011. Electoral accountability and corruption: evidence from the audits of local governments. *American Economic Review,* 101(4), 1274 – 1311.

Fisman, R., Svensson, J. 2007. Are corruption and taxation really harmful to growth? Firm level evidence. *Journal of Development Economics,* 83(1), 63 – 75.

Geddes, B., Neto, A.R. 1992. Institutional sources of corruption in Brazil. *Third World Quarterly,* 13(4), 641-661.

Gwartney, J., Lawson, R. A., Hall, J. C. 2014. Economic Freedom of the World: 2014 Annual Report. Vancouver: Fraser Institute.

Heckelman, J. C., Powell, B. 2010. Corruption and the institutional environment for growth. *Comparative Economic Studies,* 52 (3), 351 – 378.

Huntington, S. P. 1968. Political Order in Changing Societies. New York: Oxford University Press.

Kreft, S. F., Sobel, R. S. 2005. Public policy, entrepreneurship, and economic freedom. *Cato Journal*, 25(3), 595 – 616.

Leff, N. H. 1964. Economic development through bureaucratic corruption. *The American Behavioral Scientist,* 8 (3), 8 – 14.

Mauro, P. 1995. Corruption and growth. *Quarterly Journal of Economics*, 110(3), 681 – 712.

Méon, P., Sekkat, K. 2005. Does corruption grease or sand the wheels of growth? *Public Choice,* 122, 69-97.

Mitchell, D. T., Campbell, N. D. 2009. Corruption's effect on business venturing within the United States. *American Journal of Economics and Sociology,* 68(5), 1135 – 1152.

Mo, P. H. 2001. Corruption and economic growth. *Journal of Comparative Economics,* 29(1), 66 – 79.

Naritomi, J., Soares, R. R., Assunção, J.J. 2012. Institutional development and colonial heritage within Brazil. *The Journal of Economic History,* 72(2), 393 – 422.

Nyström, K. 2008. The institutions of economic freedom and entrepreneurship: evidence from panel data. *Public Choice,* 136(3 – 4), 269 – 282.

Olken, B. A., Pande, R. 2012. Corruption in developing countries. *Annual Review of Economics,* 4(1), 479 – 509.

Organization for Economic Cooperation and Development. 2014. OECD Foreign Bribery Report: Analysis of the Crime of Bribery of Foreign Public Officials. OECD Publishing.

Ovaska, T., Sobel, R. S. 2005. Entrepreneurship in post-socialist economies. *Journal of Private Enterprise,* 21(1), 8 – 28.

Pieroni, L., d'Agostino, G. 2013. Corruption and the effects of economic freedom. *European Journal of Political Economy,* 29, 54 – 72.

Power, T., Taylor, M. M. 2011. “Introduction” in (Power and Taylor eds.) Corruption and Democracy in Brazil: The Struggle for Accountability. Notre Dame: University of Notre Dame Press.

Resende, G. M. 2013. Spatial dimensions of economic growth in Brazil. ISRN Economics 2013. http://dx.doi.org/10.1155/2013/398021.

Rosenthal, S. S., Ross, A. 2010. Violent crime, entrepreneurship, and cities. *Journal of Urban Economics,* 67(1), 135 – 149.

Sobel, R. S. 2008. Testing Baumol: institutional quality and the productivity of entrepreneurship. *Journal of Business Venturing,* 23(6), 641 – 655.

Sobel, R. S., Clark, J. R., Lee, D. R. 2007. Freedom, barriers to entry, entrepreneurship, and economic progress. *The Review of Austrian Economics,* 20(4), 221 – 236.

Stansel, D., Torra, J., McMahon, F. 2014. Economic Freedom of North America 2014. Vancouver: Fraser Institute.

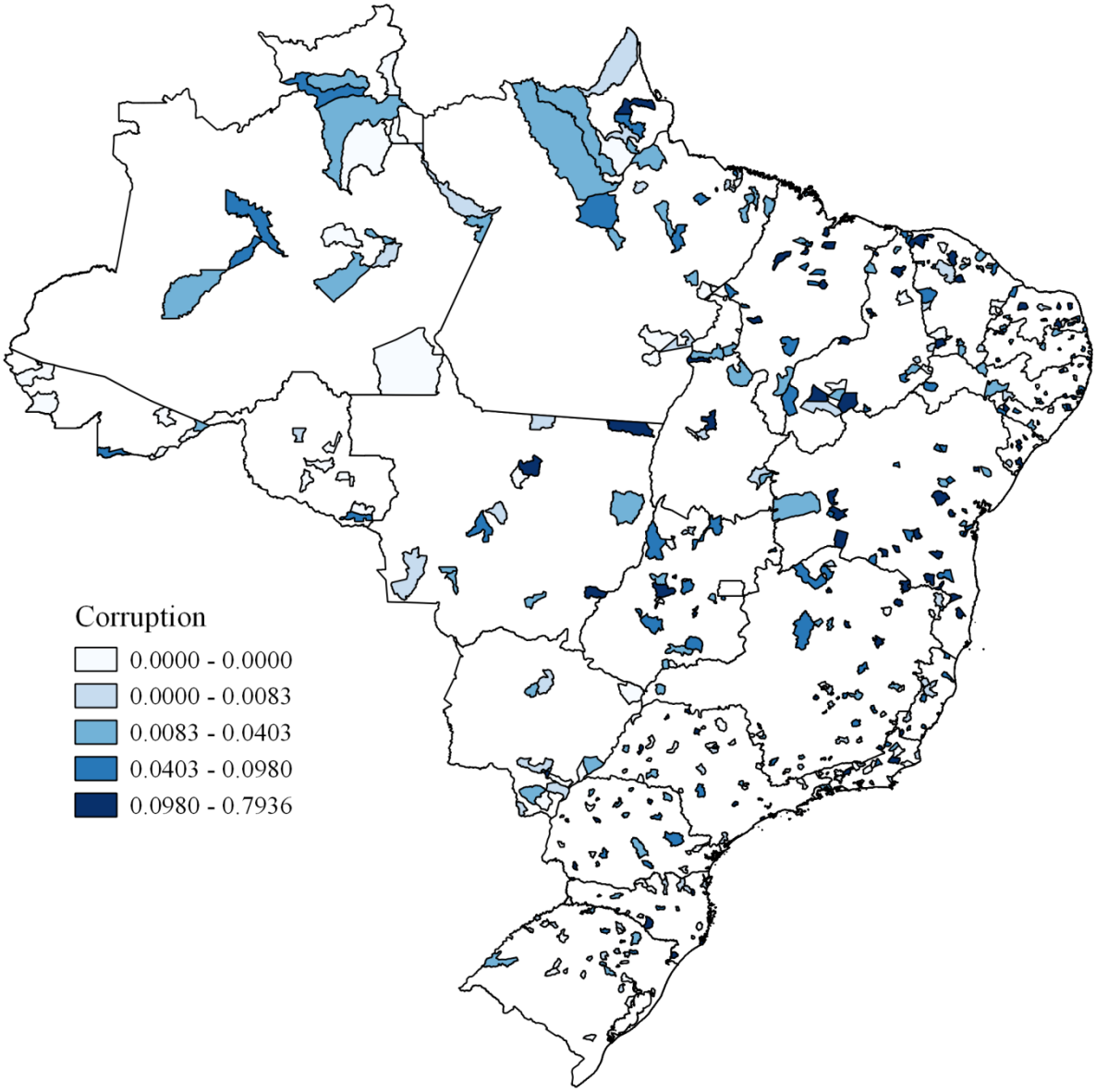
Svensson, J. 2005. Eight questions about corruption. *Journal of Economic Perspectives,* 19(3), 19 – 42.

Swaleheen, M. 2011. Economic growth with endogenous corruption: an empirical study. *Public Choice,* 146(1 – 2), 23 – 41.

Wiseman, T. *forthcoming*. Entrepreneurship, corruption, and the size of US underground economies. *Journal of Entrepreneurship and Public Policy*.

Wiseman, T., Young, A. T. 2013. Economic freedom, entrepreneurship, & income levels: some US state-level empirics. *American Journal of Entrepreneurship,* 6(1), 100 – 119.

Figure 1: Corruption, as measured by the share of audited resources (R$) found to involve corruption, across audited municipalities in Brazil.



Source: Corruption data comes from Ferraz and Finan (2011).

Table 1: Summary Statistics and Brief Description of Variables.

Variable Name	Brief Description	Source	Mean	Std. Dev.	Min.	Max.
TOTAL_ESTB	Total no. of establishments, broken down by industry.	RAIS[1]	48	198	0	4,802
TOTAL_ESTB_10	Total no. of establishments, broken down by industry, with 10 employees or less.	RAIS[1]	42	172	0	4,151
CORRUPT	Share of audited resources (in $R) found to involve corruption.	FF[2]	0.063	0.102	0.000	0.794
INFORMAL	Share of employees hired without a formal contract.	IBGE[3]	0.284	0.106	0.011	0.669
INSTITUTION	Index of institutional quality; scale of 1 (poor institutions) to 6 (superior institutions).	IBGE[3]	2.979	0.544	1.400	4.500
SCHOOL	Average number of years of schooling for population aged 10 years or more.	IBGE[3]	4.323	1.186	1.178	8.504
GDP	GDP per-capita in constant $R2000, enters regression in logged form.	IPEA[4]	5362	8528	800	129,629
DENSITY	1,000 people per square mile.	IPEA[4]	0.356	2.212	0.001	34.967
EDENSITY	1,000 employees per square mile.	IPEA[4]	0.122	0.81	0.000	12.171
MALE	Male share of total population.	IPEA[4]	0.508	0.014	0.467	0.554
DISTANCE	Index measuring the cost of distance to São Paulo, enters regression in logged-form.	IPEA[4]	1,913	1,310	68	8,582
AGRICULTURE	Share of employment in agricultural, plant extraction, and fishing industry.	IBGE[3]	0.398	0.208	0.000	0.899
MANUFACTURE[5]	Share of employment in manufacturing industry.	IBGE[3]	0.080	0.076	0.002	0.507
CONSTRUCTION	Share of employment in construction industry.	IBGE[3]	0.055	0.031	0.003	0.284
TRADE	Share of employment in trade in goods industry.	IBGE[3]	0.091	0.045	0.009	0.270
TRANSPORT	Share of employment in transportation and communication industry.	IBGE[3]	0.029	0.015	0.001	0.086
SERVICES	Share of employment in ancillary services industry.	IBGE[3]	0.015	0.019	0.000	0.227
PROVISION	Share of employment in provisional services industry (e.g., acc. and food).	IBGE[3]	0.134	0.066	0.008	0.441
SOCIAL	Share of employment in social services (e.g., health care).	IBGE[3]	0.077	0.030	0.015	0.207
GOV	Share of employment in public admin., national defense, and public safety sector.	IBGE[3]	0.054	0.035	0.004	0.278
OTHER	Share of employment in other sectors (e.g., finance, real estate, insurance).	IBGE[3]	0.058	0.028	0.003	0.182
YOUNG[5]	Share of population ages zero to nine years old.	IBGE[3]	0.216	0.042	0.107	0.368
TEEN	Share of population ages ten to nineteen years old.	IBGE[3]	0.223	0.267	0.144	0.284
WORK	Share of population ages twenty to sixty years old.	IBGE[3]	0.473	0.052	0.336	0.579
ELDER	Share of population that is more than sixty years old.	IBGE[3]	0.088	0.026	0.031	0.214

[1] Annual Social Information (Relação Anual de Informações Sociais) from the Ministry of Labor and Employment of Brazil.

[2] Ferraz and Finan (2011) dataset.

[3] The Brazilian Institute for Geography and Statistics (Instituto Brasileiro de Geografia e Estatística) Census 2000 data.

[4] The Institute for Applied Economic Research (Instituto de Pesquisa Econômica Aplicada).

[5] Excluded from regression to avoid collinearity issues where shares sum to one.

Table 2: Summary statistics and brief description of growth variables.

Variable Name	Brief Description	Source	Mean	Std. Dev.	Min.	Max.
4-Year Growth 2003-2007						
GROWTH	Avg. yearly change in the number of total establishments.	RAIS[1]	1.299	5.561	-46.500	122.00
GROWTH_10	Avg. yearly change in the number of total establishments with 10 employees or less.	RAIS[1]	0.997	4.727	-74.800	92.250
4-Year Growth 2008-2012						
GROWTH	Avg. yearly change in the number of total establishments.	RAIS[1]	1.399	7.473	-71.500	228.500
GROWTH_10	Avg. yearly change in the number of total establishments with 10 employees or less.	RAIS[1]	0.985	6.767	-84.500	227.500
9-Year Growth 2003-2012						
GROWTH	Avg. yearly change in the number of total establishments.	RAIS[1]	1.398	5.411	-38.300	117.200
GROWTH_10	Avg. yearly change in the number of total establishments with 10 employees or less.	RAIS[1]	1.036	4.422	-46.600	109.889

[1] Annual Social Information (Relação Anual de Informações Sociais) from the Ministry of Labor and Employment of Brazil.

Table 3: Sector categories that each establishment may be classified as.

Establishment Sector Category	Source	Number of Establishments	
		Mean	Std. Dev
Agriculture, forestry, and logging	CNAE 1.0	63.715	109.685
Fishing	CNAE 1.0	0.854	3.540
Extractive Industries (e.g., mining)	CNAE 1.0	2.836	6.405
Processing Industries (e.g., manufacturing)	CNAE 1.0	73.055	148.212
Production and distribution of electricity, gas, and water	CNAE 1.0	1.462	2.103
Construction	CNAE 1.0	23.974	54.723
Trade; personal and household goods; repair of motor vehicles	CNAE 1.0	376.184	643.175
Accommodation and food services	CNAE 1.0	47.397	103.870
Transportation, storage, and communication	CNAE 1.0	34.071	74.383
Financial intermediation, insurance, pension funds, and related services	CNAE 1.0	7.664	19.050
Real estate, rents, and business services	CNAE 1.0	68.041	239.906
Public administration, defense, and social security	CNAE 1.0	3.363	2.780
Education	CNAE 1.0	14.411	31.126
Human health and social services	CNAE 1.0	22.940	56.420
Other community, social, and personal services	CNAE 1.0	81.211	118.079
Domestic services	CNAE 1.0	1.139	2.763
International	CNAE 1.0	0.058	0.694

Notes: Source is the National Classification of Economics Activities Version 1.0 (Classificação Nacional de Atividades Econômicas Versão 1.0).

Table 4: The effect of corruption on the number of establishments over time.

	Total		***Total with 10 employees or less***	
Year	*CORRUPT*	R^2	*CORRUPT*	R^2
2003	-47.494***	0.320	-40.313***	0.325
	(18.158)		(15.575)	
2004	-50.886***	0.321	-42.709***	0.328
	(18.621)		(15.827)	
2005	-53.325***	0.324	-44.884***	0.331
	(19.370)		(16.416)	
2006	-52.749***	0.326	-44.016***	0.332
	(19.547)		(16.574)	
2007	-55.383***	0.328	-45.803***	0.336
	(19.797)		(16.636)	
2008	-57.972***	0.329	-47.871***	0.337
	(20.627)		(17.220)	
2009	-61.237***	0.330	-50.669***	0.337
	(21.615)		(18.004)	
2010	-65.752***	0.330	-54.217***	0.339
	(22.500)		(18.577)	
2011	-68.944***	0.332	-56.222***	0.341
	(23.313)		(19.091)	
2012	-68.940***	0.333	-55.998***	0.341
	(23.853)		(19.407)	

Notes: *, **, and *** indicate statistical significance for the 10%, %5, and %1 levels, respectively. Standard errors given in parentheses are clustered by municipality. Regressions include the size of the informal sector, institutional quality, average years of schooling, logged GDP per-capita, population density, employment density, share of population that is male, index measured cost of distance to São Paulo, employment shares, and age group population shares as basic controls, although not reported. Regressions also include lottery, state, and industrial sector fixed-effects. Number of observations equal 7,378 in each specification.

Table 5: The effect of corruption on the average yearly change in the number of establishments over three time periods.

	Total		***Total with 10 employees or less***	
	CORRUPT	R^2	*CORRUPT*	R^2
		Panel a: 4-year periods		
2003-2007	-2.050***	0.207	-1.586***	0.152
	(0.603)		(0.568)	
2008-2012	-2.572***	0.117	-2.057***	0.077
	(0.703)		(0.638)	
		Panel b: 9-year periods		
2003-2012	-2.342***	0.216	-1.847***	0.159
	(0.492)		(0.421)	

Notes: *, **, and *** indicated statistical significance for the 10%, %5, and %1 levels, respectively. Standard errors given in parentheses are clustered by municipality. Regressions include the size of the informal sector, institutional quality, average years of schooling, logged GDP per-capita, population density, employment density, share of population that is male, index measured cost of distance to São Paulo, employment shares, and age group population shares as basic controls, although not reported. Regressions also include lottery, state, and industrial sector fixed-effects. Number of observations equal 7,378 in each specification.

Table 6: The effect of corruption on the number of establishments over time for four specific sectors.

	Total		***Total with 10 employees or less***	
	CORRUPT	R^2	*CORRUPT*	R^2
	Panel a: Extractive Industries			
2003	-4.091*	0.321	-3.081*	0.330
	(2.096)		(1.605)	
2008	-5.516**	0.335	-4.258**	0.343
	(2.421)		(1.843)	
2012	-6.493**	0.323	-4.503**	0.339
	(2.801)		(2.125)	
	Panel b: Manufacturing Industries			
2003	-88.254**	0.637	-62.204**	0.632
	(40.505)		(28.658)	
2008	-103.883**	0.610	-72.736**	0.602
	(46.658)		(32.186)	
2012	-113.882**	0.601	-85.433***	0.600
	(48.865)		(32.252)	
	Panel c: Construction Industries			
2003	-31.555***	0.557	-25.968***	0.561
	(11.423)		(9.344)	
2008	-41.657***	0.555	-33.055***	0.552
	(14.690)		(11.506)	
2012	-73.225***	0.548	-58.874***	0.549
	(24.754)		(19.959)	
	Panel d: Transportation and Communication Industries			
2003	-36.190*	0.505	-31.697*	0.487
	(20.687)		(18.132)	
2008	-47.642**	0.550	-41.847**	0.545
	(23.231)		(19.772)	
2012	-71.418**	0.555	-62.428**	0.555
	(30.120)		(25.165)	

Notes: *, **, and *** indicated statistical significance for the 10%, %5, and %1 levels, respectively. Robust standard errors given in parentheses. Regressions include the size of the informal sector, institutional quality, average years of schooling, logged GDP per-capita, population density, employment density, share of population that is male, index measured cost of distance to São Paulo, employment shares, and age group population shares as basic controls, although not reported. Regressions also include lottery and state fixed-effects. Number of observations equal 434 in each specification.

Table 7: The effect of corruption on the average yearly change in the number of establishments over time for four specific sectors.

	Total		***Total with 10 employees or less***	
	CORRUPT	R^2	*CORRUPT*	R^2
Panel a: Extractive Industries				
2003-2007	-0.368	0.160	-0.460**	0.173
	(0.231)		(0.220)	
2008-2012	-0.281	0.133	-0.062	0.113
	(0.184)		(0.173)	
2003-2012	-0.300**	0.149	-0.179	0.158
	(0.138)		(0.123)	
Panel b: Manufacturing Industries				
2003-2007	-1.069	0.320	-0.457	0.221
	(2.549)		(2.029)	
2008-2012	-2.836	0.192	-3.824*	0.155
	(2.359)		(2.091)	
2003-2012	-2.861*	0.358	-2.960**	0.302
	(1.729)		(1.144)	
Panel c: Construction Industries				
2003-2007	-1.565	0.226	-0.949	0.156
	(1.124)		(0.922)	
2008-2012	-6.749**	0.452	-5.577**	0.423
	(2.996)		(2.720)	
2003-2012	-4.400**	0.474	-3.563**	0.450
	(1.741)		(1.481)	
Panel d: Transportation and Communication Industries				
2003-2007	-2.751	0.411	-2.456	0.350
	(1.761)		(1.718)	
2008-2012	-4.335**	0.471	-3.721**	0.452
	(2.021)		(1.723)	
2003-2012	-3.617**	0.539	-3.210**	0.534
	(1.493)		(1.251)	

Notes: *, **, and *** indicated statistical significance for the 10%, %5, and %1 levels, respectively. Robust standard errors given in parentheses. Regressions include the size of the informal sector, institutional quality, average years of schooling, logged GDP per-capita, population density, employment density, share of population that is male, index measured cost of distance to São Paulo, employment shares, and age group population shares as basic controls, although not reported. Regressions also include lottery and state fixed-effects. Number of observations equal 434 in each specification.

Table 8: The effect of corruption on the number of establishments for government specific sectors.

	Total		***Total with 10 employees or less***	
	CORRUPT	R^2	*CORRUPT*	R^2
Panel a: Public Administration				
2003	-1.395	0.393	-0.891	0.300
	(0.877)		(0.746)	
2008	-1.173	0.408	-0.700	0.300
	(1.040)		(0.835)	
2012	-1.224	0.286	-0.536	0.241
	(1.031)		(0.785)	
Panel b: Utilities Industry				
2003	-0.729	0.466	-0.656	0.377
	(0.811)		(0.707)	
2008	-1.010	0.498	-0.720	0.433
	(0.676)		(0.531)	
2012	-0.957	0.423	-0.894	0.333
	(0.740)		(0.616)	

Notes: *, **, and *** indicated statistical significance for the 10%, %5, and %1 levels, respectively. Robust standard errors given in parentheses. Regressions include the size of the informal sector, institutional quality, average years of schooling, logged GDP per-capita, population density, employment density, share of population that is male, index measured cost of distance to São Paulo, employment shares, and age group population shares as basic controls, although not reported. Regressions also include lottery and state fixed-effects. Number of observations equal 434 in each specification.

Table 9: The effect of corruption on the average yearly change in the number of establishments over time for government specific sectors.

	Total		***Total with 10 employees or less***	
	CORRUPT	R^2	*CORRUPT*	R^2
Panel a: Public Administration				
2003-2007	0.087	0.110	-0.045	0.103
	(0.272)		(0.241)	
2008-2012	-0.034	0.218	0.016	0.225
	(0.199)		(0.207)	
2003-2012	-0.008	0.228	0.024	0.220
	(0.114)		(0.098)	
Panel b: Utilities Industry				
2003-2007	0.126	0.189	0.186	0.187
	(0.122)		(0.122)	
2008-2012	0.018	0.110	-0.050	0.097
	(0.107)		(0.113)	
2003-2012	-0.030	0.124	-0.028	0.135
	(0.062)		(0.059)	

Notes: *, **, and *** indicated statistical significance for the 10%, %5, and %1 levels, respectively. Robust standard errors given in parentheses. Regressions include the size of the informal sector, institutional quality, average years of schooling, logged GDP per-capita, population density, employment density, share of population that is male, index measured cost of distance to São Paulo, employment shares, and age group population shares as basic controls, although not reported. Regressions also include lottery and state fixed-effects. Number of observations equal 434 in each specification.

Table 10: Testing the "grease the wheels" hypothesis" of corruption on the average yearly change in the number of establishments over time.

	Total	***Total with 10 employees or less***
	Panel a: 2003-2007 period	
CORRUPT	6.404**	5.237*
	(3.223)	(2.902)
INSTITUTION	0.571***	0.421***
	(0.190)	(0.161)
CORRUPT × *INSTITUTION*	-2.861**	-2.309**
	(1.121)	(1.021)
R^2	0.208	0.152
	Panel b: 2008-2012 period	
CORRUPT	13.508***	10.922***
	(4.194)	(3.902)
INSTITUTION	0.945***	0.741**
	(0.342)	(0.311)
CORRUPT × *INSTITUTION*	-5.440***	-4.390***
	(1.494)	(1.390)
R^2	0.118	0.078
	Panel c: 2003-2012 period	
CORRUPT	9.211***	7.146***
	(2.857)	(2.455)
INSTITUTION	0.807***	0.605***
	(0.222)	(0.184)
*CORRUPT * INSTITUTION*	-3.909***	-3.043***
	(1.000)	(0.862)
R^2	0.218	0.160

Notes: *, **, and *** indicated statistical significance for the 10%, %5, and %1 levels, respectively. Robust standard errors given in parentheses. Regressions include the size of the informal sector, average years of schooling, logged GDP per-capita, population density, employment density, share of population that is male, index measured cost of distance to São Paulo, employment shares, and age group population shares as basic controls, although not reported. Regressions also include lottery, state, and industrial sector fixed-effects. Number of observations equal 7,378 in each specification.

Table 11: Testing the "grease the wheels" hypothesis" of corruption on the average yearly change in the number of establishments for four sectors over time.

	Sector Category							
	Extractive		Manufacture		Construction		Transport & Communication	
	Total	***10 or less***	***Total***	***10 or less***	***Total***	***10 or less***	***Total***	***10 or less***
				Panel a: 2003-2007 period				
CORRUPT	-1.354	-0.180	6.547	0.515	4.444	5.256	7.156	4.765
	(1.473)	(1.213)	(13.450)	(9.417)	(6.025)	(4.896)	(7.393)	(7.806)
INSTITUTION	-0.001	0.036	0.607	0.318	0.554	0.427	0.075	-0.154
	(0.090)	(0.084)	(0.931)	(0.620)	(0.372)	(0.320)	(0.568)	(0.641)
CORRUPT × *INSTITUTION*	0.333	-0.095	-2.578	-0.329	-2.034	-2.100	-3.353	-2.444
	(0.519)	(0.418)	(5.149)	(3.637)	(2.131)	(1.755)	(2.582)	(2.822)
R^2	0.161	0.173	0.321	0.221	0.228	0.159	0.412	0.351
				Panel b: 2008-2012 period				
CORRUPT	0.377	-0.297	23.489*	20.126*	16.695	14.767	21.972*	18.227*
	(1.100)	(0.964)	(12.222)	(10.524)	(16.130)	(13.709)	(12.619)	(10.516)
INSTITUTION	0.040	-0.016	0.196	0.072	1.970	1.898*	2.448**	2.189**
	(0.071)	(0.058)	(0.785)	(0.734)	(1.301)	(1.090)	(1.090)	(0.946)
CORRUPT × *INSTITUTION*	-0.222	0.080	-8.905**	-8.102**	-7.931	-6.882	-8.899*	-7.425*
	(0.398)	(0.345)	(4.191)	(3.591)	(5.875)	(5.078)	(4.655)	(3.890)
R^2	0.133	0.114	0.197	0.162	0.455	0.426	0.477	0.458
				Panel c: 2003-2012 period				
CORRUPT	-0.126	-0.171	14.059	8.354	11.999	9.540	13.205*	9.708*
	(0.874)	(0.773)	(10.505)	(6.749)	(9.625)	(7.633)	(7.290)	(5.816)
INSTITUTION	0.025	0.011	0.642	0.330	1.475**	1.240**	1.263**	1.010**
	(0.055)	(0.045)	(0.724)	(0.466)	(0.723)	(0.562)	(0.568)	(0.426)
CORRUPT × *INSTITUTION*	-0.059	-0.003	-5.725	-3.828	-5.549*	-4.434*	-5.692**	-4.371**
	(0.317)	(0.281)	(3.803)	(2.448)	(3.333)	(2.675)	(2.567)	(2.059)
R^2	0.150	0.158	0.362	0.306	0.477	0.454	0.544	0.538

Notes: *, **, and *** indicated statistical significance for the 10%, %5, and %1 levels, respectively. Robust standard errors given in parentheses. Regressions include the size of the informal sector, average years of schooling, logged GDP per-capita, population density, employment density, share of population that is male, index measured cost of distance to São Paulo, employment shares, and age group population shares as basic controls, although not reported. Regressions also include lottery and state fixed-effects. Number of observations equal 434 in each specification.