Understanding the Links Between Firm Size, Exposure to Public Officials, and Firm Corruption

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Abstract

In this paper, we examine the extent to which firm's financial performance and dependence on the government impacts their engagement in corrupt activities, specifically the intensive and extensive margins of bribe payments. We find that the number of requests for licenses and permits has a positive and statistically significant effect on the probability a firm pays bribes (extensive margin), while firm sales has a positive and statistically significant effect on the size of these payments (intensive margin). Building from these results, we also consider the impact of corruption on firm growth and find that corruption is associated with faster growth for the largest firms (those with annual sales in excess of 3.9 million dollars), and slower growth for all other firms.

Keywords: Corruption, Bribery, Growth, Firm size

JEL classification: D7, H7, L2, O1, O4

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1 Introduction

Corruption has been described as one of the greatest obstacles to economic and social development.[1] Given these concerns, many scholars have attempted to measure corruption at the national level and to devise ways to reduce its presence.[2] However, the literature has paid less attention to corruption at the firm level—specifically, determining which firm characteristics most influence corrupt behavior. Understanding the firm-level determinants of corruption will provide greater insight into the channels through which corruption impacts economic activity. Specifically, does corruption "grease the wheels" of the economy, or does it represent a deadweight loss for a majority of firms. In this paper, we construct a large data set of firms operating in developing countries to assess the firm-level determinants of corruption. We find that both firm sales and interaction with government officials are positively associated with corruption, suggesting that larger firms and those with greater exposure to the government engage in more corrupt activities.[3] We also use our data to explore firms' underlying motive to engage in corruption. We find that only the largest firms, those in the top 25 percent in terms of sales, experience growth benefits from corruption, and we find no association between firm growth and interaction with government officials.

The empirical literature has identified several aggregate factors that contribute to the spread of corruption.[4] Openness to trade, exposure to democracy, cultural norms, historical and religious traditions, economic development, the rule of law, accountability and transparency, press freedom, and colonial heritage are some of the aggregate factors that have been proposed to determine the extent of corruption in developing and developed countries (see, for example, Acemoglu et al. (2001), Ades and Di Tella (1999), Dong and Torgler (2013), Fan et al. (2009), Goel and Nelson (2010), Iwasaki and Suzuki (2012), La Porta et al. (1999), Lambsdorff (2007), Pellegrini (2011), Svensson (2005), Tanzi (1998), and Treisman (2000)).

Although the factors mentioned above are important determinants of corruption at the na-

[1] International Chamber of Commerce et al. (2008)

[2] For example, Rose-Ackerman (1978) argues that the monopolistic power of government officials is the centerpiece of corrupt practices. She suggests that creating competing jurisdictions in which an unsatisfied client can visit another official for the same service can be an effective way to fight corruption. Also see Martinez-Vazquez et al. (2007), Jain (2001), and Bardhan (1997) for detailed reviews of theories and evidence on fighting corruption.

[3] Following Svensson (2003) we use firms' perceived bribe payment within their industry as a measure of corruption. See Section 2.1 for additional details.

[4] Economists have used different definitions of corruption. Banerjee et al. (2012) define corruption "as the breaking of a rule by a bureaucrat (or an elected official) for private gain." Shleifer and Vishny (1993) define it "as the sale by government officials of government property for personal gain." Finally, Svensson (2005) defines corruption as "the misuse of public office for private gain."

tional level, they cannot explain the large variation among firms that operate in the same region and industry within a country. Svensson (2003) argues that such differences can result from the discretionary power of government agents. When the regulatory system provides government agents with the discretion to interpret, implement, and enforce rules, they may choose to act as rent maximizers by asking firms to pay a bribe for their services. To put it simply, if a government agent has the power to decide who receives a license, a permit, or connection to utility services, then they may demand gifts and informal payments in exchange for those services. In some cases, agents have the power to decide whose requests are approved, and in other cases, they can speed up or slow down the bureaucratic process.

Aside from the discretionary power of the public agents, attributes of the firms can also affect corruption and bribery. One way to think about this is the speed-money hypothesis (Huntington, 1968; Leff, 1964; Lui, 1985), which suggests that firms that enjoy more benefits from government services are more willing to pay bribes in order to get access to the services (or to shorten the wait time). Also, endogenous harassment theory, as laid out in Kaufmann and Wei (1999), states that government agents may use observable firm characteristics, such as age, size, and financial performance, to estimate firms' willingness to pay for the services and demand a commensurate bribe. Corrupt officials might only target firms that can provide them with a good return. Higher sales also make firms more visible. This suggests that firms with better financial performance may end up paying higher bribes because government agents assume that they have more available funds and therefore demand more.[5] Therefore, even if the firms operate in the same environment—with the same regulations and the same level of dependence on the public sector—they can have quite different experience of corruption based on the behavior of the public agents they interact with, the extent of the agents' power, and the firms observable characteristics including their ability to pay. In other words, a corrupt public official can extract as much bribe as possible, taking into account a firm's ability to pay and the risk of getting caught.

Surveys of firms worldwide find vast differences in firms' experiences with corruption. As discussed above, Svensson (2003) argues that government control of a firm is the main determi-

[5] Another constraint on corrupt government agents concerns how much they can extract without inducing firms to resist their demands. Svensson (2003) includes a measure of this constraint in his model. He suggests firms' bargaining power (or refusal power) affects bribe payment. The higher the firms' alternative return on their assets, the higher their bargaining power. Svensson assumes that refusal to pay bribes means a business must close, at which point the owners can start a new business. If a business can liquidate its assets without a high sunk cost, it will be more inclined to refuse a predatory bribe demand.

nant of the incidence of corruption and that firms' bargaining power influences the magnitude of corruption. Using a survey of Ugandan firms, he tests these hypotheses and finds that firms' profitability and dependence on government services[6] determine why some firms pay bribes and why the amount of the bribe differs among firms. Using firms in the infrastructure sector in a cross-country sample, Clarke and Xu (2004) find that more profitable and younger firms are more likely to pay bribes either because of their higher willingness to pay or because of the higher potential for bribe extraction by government agents. Ayyagari et al. (2014) look into differences between innovating and non-innovating firms and find that non-innovators pay less bribe money. They also find that the difference between the two groups increases in countries with more complex regulations. Cai et al. (2011) look into the entertainment and travel costs (ETC) of Chinese firms as a proxy for corruption expenditure, and while ETC is used to build relationships with clients and customers, the authors also find that it is used to get better government services and lower tax rates. Cai et al. (2011) also find that ETC has a negative and statistically significant effect on firm productivity. Finally, Kaufmann and Wei (1999) test the hypothesis that corruption acts as speed money in the presence of burdensome bureaucracies. According to the speed-money hypothesis, firms pay bribes to reduce red tape to incentivize government agents to work more efficiently. However, Kaufmann and Wei (1999) find that firms that pay bribes spend more time dealing with government agents, which contradicts the hypothesis. This implies that coercive corruption, in which firms pay bribes on top of legal fees, is more common than collusive corruption, in which firms and government agents cooperate, and firms collect some rents from paying bribes.

The present paper expands on the existing literature in four important ways. First, the data set used in our analysis is far larger than those employed in comparable works by Svensson (2003) and Clarke and Xu (2004), combining survey data of the business environment in thirty-six countries in South Asia, Latin America, and the Caribbean. Thus, given the scope of our data set, we are more confident in the generalizability of our results. Furthermore, the control government agents have over private businesses depends not only on the extent of their discretionary power (the variable of interest) but also on a variety of factors, including the degree to which laws are enforced, and the severity of punishment one expects to face if arrested. Given that we benefit from a large sample of cross-country firms, we can control for all these factors and estimate the net effect of public agent discretionary power. This cannot be achieved in a

[6] Throughout the text, "dependence on government services", "government control over the firm", and "interaction with government officials" are used interchangeably.

single country study such as Svensson (2003). Second, we test our results using a variety of model specifications and statistical methods to ensure that our results are consistent. Third, we consider how firms' failure to report bribe payments may impact our estimates. Firm-level surveys, such as the World Business Environment Survey, often contain many missing values for sensitive questions such as those related to bribe payments. The common practice in the literature has been to treat these observations as missing completely at random. However, Dastan and Gibson (2023) argues that the presence of such missing values can generate biased inference. As such, we test the robustness of our estimates by accounting for the effect of missing values in Section 4.3 and we find that non-response does not significantly affect the outcome of our estimation method. Lastly, we explore the relationship between corruption and firm growth and examine whether corruption has a heterogeneous effect on firm growth.[7]

The rest of the paper is organized as follows. Section 2 describes the data. Section 3 describes our hypotheses and outlines the identification strategy and the empirical specification. Section 4 presents the results, tests the robustness of the estimates, and provides a brief analysis of the effect of corruption on firms' growth. Finally, Section 5 provides concluding remarks.

2 Data

The data used in this paper come from the World Business Environment Survey (WBES), a survey of manufacturing and service-industry firms in developing countries conducted by the World Bank.[8] The purpose of the WBES is to collect information about the business environment and obstacles that deter firms from producing. The survey includes many questions on the incidence of regulation, corruption, taxation, and the function of the financial system. The questions are designed to provide both quantitative and qualitative measures of the business environment. For our purposes, we are interested in questions that relate to firms' experience with corruption and the perception of corrupt activities in their region. Firms are asked about their bribery experience, their overall bribe payment, and their perception of the severity of corruption as an obstacle to firms.

The WBES uses a uniform sampling method across all countries to create a representative

[7] Nguyen and van Dijk (2012) find that corruption hurts the growth of firms in the private sector but has no impact on firms in the public sector. To the best of our knowledge, this is the first study that explores the heterogeneity in the effect of corruption based on firms' size.

[8] The data are available in The World Bank Enterprise Survey data portal at http://www.enterprisesurveys.org/en/data.

dataset that can be used to make cross-country comparisons among firms. Furthermore, the within-country sample is designed to ensure that the sample is representative of the size, location, and business sector of firms in the overall population. The sample of firms comes from two main sectors: manufacturing and services. Manufacturing is classified into a set of industries that differs slightly from one country to another..[9]

The sample consists of 52,798 establishments surveyed between 2007 and 2018.[10] For each country, the surveys cover the geographical regions where the majority of economic activities take place.[11]

2.1 Dependent Variables

Given the nature of our research question, the primary dependant variable in our analysis must measure firms' engagement in corrupt activities. To this end, we measure corruption using firms' response to the question regarding their informal payments to government agents. While the use of such questions raises concerns regarding truthful response, as firms may be concerned that they will face consequences for revealing sensitive information, the World Bank adopted a data collection strategy that was designed to alleviate such concerns. First, the World Bank worked with private organizations, rather than local governments, to help ensure that all responses will be kept confidential.[12] Second, survey questions related to corruption were phrased so that blame is placed on the bureaucratic system, not the individual respondents. For example, the question regarding the firm's bribe payment is phrased as: "It is said that establishments are sometimes required to make gifts or informal payments to public officials to "get things done" with regard to customs, taxes, licenses, regulations, services, etc. On average, what percentage of total annual sales or estimated total annual value, do establishments like this one pay in informal payments or gifts to public officials for this purpose?" By framing the question this way, the World Bank hopes to reduce the odds of misreporting.[13]

[9] The main industries are as follows: chemicals, electronics, food, garments, metal products, and machinery and equipment.

[10] The 175 establishments whose total number of employees was less than three are dropped from the sample. However, their exclusion from the analysis does not affect the conclusions.

[11] Two questions ask the survey collectors to report the truthfulness and accuracy of the firms' responses. Observations for which the survey collectors state that the responses are unreliable or the respondent is untruthful are dropped from the final sample. This accounts for the omission of 6,373 observations.

[12] To maintain survey consistency across countries, the World Bank hires the same firm within each region. For example, all interviews in central Asia were conducted by A.C. Nielsen.

[13] Azfar and Murrell (2009) argue that some firms might not respond to any question about firm corruption—even one framed in terms such as "firms like yours." In Section 4.3, we address the problem of reticent respondents in the sample.

2.2 Independent Variables

We include many firm-level characteristics as explanatory variables in our regression analysis. However, we are primarily concerned with firms' ability to pay, which is captured by their sales, and the extent to which the government controls the firm, which is captured by the number of licenses and permits the firm applies for (Permits & Licenses). The empirical model also includes firm characteristics such as the firm's age, a dummy variable indicating whether the firm trades internationally (Trade), a dummy variable indicating whether foreigners own part of the firm (Foreign Ownership), and a dummy variable indicating the firm's legal status (Legal status). Along with these firm characteristics, we also include a set of dummy variables representing the year, sector, region, and country in which the firm operates. See Table A.1 in the Appendix for a description of all variables.

2.3 Summary Statistics

Table 1 presents descriptive statistics for the variables used in this study. Of the 52,798 firms surveyed, about 78 percent (41,308) responded to the question about their bribe payment and only 15 percent reported paying a bribe. The average bribe payment among all firms is approximately $10,800, but this number rises to about $74,600 once we condition on firms who report paying a bribe[14]. In terms of firm characteristics, the average firm has been in business for twenty-two years, and foreigners have ownership rights in less than 10 percent of the firms.

Figure 1 presents a scatter plot with the log of firm sales on the x-axis and the size of the bribe payment on the y-axis. Inspection of Figure 1 shows a clear positive relationship between the size of the bribe and firm sales. Figure 2 is a bar graph that reports the proportion of firms who pay bribes broken down by the number of permits they request. Inspection of Figure 2 shows a positive relationship between the number of permits requested and the proportion of firms that pay bribes. There is a clear difference in the ratio of firms that pay bribes between the firms that made no permit requests (11 percent report paying bribes) and those that requested one permit (17.5 percent report paying bribes) and there is also a small increase in the bribe payment ratio for each additional permit requested. Furthermore, the bribe payment ratio among the firms with at least one permit request ratio is 18.5 percent, which is substantially larger than the 11 percent ratio among the firms with no permit request. Taken together, these results suggest that firms' dependence on government agents is an important factor in their exposure to bribery.

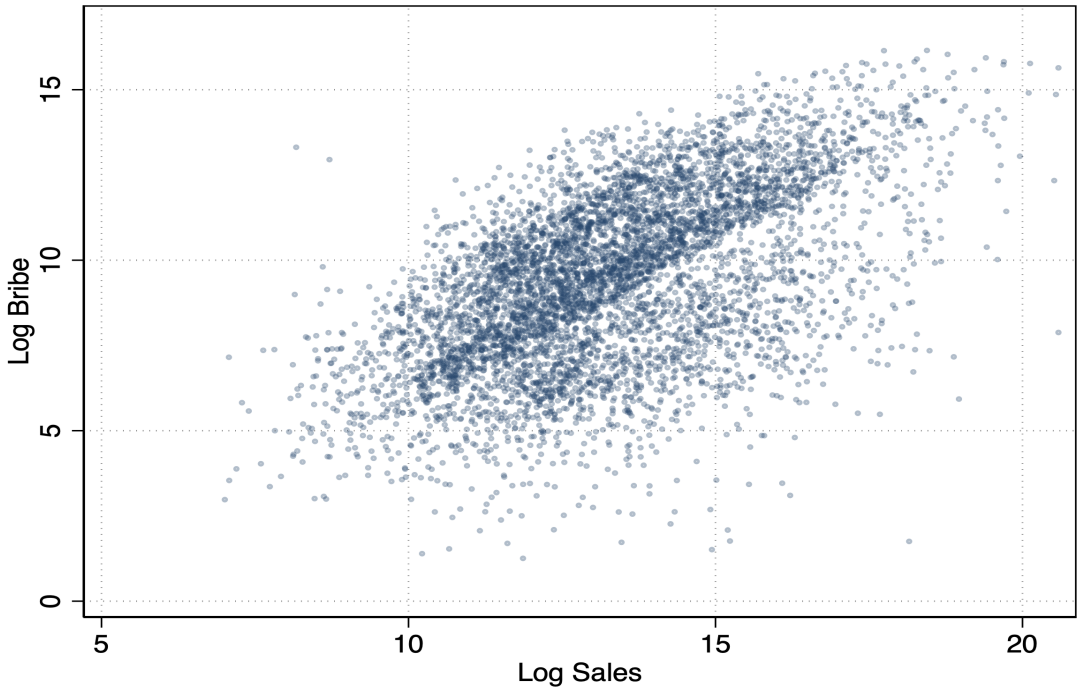
[14] All values for bribe payments and sales are in constant 2010 USD.

Table 1: **Summary Statistics**

	Obs	Mean	Std. dev	Min	Max
Bribe	41308	10776.49	106747.1	0	3652519
Proportion paying bribe	41308	.1444272	.3515267	0	1
Nonresponse to corruption Q.	52798	.2176219	.4126328	0	1
Trade	52798	.5140157	.4998083	0	1
Foreign ownership	52130	.0942835	.2922256	0	1
Manager Experience	51982	19.07481	11.40137	0	50
Permits & licenses	52798	.7502936	1.013292	0	5
Age	52328	21.91448	15.77583	1	81
Sales	48813	5475670	1.44e+07	2515.158	1.59e+08
Growth	43553	1.586154	15.16593	–32.7394	34.98332

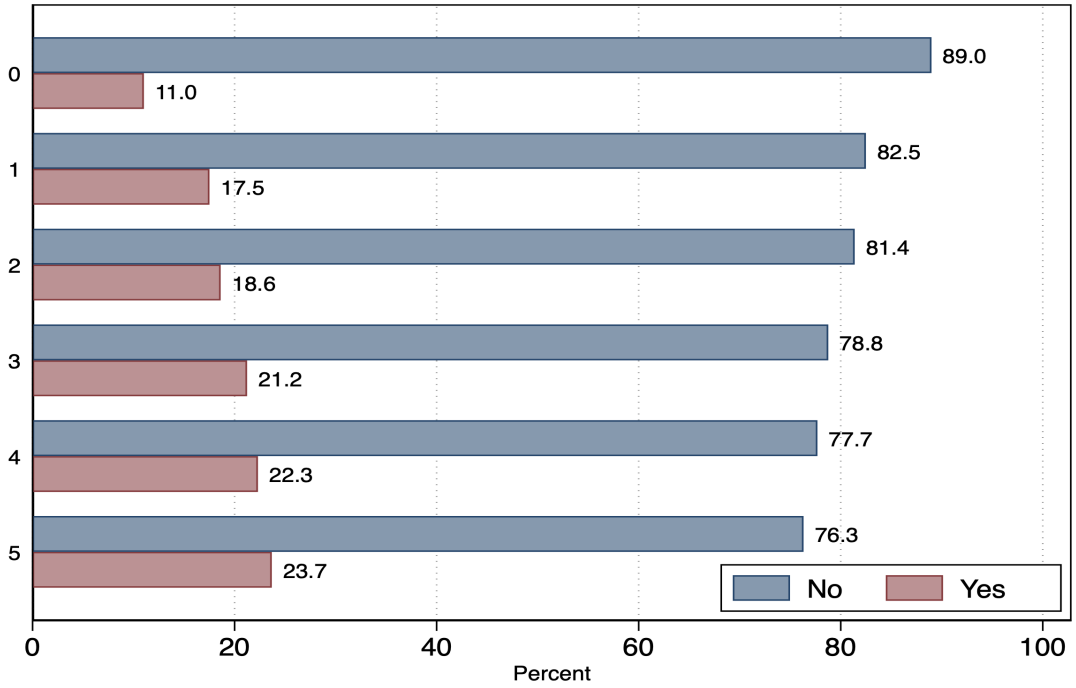
Notes: This table presents the summary statistics for the variables used in this study. The average bribe payment is about $10,800. About 14% of the firms report paying bribes, and 22% of the firms do not respond to the question regarding bribery. Values for Bribe and Sales are in constant 2010 USD. All variables are defined in the Appendix in Table A.1.

Figure 1: **Correlation between bribe payment and sales**



Notes: This graph presents the relationship between sales and bribe payment among the firms that have reported paying bribe.

Figure 2: **The proportion of firms paying bribes in relation to the number of requests for permits and licenses**



Notes: This graph shows the proportion of firms paying bribe based on their number of requests for permits and licenses. Among the firms with zero requests, only 11% report paying bribe. It can be seen that as the number of request increases the proportion of firms paying bribe also increases.

3 Empirical Methodology

The empirical analysis assumes that the bribe ($bribe_{ijct}$) that firm i, in industry j, in country (region) c, at time t pays to government officials is a function of the firm's characteristics (X_{ijct}), government control over the firm (G_{ijct}), an industry fixed effect (λ_j), a country or region fixed effect (η_c), and a time fixed effect (T_t), plus an unobserved error term (ξ_{ijct}).

Our two primary specifications are:

$$Bribe_{ijct} = \beta^T X_{ijct} + \gamma^T G_{ijct} + \lambda_j + \eta_c + T_t + \xi_{ijct} \tag{1}$$

$$\ell = \sum \left(B_{ijct} log\Big[\Phi(\psi_{ijct})\Big] + (1 - B_{ijct}) log\Big[1 - \Phi(\psi_{ijct})\Big] \right) \tag{2}$$

Equation 1 estimates the impact of our control variables on the level of bribe payment, while Equation 2 is the log-likelihood function in our probability model. In Equation 1, X_{ijct} contains firm sales, firm age, managers' years of experience in the sector, a dummy variable indicating whether foreigners own the firm's shares, and dummy variables indicating whether the firm engages in trade, and whether the firm operates legally. G_{ijct} represents the number of permits and licenses the first has applied for and serves as our measure of government control over private firms. Similarly, in Equation 2, B_{ijct} is a binary variable indicating whether the firm has paid bribes, ψ_{ijct} is the right-hand-side term in Equation 1, and Φ is the standard normal distribution. Equation 1 is estimated by OLS, while Equation 2 is estimated by probit.

Given the setup described above, one may be concerned with simultaneity and omitted-variable bias. For instance, the model implicitly assumes that financial performance impacts a firm's bribe payment decision. However, it is also possible that engaging in corrupt actions, such as bribing public officials to expedite licences and permits, may influence a firm's financial performance. Furthermore, Alm et al. (2016) argue that corruption and tax evasion may be intertwined. In a more corrupt country, tax officials might turn a blind eye to tax evasion to gain bribe income. They argue that a firm might under-report its earnings and profits if it can pay bribes to a corrupt official. Finally, because of data limitations, some potentially important variables are not controlled for in this paper. For instance, data on firms' tax payments and on punishment for being caught giving or accepting a bribe are not available.

To mitigate concerns regarding endogeneity, we first include country, region, and industry indicators in the regression analysis. Many of the sources of endogeneity specified above depend

on law enforcement and the overall business environment. Therefore, including a vector of region and industry indicators can account for a wide range of omitted and confounding variables. While the inclusion of these variable can address part of the endogeneity problem, it cannot address the effect of firm-specific unobserved factors. Therefore, in Section 4.2, as a second step, we use instrumental variables to address the endogeneity in the variables that are not controlled for through the set of covariates. Following, Svensson (2003) and Fisman and Svensson (2007), we use industry–region average sales as an instrument for firm sales. This instrument is a function of underlying industry–region factors and as a result it is not correlated with firm-specific characteristics. Furthermore, since the model includes industry and region-fixed effects, the instrument is not associated with aggregate factors, such as the risk of punishment for bribery.

4 Results

The next few subsections present our results in steps. First, we estimate our probability model using Probit to determine the impact of firm characteristics on the probability a firm engages in bribe payments (the extensive margin of corruption). Next, we estimate our baseline model using OLS to determine the impact of firm characteristics on the size of these bribe payments (the intensive margin of corruption). As described above, the results of these regressions may suffer from endogeneity and as such, we use industry-region average sales as an instrument for firm sales. After presenting our IV results, we consider a variety of alternative specifications to determine how sensitive our results are to changes in the underlying statistical model. And finally, we consider the relationship between firm growth and the firm characteristics that were found to be positively associated with corruption in order to provide suggestive evidence regarding the motivation of firms to engage in corruption.

4.1 Baseline Estimation Results

First, we consider the extensive margin of corruption by estimating our probability model, Equation 2, using Probit. The results of this regression for four model specification are presented in Table 2.[15] Inspection of Table 2 reveals that the coefficient on permits and licenses is positive

[15] The model specifications differ in terms of the dummy variables that are included. Our preferred specification is specification 4, which includes Year, Legal Status, Industry, and Region dummies. Note that there are multiple regions within each country, so including Region dummies is more restrictive than including Country dummies.

and statistically significant at the 1 percent level and suggest that each additional request for a permit or license raises the probability that the average firm will pay a bribe by about three percentage points. This finding is consistent with the hypothesis that an increase in the power of government agents is associated with a higher likelihood of bribery. However, we find no evidence of the ability-to-pay hypothesis within our Probit estimates as firm sales do not have a significant effect on the likelihood a firm pays a bribe. Among the control variables, the results do not show any significant relationship between firm-level variables, such as trade, foreign ownership, manager experience, and firm age, and the likelihood of firms' engaging in corruption.

While the previous results focused on the extensive margin of corruption, we are also interested in the intensive margin. To this end, we estimate our baseline model, Equation 1, using OLS. The results of this regression for our four model specifications (as described above) are presented in Table 3. Inspection of Table 3 reveals that an increase in permits and licenses is associated with a positive and statistically significant increase in bribe payment in our preferred specification, but not for the other three specifications. The preferred specification shows that for each additional request for permits and licenses firms pay on average 31 percent more in bribe payments.[16] We also find support for the ability-to-pay hypothesis when focusing on the intensive margin. Specifically, we find that firm performance raises the magnitude of bribes paid on average, with a 1 percent increase in sales resulting in a 0.5 to 0.54 percent increase in the bribes, with all coefficients significant at the 1 percent level.

Additional results indicate that firm age has a positive and significant effect on the size of bribe payments, while manager experience has a negative and significant effect. Other variables are not significant in any model specification. One possible explanation for the positive effect of firm age on bribe payment is with regard to the defined relationships over the past years between the firm and government officials that requires ongoing bribe payment to maintain. On the other hand firms with more experienced managers may have established reltionship with government officials that enable them to pay less bribe for the same service in comparision with the firms with lower manager experience.

In contrast, the finding that older firms pay more in bribes holding everything else constant could be explained by a few factors. First, older firms may have established relationships with government officials that require ongoing bribes to maintain. Second, older firms may be more

[16] To calculate the percentage increase in the bribe, we use the following formula: $\frac{\Delta Y}{Y} = (e^b - 1) \times 100 = (e^{0.27} - 1) \times 100 \approx 31$.

set in their ways and less likely to adapt to changing business environments, including shifts in the bribery landscape. Finally, older firms may face increased scrutiny from government officials and other stakeholders, which could result in more demands for bribes.

Table 2: Probit Regression on the Incidence of Bribery (Extensive Margin)

	(1)	(2)	(3)	(4)
Permits & licenses	.032***	.031***	.031***	.031***
	(.006)	(.006)	(.006)	(.005)
Log Sales	.006**	.002	.002	.001
	(.003)	(.003)	(.003)	(.003)
Trade	.021	.020	.023*	.019
	(.015)	(.014)	(.013)	(.012)
Foreign ownership	.012	.008	.009	.002
	(.017)	(.016)	(.016)	(.016)
Manager Experience	.000	.000	.000	.000
	(.001)	(.001)	(.001)	(.001)
Log Age	.005	.005	.007	.004
	(.014)	(.013)	(.012)	(.012)
Year dummy	✓	✓	✓	✓
Country dummy	✓	✓	✓	X
Legal status dummy	X	✓	✓	✓
Industry dummy	X	X	✓	✓
Region dummy	X	X	X	✓
Observations	39629	39596	39596	39164
Pseudo R^2	0.12	0.13	0.14	0.17

Notes: This table presents the Probit model estimation results of four specifications on the firm-level factors affecting the incidence of bribery based on Equation 2. The specifications differ with respect to the included dummy variables. The first specification only contains county dummies. In the second specification, we add dummy variables representing firms' legal status. The third specification adds industry dummies to the model, and finally, in the last specification, we replace country dummies with within-country regional dummy variables.

The dependent variable (Bribery incidence) takes the value 1 if the firm has paid bribes and 0 otherwise. The coefficients in the table represent the marginal effect of the variables on the incidence of bribery. *, **, and *** represent significance level at 10%, 5% and 1% respectively. Robust standard errors are in parenthesis.

4.2 Instrumental Variables

Table 4 present the IV results for the incidence of bribery (extensive margin), where average log sales in each industry–region pair is used as an instrument. The variables included in each column are identical to those in Table 2 in terms of model specifications. The results presented

Table 3: Regression Analysis of the Determinants of Bribery (Intensive Margin)

	(1)	(2)	(3)	(4)
Permits & licenses	.228**	.217*	.228**	.270**
	(.115)	(.114)	(.108)	(.113)
Log Sales	.538***	.530***	.498***	.532***
	(.063)	(.064)	(.058)	(.061)
Trade	–.004	–.054	.018	–.102
	(.193)	(.191)	(.233)	(.246)
Foreign ownership	.114	.136	.077	–.376
	(.395)	(.370)	(.382)	(.373)
Manager Experience	–.019*	–.019*	–.022**	–.019**
	(.010)	(.010)	(.010)	(.009)
Log Age	.472**	.446**	.448**	.431**
	(.190)	(.194)	(.191)	(.194)
Year dummy	✓	✓	✓	✓
Country dummy	✓	✓	✓	**X**
Legal status dummy	**X**	✓	✓	✓
Industry dummy	**X**	**X**	✓	✓
Region dummy	**X**	**X**	**X**	✓
Observations	5703	5700	5700	5700
R^2	.375	.379	.430	.476

Notes: This table presents the OLS estimations of Equation 1. The dependent variable is the natural logarithm of bribe payment. The independent variables in the models are identical to those in Table 2. The models only account for the observations with non-zero bribe payment.

*, **, and *** represent significance level at 10%, 5% and 1% respectively. Robust standard errors are in parenthesis.

in Table 4 are consistent with those found in Table 2. Specifically, we still find evidence in support of the control-power hypothesis, with the coefficient on permits and licenses being positive and statistically significant at 1 percent level. We also find no evidence for the ability to pay hypothesis on the extensive margin.

Table 4: Bribery Determinants — IV probit (Extensive margin)

	(1)	(2)	(3)	(4)
Permits & licenses	.033***	.031***	.031***	.031***
	(.007)	(.007)	(.007)	(.006)
Log Sales	.004	.001	−.000	.000
	(.010)	(.010)	(.010)	(.008)
Trade	.019	.019	.023	.019
	(.016)	(.016)	(.015)	(.014)
Foreign ownership	.014	.010	.011	.003
	(.019)	(.018)	(.018)	(.017)
Manager Experience	.000	.000	.000	.000
	(.001)	(.001)	(.001)	(.001)
Log Age	.004	.004	.006	.004
	(.014)	(.013)	(.013)	(.013)
Year dummy	✓	✓	✓	✓
Country dummy	✓	✓	✓	X
Legal status dummy	X	✓	✓	✓
Industry dummy	X	X	✓	✓
Region dummy	X	X	X	✓
Observations	39629	39596	39596	39164
Pseudo R^2				

Notes: This table presents the results of Probit method with endogenous covariates for the model in Equation 2. The model specifications is similar to those in Table 2. The excluded instrument in all specifications is industry-region sales.The dependent variable takes the value 1 if the firm has paid bribes and 0 otherwise. The coefficients in the table represent the marginal effect of the variables on the incidence of bribery.

*, **, and *** represent significance level at 10%, 5% and 1% respectively. Robust standard errors are in parenthesis.

Table 5 shows the IV estimation results for the size of bribe payment (intensive margin), with all model specifications being the same as those in Table 3. In all four specifications we find a nearly one-to-one relationship between firm sales and the size of bribe payment among the firms that are subject to bribe requests. That is, a 1 percent increase in sales raises the average bribe payment by around 1 percent, holding other factors constant. This suggests that the impact of firm performance is much larger than that found in Section 4.1.

Table 5: Bribery Determinants — IV regressions (Intensive margin)

	Log Bribe	Log Bribe	Log Bribe	Log Bribe
Log Sales	1.100***	1.059***	.946***	1.150***
	(.327)	(.316)	(.319)	(.387)
Permits & licenses	.070	.071	.098	.096
	(.160)	(.155)	(.153)	(.176)
Trade	–.419	–.382	–.260	–.527
	(.329)	(.299)	(.305)	(.377)
Foreign ownership	–.246	–.076	–.104	–.708*
	(.499)	(.426)	(.418)	(.424)
Manager Experience	–.026**	–.024**	–.026**	–.026**
	(.013)	(.012)	(.012)	(.012)
Log Age	.377*	.358*	.373**	.303
	(.195)	(.196)	(.189)	(.187)
Year dummy	✓	✓	✓	✓
Country dummy	✓	✓	✓	X
Legal status dummy	X	✓	✓	✓
Industry dummy	X	X	✓	✓
Region dummy	X	X	X	✓
Observations	5703	5700	5700	5700
R^2	.28	.30	.37	.38
Partial R^2	.08	.09	.08	.07
F-stat of the instruments	57.00	56.68	59.54	57.96

Notes: This table presents the results of 2SLS method for the model in Equation 1. The model specifications is similar to those in Table 3. The excluded instrument in all specifications is industry-region sales. The dependent variable is the natural logarithm of bribe payment. The models only account for the observations with non-zero bribe payment.
At the bottom of the table, we report the performance of the instrument, namely, Partial R^2 and Cragg-Donald Wald statistic (F stat of the instruments).
*, **, and *** represent significance level at 10%, 5% and 1% respectively. Robust standard errors are in parenthesis.

As for the statistical validity of our instrument, Table A.2 in the Appendix presents the results of the first-stage regression of sales on all covariates and our instrument (Industry-region average sales). The IV performs well and has a significant explanatory power, explaining around 47 to 56 percent of the variation in sales. At the bottom of Table 5, there is more information about the performance of the IV model. Following Bound et al. (1995), we report the partial R-squared values of the excluded instrument. Partial R-squared (or the coefficient of partial determination) indicates the percentage of the variation in the dependent variable that is exclusively explained by the instrument. Between 7 to 9 percent of the variation in sales is explained by the instrument, which means that it is relevant.[17]

4.3 Missing Data and Possible Selection Problem

So far, we have followed the existing literature and have treated observations where firms do not respond to the survey's corruption question as though they were missing completely at random. However, Dastan and Gibson (2023) and Jensen et al. (2010) discuss the fact that this non-response may not be a completely random event that can easily be ignored. For instance, Dastan and Gibson (2023) shows that firms' non-response to the corruption question is correlated with their size among other variables, and Jensen et al. (2010) emphasize that the response rate is lower in countries with less press freedom. As a result, failing to accounting for non-response can lead to potentially biased estimates.

Out of the 52,798 establishments included in the WBES sample, 11,490 (roughly 22 percent) do not respond to the question about bribe payments,[18] and as discussed above, removing such a large proportion of the data can potentially bias our estimates. To address this problem, we use an augmented 2SLS approach based on Wooldridge (2010). The model is appropriate when both selection bias and endogenous variables are present in the estimation procedure. To resolve both problems, Wooldridge (2010) suggests to first, estimate a selection model using the probit method to account for the potential non-response bias. Then, include the acquired inverse mills ratio from this step to the IV estimation model. Therefore, we can account for both the selection problem and endogeneity in the regression model.

[17] Another measure for testing the relevance of the instrument is the Cragg-Donald Wald statistic (F-statistic of the instruments in the table). In all of the IV models, the Wald statistics are about 57 or higher, which shows that the instruments have a highly significant net effect on the endogenous regressor (sales).

[18] The missing data in Svensson (2003) is about 41 percent of their sample.

$$Pr(s_{ijct} = 1|Z_{ijct}) = \Phi(\gamma^T Z_{ijct}) \tag{3}$$

In Equation 3, s_{ijct} is a binary selection indicator representing whether the firm reported a positive bribe payment, $s_{ijct} = 1$, or did not respond to the question, $s_{ijct} = 0$. Φ is the cumulative standard normal-distribution function, and Z_{ijct} denotes the vector of the explanatory variables. After constructing the inverse Mills ratio from the selection model, we simply add it as another control variable to our IV estimation model.

Table 6: Regression Results Accounting for Missing Data

	(1)	(2)	(3)	(4)
Log Sales	1.083***	.899***	.724***	.769***
	(.284)	(.243)	(.142)	(.137)
Permits & licenses	.040	–.053	.063	.090
	(.231)	(.194)	(.153)	(.104)
Trade	–.406	–.112	–.289	–.459
	(.299)	(.220)	(.294)	(.303)
Foreign ownership	–.251	–.166	.088	–.026
	(.503)	(.434)	(.393)	(.374)
Manager Experience	–.025**	–.018*	–.031**	–.022
	(.012)	(.011)	(.016)	(.014)
Age	.341	.188	.375**	.304**
	(.235)	(.248)	(.163)	(.147)
IMR	–.456	–2.078	–1.187	–.666
	(1.524)	(1.567)	(1.313)	(1.116)
Year dummy	✓	✓	✓	✓
Country dummy	✓	✓	✓	**X**
Legal status dummy	**X**	✓	✓	✓
Industry dummy	**X**	**X**	✓	✓
Region dummy	**X**	**X**	**X**	✓
Observations	5703	3887	3887	3879
R^2	.28	.40	.44	.51
Partial R^2	.12	.17	.42	.37
F-stat of the instruments	106.41	49.18	180.74	180.67

Notes: This table presents the results of Heckman selection model. The variables included in each specifications is similar to those in Table 3. The excluded instrument in all specifications is industry-region sales. The dependent variable is the natural logarithm of bribe payment. The models only account for the observations with non-zero bribe payment.
At the bottom of the table, we report the performance of the instrument, namely, Partial R^2 and Cragg-Donald Wald statistic (F-stat of the instruments).
*, **, and *** represent significance level at 10%, 5% and 1% respectively. Robust standard errors are in parenthesis.

Table 6 presents the results of the augmented IV (Heckman-IV) estimation model described above. The instrument in all specifications is average industry–region sales. We find that firm's sales has a positive and statistically significant effect on corruption. The coefficient of permits and licenses is no longer significant when we account for the nonresponders. However, The inverse Mills ratio is insignificant in all specifications. This means that the null hypothesis of no selection cannot be rejected and there is no evidence of sample selection bias. That is, we can rely on our findings in Tables 4 and 5.

4.4 Sector-Specific Results

As described above, the data used in our analysis includes firms in both the Manufacturing and Services sectors. As such, the results presented above can best be thought of as average findings across firms operating in these distinct environments. Given the large differences that exist between firms operating in the Manufacturing and Services sectors, it is possible that our findings vary substantially across sectors. To this end, we re-estimate our IV models Tables 4 and 5 for sector-specific subsamples, including year, legal status, and region dummies.

Table 7 presents the results of our sector-specific analysis. From Columns 1 and 2 of Table 7 we see that the main extensive margin result is similar across both sectors, with the sector-specific coefficients on permits and licenses being nearly identical to that reported in Table 4 above. This suggests that the impact of government agent exposure on the propensity to engage in corrupt activities does not vary significantly across the two sectors considered.

While our main finding for the extensive margin is consistent across sectors, we find more variation in our intensive margin results. Inspection of Columns 3 and 4 of Table 7 shows that the magnitude of bribe payments are less responsive to changes in sales within the Manufacturing sector versus the Services sector. Specifically, while our full sample results suggest a near one-to-one relationship between firm sales and bribes, the coefficient on log sales is 0.725 for Manufacturing and 1.913 for Services (both significant at the 5 percent level). The Manufacturing sector is typically more capital-intensive, meaning that it relies more on machinery and equipment than labor. This difference in production structure may make it more difficult for corrupt officials to demand bribes from manufacturing firms, as they may have fewer opportunities to exert control over the production process.

We also observe statistically significant heterogeneity in the effect of foreign ownership in the manufacturing and service sectors. Specifically, we find that firms in the Services sector with

partial foreign ownwership pay less in bribes compared to locally owned firms. One possible reason for this is that foreign-owned firms may be required to adhere to stricter legal standards imposed by their home countries. Moreover, service sector firms face lower sunk costs and can easily exit in the face of hostile or unwarranted corrupt requests. However, manufacturing firms encounter higher initial investments when entering a new market and have fewer alternatives available to them. Consequently, they may be more susceptible to similar requests from local government officials.

Table 7: Does the relationship between bribery and firm size depends on sector?

	Extensive Margin		Intensive Margin	
	(1) Manufacturing	(2) Service	(3) Manufacturing	(4) Service
Permits & licenses	.033***	.030***	.155	–.037
	(.008)	(.009)	(.104)	(.372
Log Sales	.002	–.000	.725**	1.913**
	(.010)	(.014)	(.309)	(.827)
Trade	.034	.007	.071	–.779
	(.021)	(.023)	(.304)	(.739)
Foreign ownership	–.024	.030	.233	–1.751**
	(.021)	(.027)	(.421)	(.748)
Manager Experience	.000	.001	.004	–.054*
	(.000)	(.001)	(.009)	(.028)
Log Age	.002	.000	–.118	.551
	(.011)	(.021)	(.157)	(.371)
Year dummy	✓	✓	✓	✓
Legal status dummy	✓	✓	✓	✓
Region dummy	✓	✓	✓	✓
Observations	26547	12312	4003	1697

Notes: The table presents the results of the analysis, which divides the sample into two sectors: manufacturing and service. The extensive margin results are displayed in columns 1 and 2, and the dependent variable is binary, taking the value of 1 if the firm paid bribes and 0 otherwise. The coefficients in the table represent the marginal effect of variables on the incidence of bribery, and the analysis is conducted using the Probit method with endogenous covariates, as specified in equation 2. The intensive margin results are presented in columns 3 and 4, and the dependent variable is the natural logarithm of bribe payment. The analysis is conducted using 2SLS, and industry–region average sales is used as the excluded instrument in all specifications.

*, **, and *** represent significance level at 10%, 5% and 1% respectively. Robust standard errors are in parenthesis.

4.5 The Effect of Corruption on Firm Growth

The previous results shed light on the firm-level determinants of corruption. However, we are also interested in understanding how corruption might impact the firm itself. There are two main conflicting views on the effects of corruption.[19] One view argues that corruption can grease the wheels of commerce by reducing bureaucratic inefficiency and red tape (For theoretical works on the efficiency of corruption, see Leff, 1964, Huntington, 1968)).[20] Alternatively, corruption may be viewed as the cause, rather than the solution, to inefficiency. For example, Shleifer and Vishny (1993) argue that corruption raises operational costs and creates uncertainty, which in turn impedes investment and economic growth. Also, Sarte (2000) contends that bureaucratic rent-seeking may restrict entry into the formal economy, resulting in a low growth rate (see also Rose-Ackerman (1975, 1978), Banerjee (1997), and Klitgaard (1988)). The empirical evidence is largely in support of the latter theory. For example, according to Mauro (1995) and Méon and Sekkat (2005), corruption inhibits both investment and growth.

Some scholars have looked at the impacts of corruption at the firm level, complementing earlier works on the aggregate effect of corruption. Fisman and Svensson (2007) examine the impact of taxation and corruption on companies in Uganda, and conclude that taxation does not hurt company growth as much as corruption. In a study of Vietnamese firms, Nguyen and van Dijk (2012) find that corruption dampens the growth of the private sector but not the public sector, suggesting that corruption creates an inefficient business environment that disadvantages private firms. The two studies indicate that corruption adversely impacts private firms' growth, but they do not discuss whether the impact of corruption varies based on the underlying characteristics of the firms. However, our previous results suggest that corruption increases as firms grow larger. In light of this finding, one might wonder whether corruption affects growth differently depending on the size of a business? In other words, corruption might grease the wheels of growth for some firms while sanding them for others.

The empirical model for assessing the effect of corruption on growth[21] is represented by Equation 4:

$$Growth_{ijct} = \beta_1 Bribe_{ijct} + \beta_2 FirmSize_{ijct} + \beta_3 Bribe_{ijct} \times FirmSize_{ijct} + \gamma^T X_{ijct} + \xi_{ijct} \quad (4)$$

[19] See Aidt et al. (2008) for a detailed review of the literature.
[20] Méndez and Sepúlveda (2006) studies the impact of corruption on long-run growth and finds that corruption is beneficial for growth at low levels and harmful at high levels.
[21] Growth is defined as the change in firm sales over a three-year period.

where X_{ijct} is composed of all the independent variables as in Equation 1, as well as dummy variables for industry, region, and year. Column 1 of Table 8 shows that corruption adversely affect firms' growth on average, which is consistent with existing research. However, we are also interested in how this effect varies with firm size. Column 2 of Table 8 includes the interaction between corruption and firm size (Log Sales). The results show that as firm size increases, the negative impact of corruption on businesses shrinks. We find that the net average effect of corruption on growth for firms with annual sales more than $3.9 million is positive.[22] The plot on the left side in Figure 3 clearly shows that corruption has a differtial impact on growth depending on the magnitude of firm sales. Note that the firms who experience a positive effect from corruption account for 24.5% of sampled firms and more than 68.7% percent of total sales.

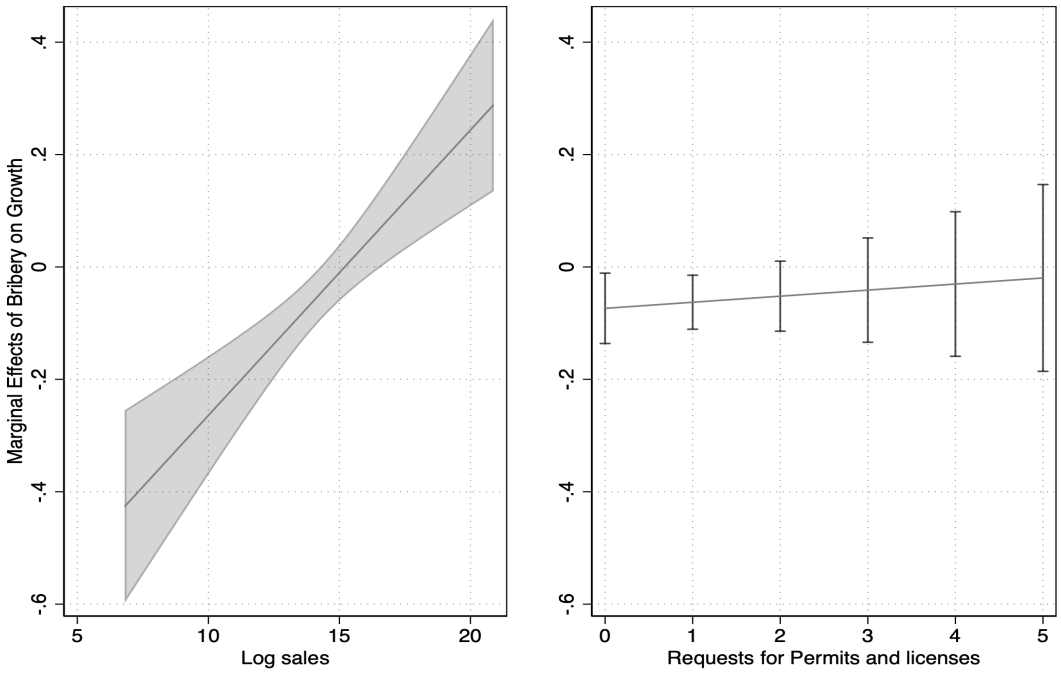
The previous results suggest that large firms, who were identified as engaging in more corruption, may actually benefit from these corrupt activities through faster growth. However, firm size (sales) was not the only firm-level factor that significantly impacted corruption in our earlier results. We also found that firms' interaction with government agents, and the control these agents have over the firm, was associated with increased corruption. In Column 3 we consider the case where the effect of corruption on growth interacts with government control over the firm. In the previous sections, we found that higher dependence on government leads to higher level of corruption. Corrupt agents exploit firms when they make business related requests, and as Kaufmann and Wei (1999) discuss, they try to gauge the firm's willingness to pay based on their observable characteristics. Now, are the firms dealing with corrupt government agents benefiting from their bribe payments? To this end, we estimate the interaction between corruption and dependence on government services on firm growth. As can be seen in Column 3 of Table 8, we find no association between growth and the interaction term. The plot on the right of Figure 3 also depicts the average marginal effect of corruption on growth at different values of permit requests. As can be seen, there are no indications of an interaction effect between corruption and requests for permits and licenses. This finding suggests that the government agents may benefit from the transaction while firms participate out of necessity.

While the previous result suggests that large firms may experience a positive growth benefit associated with corruption, the results at the regional level are found to be negative. The results presented in Columns 4 and 5 of Table 8 indicate that higher average regional (and

[22] To calculate the turnaround point, we solve for the first-order condition with respect to corruption, $\frac{d(growth)}{d(bribe)} = b_1 + b_2 log(sales) = 0$. By Simplifying the FOC, we get $sales = exp(\frac{-b_1}{b_2})$. By substituting for b_1 and b_2 from Table 8 we get the value of $3.9 million in sales.

sector-region) corruption is negatively associated with firm growth. This suggests that when corruption becomes more prevalent, it comes at the expense of economic activity. Given that, earlier we showed corruption has a heterogeneous effect based on firm size, this implies that corruption creates a less competitive business environment in which small firms are adversely impacted. Furthermore, the gains accruing to large firms do not compensate for the losses experienced by small and medium-sized firms. As such, the net impact of corruption appears to be negative.

Figure 3: **Average Marginal Effect of Bribery**



Notes: Plots on the left and right represent the average marginal effect of bribery on firms' growth at different values of sales and requests for permits and licenses, respectively.

5 Conclusion

In this paper, we aimed to address the gap in the literature regarding the causes of corruption at the firm level. While several studies have examined the conditions under which corruption thrives, little attention has been paid to what differentiates firms' experiences with corruption. We use World Bank Enterprise Survey data from 36 countries to examine the firm-level characteristics that influence the incidence and magnitude of corruption, while controlling for environmental factors such as institutional structure and the availability of public resources.

Table 8: **Impact of Corruption on Firms Growth**

	(1)	(2)	(3)	(4)	(5)
Log Bribe	−.057**	−.788***	−.074**		
	(.024)	(.162)	(.032)		
Log Bribe × Log Sales		.052***			
		(.011)			
Log Bribe × Permits			.016		
			(.020)		
Avg. Regional Bribe				−1.726***	
				(.142)	
Avg. Region-Industry Bribe					−.711***
					(.076)
Log Sales	1.118***	1.055***	1.119***	1.090***	1.120***
	(.045)	(.046)	(.045)	(.042)	(.042)
Permits & licenses	.451***	.448***	.421***	.503***	.517***
	(.084)	(.084)	(.089)	(.079)	(.079)
Trade	−.364**	−.355**	−.362**	−.132	−.189
	(.177)	(.177)	(.177)	(.164)	(.164)
Foreign ownership	−1.236***	−1.233***	−1.235***	−1.226***	−1.242***
	(.282)	(.282)	(.282)	(.259)	(.260)
Manager Experience	−.005	−.006	−.005	.000	−.000
	(.007)	(.007)	(.007)	(.007)	(.007)
Log Age	−2.714***	−2.707***	−2.713***	−2.711***	−2.726***
	(.128)	(.128)	(.128)	(.119)	(.119)
Year dummy	✓	✓	✓	✓	✓
Legal status dummy	✓	✓	✓	✓	✓
Industry dummy	✓	✓	✓	✓	✓
Region dummy	✓	✓	✓	✓	✓
Observations	35728	35728	35728	42230	42093
R^2	.210	.210	.210	.210	.208

Notes: This table presents the results of the impact of corruption on firms growth. The dependent variable is firms' sales growth over three years period. *, **, and *** represent significance level at 10%, 5% and 1% respectively. Robust standard errors are in parenthesis.

Our findings suggest that both firm size, measured by firm sales, and the government's influence over private firms, measured by the number of permits requested, are positively associated with the incidence and magnitude of corruption.

We also studied the relationship between corruption and firms' growth. We found that larger firms are more likely to engage in corrupt activities to seek out potential growth benefits, while smaller firms pay bribes out of necessity. This asymmetrical relationship between corruption and firm size highlights the importance of considering the heterogeneity of firms when designing anti-corruption policies.

While our study contributes to the literature on corruption and firm growth by examining the firm-level determinants of corruption and their impact on firm growth, many possible extensions of the present analysis exist. For example, additional work is needed to determine how our findings carry over to firms outside of the Manufacturing and Services sectors. Furthermore, while we were able to establish an association between corruption and firm growth, additional research is needed to determine if a causal relationship exists between these two variables.

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Appendix

A Tables and Figures

This appendix contains a number of tables and figures that were referred to throughout the main text. Table A.1 presents the definitions of all variables used in the paper. Table A.2 shows the first stage regression results for our IV estimation model in Table 5. It can be seen from the table that the instruments for log sales (industry-region average log sales) is statistically significant in each of the specifications. Figure A.1 displays histograms of the Log Bribe and Bribe among firms paying bribes. It is evident that the distribution of Bribe is highly skewed and its log transformation (Log Bribe) produces an approximately normal distribution.

Table A.1: Variables Description

Variable name	**Definition**
Bribe	Reported bribe payment by the firm. The survey asked the following question: "Many business people have told us that firms are often required to make informal payments to public officials to deal with customs, taxes, licenses, regulations, services, etc. Can you estimate what a firm in your line of business and of similar size and characteristics typically pays each year?". The value is in constant 2010 US$.
Sales	Firm's reported last fiscal year sales in constant 2010 US$.
Growth	Firm's sales growth over the past three years.
Age	Firm's age.
Permits & Licenses	Number of applications firm submitted to acquire electrical and water connections; construction permits; operating and import licenses.
Manager Experience	Top manager years of experience working in this sector.
Foreign Ownership	Binary variable taking the value 1 if foeigners own parts of the firm's shares.
Trade	Binary variable equal to 1 if firm does either import or export (directly or indirectly) and 0 otherwise.
Legal status	Dummy variables indicating the legal stauts of the firm. The catagories are: Pulicly listed; Privately held, limited liability; Sole proprietorship; Partnership; Limited partnership; other.
Security cost ratio	% of annual sales spent on security in the last fiscal year.

All monetary units are in 2010 US$.

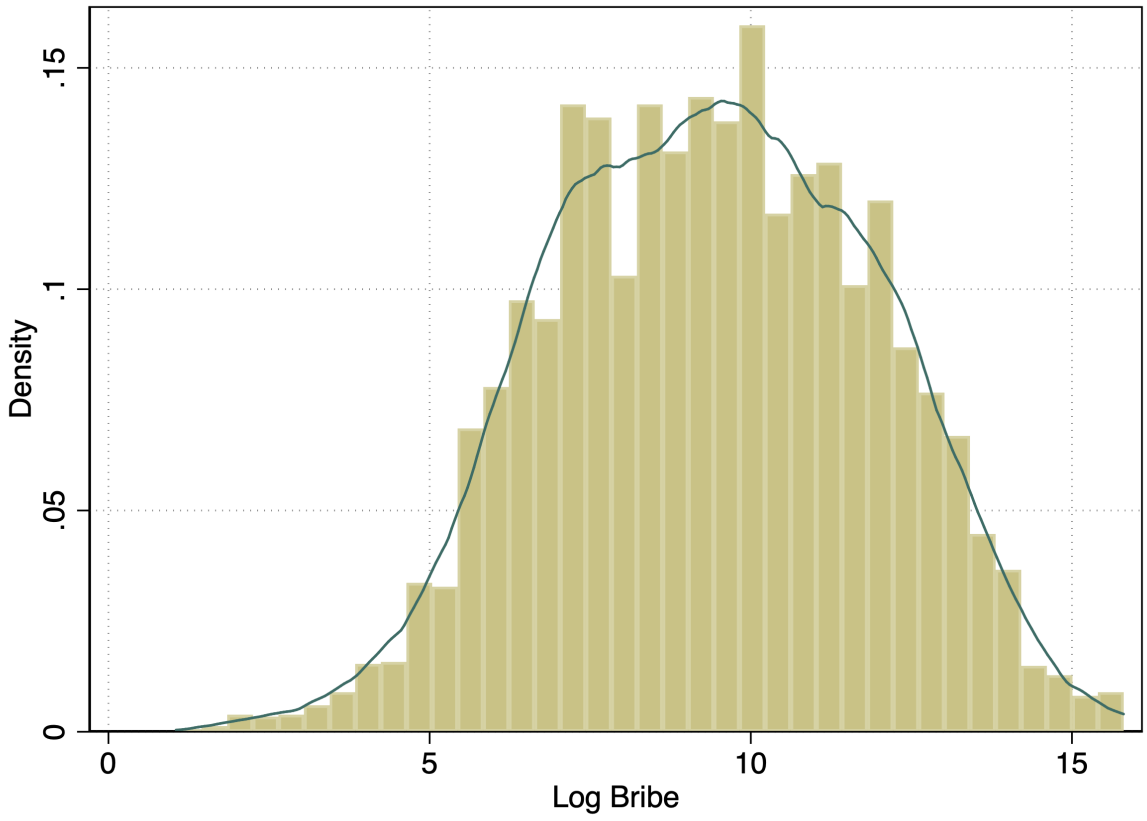
Table A.2: First stage regressions (Dep. variable: Log sales)

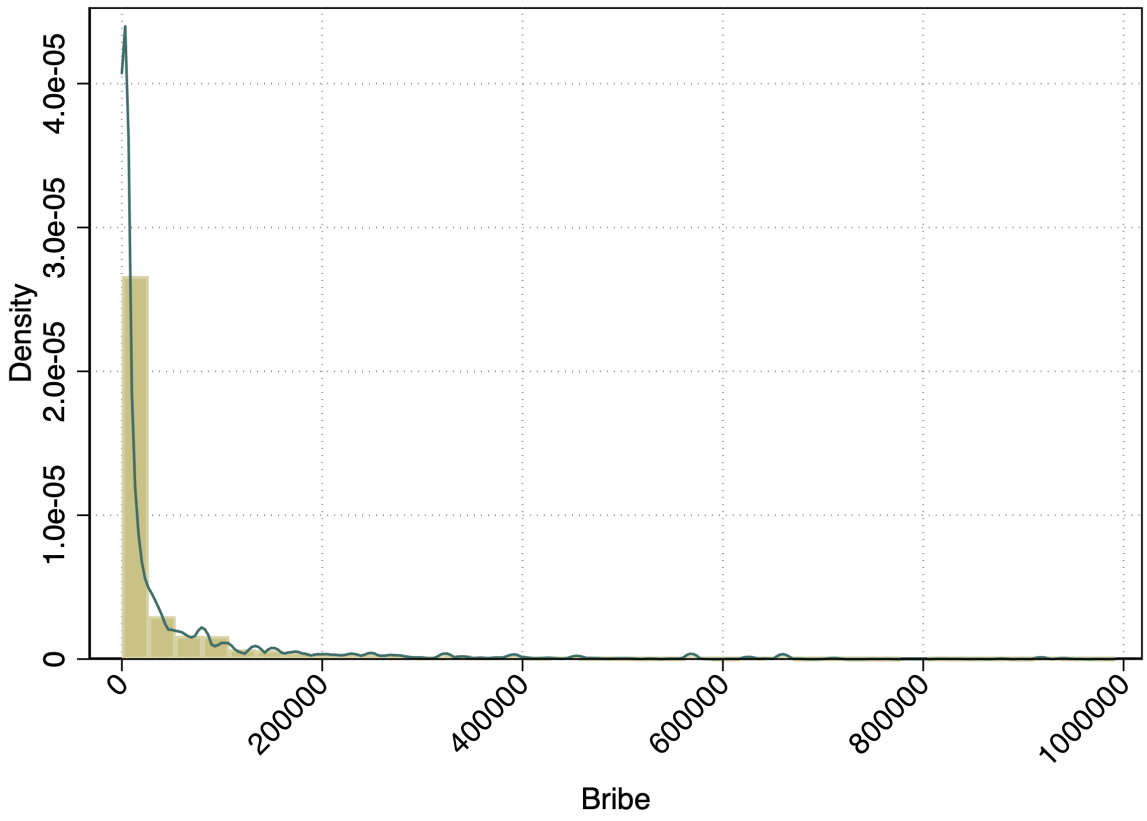
	(1)	(2)	(3)	(4)
Industry-region avg. sales	.814***	.833***	.813***	.887***
	(.109)	(.113)	(.105)	(.112)
Permits & licenses	.275***	.275***	.283***	.291***
	(.062)	(.061)	(.054)	(.052)
Trade	.633***	.521***	.594***	.658***
	(.123)	(.122)	(.140)	(.126)
Foreign ownership	.711***	.425*	.467**	.610***
	(.222)	(.223)	(.213)	(.198)
Manager Experience	.017***	.015**	.017***	.016**
	(.006)	(.006)	(.006)	(.007)
Age	.084	.081	.082	.131
	(.140)	(.142)	(.126)	(.124)
Year dummy	✓	✓	✓	✓
Country dummy	✓	✓	✓	**X**
Legal status dummy	**X**	✓	✓	✓
Industry dummy	**X**	**X**	✓	✓
Region dummy	**X**	**X**	**X**	✓
Observations	5703	5700	5700	5700
R^2	.429	.455	.489	.536

Notes: This table presents first stage regression results of the IV methods in Table 5. The endogenous variable is the log of firms' sales.

*, **, and *** represent significance level at 10%, 5% and 1% respectively. Robust standard errors are in parenthesis.

Figure A.1: **Histograms of Log Bribe and Bribe**





Notes: Both distributions only account for the firms that are paying bribes. In the bottom graph, we have dropped the firms with more than a million dollars in bribe payment.

B Robustness check

In Section 3, we discussed concern regarding endogeneity of firms sales and our approach to account for it by using an instrumental variable method and in Section 4.2 we tested the result of our model by using industry–region average sales as our instrumental variable.

In this Section, we consider a firm's expenditure on security as another instrument for sales after Svensson (2003). Security expenditures are correlated with sales but not directly related to corruption.[23] A high level of crime can undermine property rights and reduce confidence in the government (Powell et al. (2010)). Also, Collier and Gunning (1999) argue that the risk of crime is a major factor explaining African firms' performance. Security expenditure represent the burden of protecting a firm against criminal activities. As a firm grows, their cost of protecting their personnel and their assets increase as well. While the link between firm size and security expenditures is clear, there is no direct connection between corruption and security cost.

Table B.1 present the results of incidence of bribery using both instrumental variables. The IV in the first specification is average log sales in each industry–region pair. In the second specification, the IV is the firm's security costs and in the third specifications, we use both industry-region average log sales and firm's security costs as instruments for firm sales. All IV specifications include year, legal status, industry and region dummy variables. We find that the result are highly comparable to those from table 4 on that we find evidence in support of control-power hypothesis with the coefficient on permits and licenses being positive and statistically significant at 1 percent level.

The choice of IV's in the three specifications in Table B.2 are the same as in Table B.1. The result of this table is also very comparable with those from Table 5. In all three specifications we find a one-to-one relationship between firm sales and the size of bribe payment among the firms that are subject to bribe requests. That is, a 1 percent increase in sales raises the average bribe payment by around 1 percent, holding other factors constant.

[23] Having a high level of security ensures that firms are protected against uncertainties and reduces the risk of criminal activity against their business operations. In areas where criminal activity is prevalent, the incentive to expand and improve business operations would be highly dependent on the ability of the firms to protect their assets.

Table B.1: Bribery Determinants — IV probit (Extensive margin)

	IVprobit 1	IVprobit 2	IVprobit - both IVs
Permits & licenses	.029***	.029***	.029***
	(.006)	(.006)	(.006)
Log Sales	–.001	–.011	–.012*
	(.009)	(.008)	(.007)
Trade	.014	.027	.027
	(.013)	(.017)	(.017)
Foreign ownership	.003	.012	.012
	(.017)	(.020)	(.020)
Manager Experience	.001	.002*	.002*
	(.001)	(.001)	(.001)
Log Age	.003	–.013	–.013
	(.013)	(.017)	(.017)
Year dummy	✓	✓	✓
Legal status dummy	✓	✓	✓
Industry dummy	✓	✓	✓
Region dummy	✓	✓	✓
Observations	38718	25228	25228

Notes: This table presents the results of Probit method with endogenous covariates for the model in Equation 2. The model specification is as in the last column of Table 2 which includes our most restrictive set of dummy variables: year, legal status, industry and region. The excluded instrument in column two is the average industry-region sales and the excluded instrument in column three is security costs. In column four, we use both instruments. The dependent variable takes the value 1 if the firm has paid bribes and 0 otherwise. The coefficients in the table represent the marginal effect of the variables on the incidence of bribery.

*, **, and *** represent significance level at 10%, 5% and 1% respectively. Robust standard errors are in parenthesis.

Table B.2: Bribery Determinants — IV regressions (Intensive margin)

	IV1	IV2	Both IVs
Log Sales	1.150***	.784***	.819***
	(.387)	(.178)	(.129)
Permits & licenses	.096	.113	.102
	(.176)	(.086)	(.082)
Trade	–.527	–.438	–.457
	(.377)	(.296)	(.288)
Foreign ownership	–.708*	–.095	–.116
	(.424)	(.368)	(.360)
Manager Experience	–.026**	–.017*	–.017*
	(.012)	(.010)	(.010)
Log Age	.303	.293*	.288**
	(.187)	(.151)	(.147)
Year dummy	✓	✓	✓
Legal status dummy	✓	✓	✓
Industry dummy	✓	✓	✓
Region dummy	✓	✓	✓
Observations	5700	3887	3887
R^2	.38	.51	.50
Partial R^2	.07	.21	.24
F-stat of the instruments			
Excluded instruments			
Overidentification (p-value)			

Notes: This table presents the results of 2SLS method for the model in Equation 1. The model specification is similar to the last column of table 3 which includes our most restrictive set of dummy variables: year, legal status, industry and region. The excluded instrument in column two is the average industry-region sales and the excluded instrument in column three is security costs. In column four, we use both instruments. The dependent variable is the natural logarithm of bribe payment. The models only account for the observations with non-zero bribe payment.
At the bottom of the table, we report the performance of the instruments, namely, Partial R^2 and Cragg-Donald Wald statistic (F stat of the instruments).
*, **, and *** represent significance level at 10%, 5% and 1% respectively. Robust standard errors are in parenthesis.