Corruption and Firm Growth: Evidence from around the World*

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May 2022

Abstract

We empirically investigate the relationship between corruption and growth using a firm-level data set that is unique in scale, covering almost 88,000 firms across 141 economies in 2006-2020, with wide-ranging corruption experiences. The scale and detail of our data allow us to explore the corruption-growth relationship at a very local level, within industries in a relatively narrow geography. We report three empirical regularities. First, firms that make zero informal payments tend to grow slower than bribers. Second, this result is driven by non-bribers in high-corruption countries. Third, among bribers growth is decreasing in the amount of informal payments — in both high- and low-corruption countries. We suggest that this set of results may be reconciled with a simple model in which endogenously determined higher bribe rates lead to lower growth, while non-bribers are often excluded entirely from growth opportunities in high-corruption settings.

Keywords: corruption, firm growth, enterprise surveys

JEL codes: D22, O12

*The authors are grateful to Ralph de Haas and Helena Schweiger for excellent comments and suggestions and to Tea Gamtkitsulashvili for the excellent research assistance.

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1 Introduction

A large literature has documented the adverse impact of poor governance on economic growth (e.g., Mauro, 1995; Robinson et al., 2005). A business environment characterized by corruption or weak rule of law makes investment riskier while depriving governments of revenue (e.g., Wei, 2000). It leads to an increased reliance on political and personal connections, which in turn distorts market signals and results in suboptimal allocation of capital and labor (Faccio, 2006; Murphy et al., 1991; Khwaja and Mian, 2005).

At the level of an individual firm, however, the relationship between corruption and growth is more ambiguous conceptually and less studied empirically. Faced with onerous regulations and inefficient bureaucracies, a firm may find that its best option is to make informal payments in order to "grease the wheels." The opportunity to jump the queue may be particularly valuable for firms with greater opportunity cost of wasted resources (Lui, 1985). In this scenario, firms that report making informal payments will conceivably grow relatively quickly. The relationship also depends, however, on a firm's ability to negotiate with corrupt officials in a market that often lacks clear pricing benchmarks. Indeed, Svensson (2003), Bai et al. (2017), Amodio et al. (2021) and others document a broad range of corruption experiences among firms in narrowly defined industries or geographies.

While arguments about the costs and benefits of corruption are well established, empirical evidence on the value (positive or negative) of corruption to a typical firm, holding the business environment constant, is relatively scarce. We aim to begin filling this gap by establishing several stylized facts about corruption and firm growth in a large cross-country firm-level data set covering almost 88,000 firms across 141 economies during 2006-2020. Our data are derived from the Enterprise Surveys, a set of repeated cross-sectional surveys conducted by the World Bank Group, which follow a common methodology. As part of face-to-face interviews, the respondents—senior managers or owners of firms—answer a wide range of questions about their firms' activities and experiences, including those related to recent sales growth and employment, as well as corruption. The countries included in the surveys span a broad range of corruption environments, from Zimbabwe to Estonia (the latter has a corruption perceptions rating from Transparency International that is better than that of the U.S.).

The range and scale of the data enable us to examine the correlation between firms' corruption experiences and their growth, comparing businesses within a given industry and a subnational region at a point in time.

We report several stylized facts. For the sample overall, firms that report making zero informal payments have relatively weak growth in sales and productivity when compared to other firms in their industry-region-year cell, as do firms with relatively high informal payments. (Thus, if one looks simply at a linear specification relating informal payments to growth—within an industry-region-year grouping—there is no significant association). Using a specification that

allows for considerable flexibility in functional form, we verify that there is indeed a discontinuity at zero in the relationship between informal payments and growth. We further argue that the zero bribe "penalty" does not reflect misreporting, as it is driven by survey respondents who also report (despite making zero informal payments) that corruption is a "moderate," "major," or "very severe" obstacle for doing business – responses that we would not expect from firms that wish to avoid complaining about corruption. We also examine how this relationship differs in high versus low corruption settings, splitting our sample countries at the median of the Worldwide Governance Indicator for Control of Corruption. We find that, whereas firms that make high rates of informal payments grow slowly in both subsamples, the zero bribe penalty is driven entirely by the high corruption subgroup.

The magnitudes of the effects we describe above are substantial, implying a 3 percentage point lower annual sales growth rate for firms that do not make informal payments in countries where such practices are the norm. The negative relationship between informal payments and growth is such that non-bribers grow more slowly than firms making informal payments of up to 10% of sales.

The relationships we document do not necessarily imply a causal link from corruption to firm growth and productivity – even with the inclusion of industry-region-year fixed effects, many of the caveats and critiques of cross-region or cross-country corruption analyses apply here as well. However, our data are able to reveal some nuance to the corruption-growth association: firms that pay high bribes grow more slowly, but so do firms that abstain from bribery altogether. While these regularities are not impossible to reconcile with reverse causation, we suggest that the simplest versions of such models would predict a subset of these results, but not the collective set of findings. We show that these patterns can be rationalized in a simple framework in which profit-maximizing firms have to deal with officials who issue permissions for the firm to pursue a certain profitable opportunity (such as construction permits or operating licenses). Firms which face (endogenously determined) steep bribe rates grow slowly, but so do firms which choose not to pay bribes and instead report bribe-demanding officials, and are unsuccessful in their petitions. We argue that in high-corruption settings officials may act with relative impunity, and these are thus the environments where we would observe non-bribing firms shut out of growth opportunities. We provide an illustrative model following our empirics to highlight the assumptions and implications of this framework.

Our paper contributes to the literature on governance and economic development. Modern empirical research on this topic was launched by Mauro (1995), which documented the cross-country relationship between corruption, and investment and growth, during 1960-1985. In the intervening years, a sizable body of work has enriched our understanding of what leads to weak institutions, and the consequences for development (e.g., Hall and Jones, 1999, and Robinson et al., 2005; see also Besley and Mueller, 2018, and Acemoglu et al., 2019 on the importance of political accountability). Researchers have also turned their focus to microeconomic data to better understand whether and how corruption and other institutional failures

constrain firm growth overall and lead to allocative distortions across firms. We review this literature in the next section. We see our contribution as providing the largest-scale analysis of credible observational data on firm bribe payments and growth, which reveals several heretofore undocumented empirical regularities that may provide input into the development of better theoretical foundations for understanding corruption, and also inform future empirical research on the topic.

The rest of the paper is structured as follows. The next section provides a more detailed review of prior research on corruption and firm performance. Section 3 outlines the data and methodology. Section 4 discusses our baseline empirical results, while in Section 5 we provide a set of heterogeneity and robustness results that build on and reinforce our main findings. We present in Section 6 a simple modeling framework that can rationalize our findings, and in Section 7 we discuss the extent to which alternative modeling approaches might fit with our data. Concluding remarks follow in Section 8.

2 Corruption and firm performance

The link from institutional quality (as reflected in robust property rights enforcement and constraints on rent-seeking by those in power) to economic development plausibly runs in part through the impact on individual firms. Predation by officials and weak legal enforcement inhibits investment because of lower and more uncertain returns. Prior work suggests that bribery is thus several times more detrimental to firm growth than formal taxation, based on cross-country analysis of foreign investment (Wei, 2000) and firm-level evidence from Uganda (Fisman and Svensson, 2007). Furthermore, weakness in the rule of law tends to increase the reliance of individuals and firms on personal connections, thus blunting market signals and leading to labor and capital misallocation across firms (Bussolo et al., 2018). Governance can influence long-term economic outcomes in part by altering the structure of economic activity. Economies with stronger institutions tend to specialize in sectors that are more reliant on innovation and complex contracts, and utilize more production inputs to produce final goods (Nunn, 2007; Levchenko, 2007; Silve and Plekhanov, 2018).

While extant evidence indicates that corruption lowers growth for firms overall, the relationship between the choices of individual firms—holding institutional context fixed—and performance is ambiguous. There are several well-known arguments for why bribe-paying firms may perform relatively well. Faced with onerous regulations and inefficient bureaucracies, firms may choose to make informal payments to "grease the wheels."[1] Firms that are better connected, less principled, or otherwise face lesser frictions in making informal payments may

[1] At the level of the economy overall, this argument may be turned on its head due to "endogenous red tape;" see, e.g., Guriev (2004). However, our analysis is within industry-region-year cells; this presumably allows us to control to some extent for the local regulatory environment.

also be afforded opportunities that are unavailable to other businesses, which may also allow bribe-payers to grow faster.

Firm-level evidence on the corruption-performance relationship is limited. Fisman and Svensson (2007) find a strong negative association between informal payments and sales growth in Uganda in the 1990s; De Rosa et al. (2015) document a positive relationship in most economies in Central and Eastern Europe, apart from three high-corruption economies where the relationship is negative; Aterido et al. (2011) find inconclusive results on the link between the incidence of facilitation payments in a certain region/sector and employment growth. Foreshadowing the inevitable endogeneity concerns that will arise in our analysis, Bai et al. (2017) show that growth *causes* a reduction in bribe extraction, based on an instrumental variables strategy applied to Vietnamese firm-level data. Amodio et al. (2021) use a randomized experiment to study the relationship between firm characteristics and bribery in the Kyrgyz Republic. They show that rewarding tax inspectors for higher anonymous evaluations by firms decreases corruption but also shifts inspections toward firms with lower elasticity of demand, fewer competitors, larger market shares, higher revenues, and higher profits.[2]

As we noted at the outset, our contribution is not to solve the endogeneity problems inherent in studying the corruption-growth relationship, but rather to document in a vast and credible dataset a number of patterns that may inform our understanding of the theories and frameworks that we briefly delineate above, which have heretofore been studied only in more narrowly bracketed samples and settings.

3 Data

Our empirical analysis draws on a cross-country firm-level dataset of unique scale. The Enterprise Surveys follow a common methodology and contain detailed data on sales, employment and the business environment for firms operating in 141 economies during 2006-2020. Most participating countries are low- and middle-income economies, although the sample also includes a number of advanced economies (such as Italy, Israel and Portugal) offering a wide range of corruption experiences, from, say, Zimbabwe to Estonia. The former is consistently ranked as among the most corrupt in global corruption perception surveys, while Estonia is ranked on par with Iceland (and eight ranks above the U.S.) in Transparency International's 2020 Corruption Perceptions Index.

These face-to-face representative surveys cover firms with at least five employees. Strat-

[2] This evidence is consistent with an imperfect competition model developed in Amodio et al. (2021) where firms differ by demand elasticities. Like in our paper, higher bribe rates set by inspectors result in lower output. On the other hand, in Amodio et al.'s model, firms' complaints about inspectors are an exogenous function of foregone profits (the complaints are anonymous and bring neither costs nor benefits to the firms); in our case, this is an outcome of strategic interaction between firm and bureaucrat given the country-specific level of enforcement.

ified random sampling is performed by broad sector (manufacturing, retail and other services, with further subsectors in selected economies), firm size (5-19 employees; 20-99 employees; and 100+ employees) and by subnational region. Surveys exclude enterprises fully owned by the state, and for other firms surveyors record the levels of state and foreign ownership. All participating firms operate in the formal sector. The dataset is a repeated cross-section, although a handful of firms enter the survey in more than one wave; in Section 5 we make use of the relatively small subset of respondents – 12 percent of our main sample – that were surveyed twice (or in some cases even three times).

A typical (median) firm covered by the survey is a domestically-owned private-sector firm with 20 employees serving the domestic market, with US$ 570,000 in annual revenue. The median firm has been operating for 16 years and has two-year annual sales growth (in US dollars) of 5.2% (see Annex Table A2). We omit firms that report positive or negative change in sales in excess of 50 times over the two-year period as these likely reflect errors in the data, a total of 1.2% of sample firms.

As part of the survey, respondents (who, recall, are all senior managers or owners of firms) are asked the following question: *"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?"* The wording seeks to elicit a truthful response given the topic's sensitive nature. Additionally, the survey records various firm characteristics as well as data on sales and employment in the last fiscal year and the three years prior.

On average, firms in the sample report spending 0.8% of revenues on informal payments. This figure ranges from more than 7% in Sierra Leone to 5% in Uganda to 3% in Albania, to less than 0.01% in most advanced economies. The informal payment rate—or the bribe rate—tends to be higher in economies where corruption is more pervasive based on the Worldwide Governance Indicator of the Control of Corruption. See Appendix Figure A1 for a country-level scatterplot depicting the relationship between Control of Corruption and the mean fraction of firms that report non-zero bribes (Panel A), as well as a scatterplot of the relationship between Control of Corruption and the average bribe rate for the subset of bribe-paying firms. As in Fisman and Svensson (2007), we exclude a small number of firms with unrealistic reports of informal payments, in excess of 50% of sales.

While the majority of firms report making no informal payments, this does not necessarily imply corruption-free business environments for these firms. In fact, we see evidence that this is not the case in our own data. Surveyed firms were asked to evaluate corruption as a constraint to doing business on a five-point scale ranging from corruption being "no obstacle" (coded 0) to corruption being a "very severe obstacle" (coded 4). Of the firms that report no informal payments, 14% nonetheless described corruption as a severe obstacle to doing business,

suggesting that they may make a conscious choice to forego opportunities to make facilitation payments; only 37% of zero-bribe firms refer to corruption as "no obstacle" at all. Interestingly, the correlation between the country-level Control of Corruption variable and firms' responses on this five-point scale is just as strong for firms that report zero informal payments as it is for firms that report positive bribes (Appendix Figure A1, Panels C and D).

The nearly 88,000 firms that constitute our main estimation sample are drawn from a larger dataset of 167,286 firms. In addition to the small fraction of firms that are screened out as described above due to unrealistic data on informal payments or sales, a substantial number of firms do not provide responses to some of the key variables in our analysis. Specifically, 14% declined to answer the question about informal payments. This may reflect respondents' genuine lack of knowledge of the issue or reluctance to answer the question if the firm is making informal payments. Our main concern is whether missing bribe data is correlated with sales growth, or with firms' vulnerability to corruption. Importantly, we show in the first column of Appendix Table A1, missing bribe data is not predicted by firm growth; in the second column we show that it is also uncorrelated with country-level Control of Corruption index (since this varies at the country-level, column (2) has only sector-year fixed effects).[3]

The main dependent variable of interest is sales growth, calculated as the log difference between sales in the last fiscal year and the three years prior, divided by two. We convert sales figures in national currencies to US dollars. We consider growth of sales per worker, as a proxy for labor productivity, and employment growth as alternative dependent variables. Calculating growth rates from recollection of past sales may introduce measurement error. However, since all firms operate in the formal sector, they would be expected to have formal accounts that senior managers would have access to, and can be consulted during interviews.

We generate a control to account for the fact that underperforming firms may have many complaints, real or imaginary, including extortion by corrupt officials – Kaufmann and Wei (1999) call such propensity to complain the "kvetch effect." Our "kvetch index" is measured as the difference between a firm's perception of transport, electricity and access to land as obstacles to its operations and the country average complaints about these aspects of the business environment. In each case, firms were asked to evaluate a potential constraint on the same five-point scale as for corruption.

[3] Full details on observations lost from the original dataset are as follows: Of the full 167,286 observations, we exclude 43,137 observations with missing sales growth and a further 19,057 observations with missing data on informal payments. 1,382 further observations were discarded because of improbably high sales growth, and a further 193 because of informal payments above 50% of sales. We then exclude an additional 14,158 observations with missing information on age, ownership, kvetch index, lagged employment, sector or region. Finally, we drop 1,530 observations that were single observations in the region × sector × year cells that make up the fixed effects in our main model. Because so many of the observations are lost due to missing data on sales growth, we also look at the correlates of missing sales growth data in column (3) of Appendix Table A1; the most striking correlation by far is with age, which is unsurprising given that sales growth is defined retrospectively over two years, so growth is thus defined for firms that are at least two years old. In column (4), we measure age by a set of indicator variables; we find that indeed sales growth is missing primarily for very young firms (the omitted category is firms greater than 10 years old).

In Appendix Table A3 we show the patterns in bribe payments over time. Of the 141 countries in our sample, most only appeared in one or two waves; however, 37 countries were surveyed in each of the three waves, allowing us to look at how firms' informal payments have changed in recent years. This kind of over-time comparison is generally difficult in perceptions-based cross-country measures (see, e.g., Fisman and Golden, 2017). The most striking pattern is the dramatic decline in the fraction of firms that report paying bribes; the share of such firms fell by half across the three waves. Among the firms that do pay bribes, the average bribe rate has not changed substantially over time, remaining at 5-6% of sales.

As we emphasize throughout, our findings are correlational, and we would not necessarily expect bribers to be identical on other dimensions to non-bribers. We can hope that our fine-grained controls account for some of the differences between the two groups of firms. We may furthermore probe the extent to which the two groups are imbalanced on other covariates, which may give a sense of the extent to which omitted variable concerns are likely to loom large in the analysis below.

In Table 1, we look at the characteristics of bribers versus non-bribers by regressing the non-zero bribe dummy on firm characteristics. We begin with a specification that includes only sector-location-year fixed effects and log(Sales), which serves as a proxy for size or visibility of the firm. The small and statistically insignificant coefficient on log(Sales) argue against any explanation for our results based on the targeting of high ability-to-pay firms with growth potential, as size is the most readily observable proxy for deep pockets; we return to a discussion of targeting after presenting our main results. In column (2) we include a number of other covariates that we use in our main regressions below, and which we might anticipate could be correlated with bribe payments. Exporters are more likely to pay bribes and foreign firms less likely to do so. The first of these very plausibly reflects interaction with the customs bureaucracy; the latter may reflect a host of factors that limit officials' ability to extract payments from foreign firms, and their ability to resist such overtures. Also unsurprising – firms that tend to complain about other business impediments also are more apt to report paying bribes (though we note that this could be a bad control in this regression; comfortingly, its inclusion/exclusion has little effect on other reported coefficients here, nor does its inclusion affect the main results reported below). Neither age nor government ownership is correlated with paying bribes. In column (3) we add profits as a covariate, measured as revenues minus costs deflated by revenues. Note that the sample is far smaller in this specification, as most firms do not provide cost data. Profits are positively correlated with the likelihood of a bribe demand, which is consistent with some degree of targeting (though also with a correlation between profitability and growth prospects, a point we return to below). We note that none of the other coefficients change sign (or magnitude) relative to column (2), despite the shift in sample.

4 Baseline Results

We regress the annualized change in the logarithm of the sales of firm i between time $t-3$ and time $t-1$ ($\Delta log(Sales_i)$) on various parameterizations that capture the extent to which firms make informal payments to officials ($Bribes$):

$$\Delta log(Sales_i) = \alpha + \beta Bribes_i + \lambda Z_i + \upsilon_{rst(i)} + \epsilon_i, \quad (1)$$

where Z is a vector of firm-level controls including the logarithm of lagged sales in US dollars, the logarithm of lagged employment, indicator variables for ownership type (state ownership, foreign ownership or private domestic ownership), the logarithm of firm age, and exporter status; $\upsilon_{rst(i)}$ is a set of 5,340 fixed effects for subnational region $\times$ sector $\times$ year, and ϵ_i is the error term, with standard errors clustered at the region-sector-survey-wave level. The fixed effects absorb the many factors that may be correlated with both rent extraction and growth across industries or areas, and focuses our analysis on the relationship between bribery and growth within relatively narrow groupings of firms. Finally, Z also includes a control for a firm's propensity to complain about various constraints on its operations, as captured by the kvetch index.

Results based on specifications of this form appear in Table 2. Column (1) provides a minimalist specification which includes region-sector-year fixed effects, since we are focused on the within- rather than cross-economy relationship between informal payments and growth, and uses $BribeShare$, defined as informal payments as a fraction of sales, as our measure of bribery. Interestingly, while the coefficient on $BribeShare$ is negative, it is not statistically significant, and is of modest magnitude.[4] A one percentage point increase in the share of informal payments is associated with a reduction of 0.053 percentage points in the annual growth of sales; given the standard error of 0.052 percentage points, we can reject effect sizes larger than 0.15 percentage points at the 5% level, based on a two-tailed test.

In column (2) we rerun this specification using instead an indicator variable for non-zero informal payments, Non-zero $BribeShare$, as our measure of firm-level bribery. Interestingly, the coefficient changes sign, with a positive relationship between making a non-trivial informal payment and firm growth. The coefficient is significant at the 5% level and large in magnitude: bribe-paying firms grow 1 percentage point per year *faster* than those with zero bribes.

In column (3), we include the measure of bribe share as well as the indicator variable for non-zero bribes. Given the opposing forces observed in the prior columns, it is unsurprising that the coefficients on both terms increase in magnitude. The point estimate on $BribeShare$ is

[4] In Appendix Table A4, we present our baseline results in a weighted regression using the BEEPS sample weights; we favor the unweighted regressions, given the very wide range in sample weights – the most heavily-weighted firms receive a weight that is 50,000 times that of the least-weighted firms (and it is also unclear that weighted regressions are preferred in any event (Solon et al., 2015)). In practice, the results are very similar.

-0.14, and 0.018 on Non-zero $BribeShare$ ($p < 0.01$ in both cases). In our preferred specification in column (4) we add the full set of firm-level controls described above; for brevity, we do not report the point estimates on these controls (these are presented in Appendix Table A5). In this preferred specification, both coefficients increase marginally in magnitude, and are estimated with comparable precision as in the previous column. The point estimates imply that firms paying even fairly high bribes grow more rapidly than bribe-abstainers, with the 'crossing point' coming only at $BribeShare = 0.09$ (0.021/0.232), which is the 78^{th} percentile of the distribution of $BribeShare$ conditional on taking a positive value.

Finally, in column (5) we allow for greater flexibility in the relationship between the share of informal payments and firm growth via a set of indicator variables which capture various ranges of $BribeShare$. The coefficients reflect the link from informal payments to growth relative to the omitted category of $BribeShare = 0$. Broadly consistent with the prior results, we observe a positive relationship between relatively modest bribe payments and growth, with the relationship only changing sign at high rates of informal payments ($BribeShare > 0.10$).

We believe these results to be the first documentation of such a non-monotonic relationship between firm bribe payments and firm performance, one which is enabled by the granularity, detail, and scale of our data. Below, we will argue that it is unlikely to be driven by misreporting of zeros, and furthermore can be reconciled with an intuitive framework of how firms respond to the demands of corrupt officials.

Our intuition for this non-monotonicity is that firms which pay zero bribes are one of two types: (i) those which may operate without having to make informal payments; and (ii) those which choose not to pay bribes, and are potentially shut out of growth opportunities as a result. Intuitively, the latter effect should be more dominant in settings where corruption is pervasive.

Motivated by this intuition, in Table 3, we split the sample according to country-level corruption rankings, based on the Worldwide Governance Indicator of Control of Corruption. This measure—available at the country-year level—aggregates data from a large number of available surveys of corruption. Each year, the resulting country-level measures are normalized to have a global mean of zero and a standard deviation of 1 (see Kaufmann et al., 2009 for details). Higher values correspond to lower corruption. The Control of Corruption measure is highly correlated with other cross-country measures of corruption such as Transparency International's Corruption Perception Index.

We classify countries as low-corruption and high-corruption using the median observation of Control of Corruption in our sample. As the Enterprise Surveys focus on lower-income, less well-governed economies, the cut-off of -0.43 is well below the global mean. Thus, countries like Bolivia, India or Vietnam belong (just barely) to the low-corruption subsample. As expected, informal payments are far higher in high-corruption countries relative to low-corruption ones. For example, in the former group 20% of firms report non-zero informal payments versus 9.6%

in the latter.

We rerun our preferred specification that includes both *BribeShare* and Non-zero *BribeShare*, as well as firm-specific controls, for the two subsamples separately in Table 3. The coefficient on *BribeShare* is negative ($p < 0.05$) in both instances. However, the indicator variable denoting whether a firm makes informal payments at all is significant ($p < 0.01$) and large in magnitude only in the high-corruption subsample. That is, among bribe-abstainers, there is no growth penalty in lower-corruption settings, only in high-corruption environments.[5]

Before turning to the hetereogeneity and robustness analyses in the next section, we note that the effects we document above come primarily through labor productivity (sales per worker) rather than changes in employment. The results for labor productivity (Appendix Table A7) look very similar to those of Table 2, while the relationship between firm corruption experiences and employment growth is relatively weak (Appendix Table A8).

5 Heterogeneity and Robustness

In this section, we begin by exploring the extent to which the primary relationships we document in the preceding section vary across firm, sector, or country characteristics. In addition to providing the reader with a fuller view of the data, this analysis aims to probe the robustness of our results, and to provide further insight into the classes of models that may rationalize the non-monotonic relationship we document above. In the latter part of the section, we consider further issues of robustness, in particular with respect to functional form, and possible reporting bias that may arise as a result of the sensitive nature of bribe responses.

Throughout, we focus on our preferred specification that includes subnational region × sector × year fixed effects as well as firm-level controls, unless otherwise noted.

5.1 Firms reporting bribes as an obstacle

As we observed earlier, a firm that makes no informal payments may nonetheless be vulnerable to corruption. Indeed, when bribery is common, such firms may be *particularly* impacted by corruption because they are unable to exploit business opportunities. We thus split the sample based on whether a firm self-reports that corruption is at least a "moderate" obstacle to growth, under the presumption that the zero-bribe penalty should be more severe amongst those complaining of corruption as an obstacle to growth. We further argue that the 'high-obstacle' sample is useful because it includes firms for which underreporting of informal

[5] In Appendix Table A6, we further subdivide the sample into corruption quartiles; we again observe that the zero-bribe penalty is higher, and monotonically increasing, in country-level corruption. In the lowest-corruption quartile, there is no zero-bribe penalty.

payments is likely less of a concern, since these 'complainers' were willing to describe government corruption as a problem.[6]

We report the results of this sample split in Table 4. For the high-obstacle subsample in column (1), the point estimates on the bribe variables are greater in magnitude, relative to the full sample results, while the bribe coefficients for the low-obstacle subsample (column (2)) are smaller and, in the case of *BribeShare*, does not approach significance. (We obtain virtually identical results if we define complainers based on whether firms are above or below the country-level mean; see Appendix Table A9.)

It may also be instructive to compare how growth compares between non-complainers and complainers, focused on firms that do not pay bribes. Intuitively, there may be firms that refuse to pay bribes and suffer from it (as bureaucrats may block their projects). Second, there are firms that do not pay bribes but do not suffer from it (e.g., they are not asked to pay or perhaps are asked to pay but complain and are fortunate enough to see the bureaucrat removed). We assume that firms of the first kind are more likely to complain about corruption as an obstacle than those of the second kind. It is also natural to conjecture that the first ones have slower growth (their projects are blocked) than the second ones. In Appendix Table A10, we show that the growth rates of non-bribing complainers are indeed lower than those of non-bribing non-complainers.

5.2 Competition

Amodio et al. (2021) and other models of bribery and its consequences presume that firms are targeted based on their ability-to-pay, which is in turn a function of competition and thus demand elasticity. It is therefore natural to consider the extent to which the patterns we document vary by extent of product market competition. In a subset of surveys, firms were asked about the number of competitors they faced for their primary product. In most cases, they were given various ranges: 0; 1; 2-5; more than 5. For firms that provide a specific number, we collapse their responses into these categories and because so few firms report zero or one competitor, we pool these two groups. In the first column of Appendix Table A11, we revisit our main results, including the interactions of our main bribery measures with the firms' self-reported product market competition. None of the interactions approach significance, providing at least suggestive evidence against demand-side explanations for our main results. (Note that competition *is* negatively correlated with sales growth, suggesting that firms' responses are capturing some element of their competitive environments.)

In columns (2) and (3) we explore a more fundamental assumption of demand-side models — whether competition is correlated with bribe demands, whether based on a dummy variable

[6] We cannot rule out the opposite bias – that firms which report bribery as a problem are *more* likely to under-report bribes for fear of reprisal, though we believe that intuition is more straightforward in the other direction.

for non-zero bribes, or a continuous measure of bribe shares. In the first case, we find that firms in more competitive settings are *more* likely to report paying positive bribes, while the point estimates on the competition variables are insignificant in predicting bribe shares.

5.3 Vulnerability to government decision-making

In this subsection, we look at heterogeneity in the bribe-growth relationship as a function of attributes that potentially reflect a vulnerability to decisions made by government officials. Specifically, we split the sample based on whether a firm (a) has secured or attempted to secure government contracts; (b) engages in import activity; (c) engages in export activity. We acknowledge that all three dimensions surely capture a broad set of firm characteristics, and thus any differences (or lack thereof) along any of these dimensions should be interpreted with caution. We also note that export and import status is missing for a very large number of firms.

With those caveats in mind, we present the three sets of sample splits in Table A12. While the coefficients do vary from column to column, the most striking feature of the table is the fact that the main U-shaped relationship between bribery and growth exists across all subgroups.[7]

5.4 Sector- and Country-level heterogeneity

We conclude with several tables that split the sample by sector and country characteristics. In Appendix Table A13, we disaggregate the sample into firms in Light and Heavy manufacturing, Wholesale and Retail, Utilities and Construction, and Others; we observe quite similar patterns across all sectors.

In Appendix Table A14, we consider whether the bribe-growth relationship differs by other country-level attributes, in particular level of democracy and income. In columns (1) and (2), we split the sample based on whether a country's Polity IV score is at least 6; we observe similar patterns for both democracies and non-democracies. In columns (3) and (4) we divide the sample based on whether it is classified as a lower-income or middle-income country by the World Bank (our sample includes very few high-income countries). Again, the main patterns are observed in both subsamples.

[7] A related dimension of heterogeneity is the type of bribe paid. In particular, one may distinguish amongst, for example, bribes paid to sidestep labor or environmental rules, to obtain government contracts, or to prevent hold-up by customs officials. Unfortunately, our data are not well-suited to drawing these distinctions. While firms were asked about various types of bribes paid, there are many missing values for each type, and if one looks at the intersection of firms with non-missing data for all bribe types, the sample drops to about 1000 firms.

5.5 Robustness checks

5.5.1 Functional Form

In the preceding section, we explored the non-monotonicity of the bribe-growth relationship via our two main specifications, both of which place particular emphasis on the bribe versus no-bribe threshold. We begin our robustness checks by further examining the robustness of this discontinuity, and whether alternative functional forms fit the data better.

A natural approach would be to provide a non-parametric plot or kernel-weighted local polynomial regression relating bribes to growth, to trace out the relationship in a less restrictive way. However, as seen in Appendix Figure A2, which shows the distribution of *BribeShare* responses in the range $(0, 0.10]$, such an exercise is not feasible. Specifically, we observe large modes at round numbers, making it impossible to estimate a continuous relationship. This is unsurprising given that, as we describe in the Data section, most *BribeShare* data are based on respondents' estimates of informal payments as a fraction of sales. When we telescope in to the range $(0, 0.001]$, i.e., just above zero, we observe a considerably smoother distribution, albeit for a relatively modest number of observations (see Appendix Figure A3).

To further probe the relationship between informal payments and growth in these barely-positive observations, we subdivide the category $(0, 0.001]$ into roughly-equal quartiles – $(0, .0001]$, $(.0001, .0003]$, $(.0003, .0006]$, $(.0006, .001]$[8] – and repeat the analysis from Table 2, column (5) above, with this finer partition of the smallest category. These results appear in the first column of Appendix Table A15. We observe that for all very low levels of informal payments, the coefficients are positive and of approximately the same magnitude, consistent with the "zero bribe penalty" we described in our main results. Based on this specification, we further graph out the coefficients as well as confidence intervals in Figure 1, which provides a clear visual representation of the bribe-growth relationship.

We also explore whether a higher-order polynomial provides a better fit for the data. In the second column of Appendix Table A15, we augment our main specification from Table 2 to include a quadratic *BribeShare* term. The coefficient on the linear term is somewhat more negative and still significant ($p<0.01$); the quadratic term is positive, implying some concavity in the relationship, though the point estimate does not approach significance. The point estimates imply a downward-sloping relationship for all bribe shares below $0.341/(2*0.332)=0.51$. In column (3) we add a cubic term; the higher-order terms are again at most marginally significant, and their point estimates imply a downward-sloping linear relationship for all positive bribe rates.

Overall, these patterns suggest that the parsimonious specification in our main table captures well the main features of the bribe-growth relationship in our data.

[8] This leads to groupings of 386, 341, 370, and 318 observations.

Throughout, we have focused on bribes as a fraction of sales as our measure of bribe extraction. We consider in Appendix Table A16 a specification that uses the natural log of (one plus) total bribe payments instead. The patterns are similar to those described in our main results – among bribe-paying firms, those that make higher bribes also grow more slowly.

5.5.2 Respondent Demand Effects

Social desirability bias and related issues inevitably arise in studying corruption via survey responses. As with most corruption surveys, the Enterprise Surveys are designed to minimize respondent bias, by asking firms about "establishments like this one" rather than themselves. The firm does not thus implicate itself directly (in a legal sense or otherwise) in illicit behaviour. While the particular wording used in the survey may alleviate some questions of legal culpability, the issue of social desirability bias surely remains, and is not fully obviated by the indirect wording nor the kvetch index control (which captures a general willingness to complain) that we utilize in our main analysis.

In our main analysis, we use a kvetch index that most closely parallels that of earlier work, but in this subsection we consider an alternative 'propensity to complain' measure that is more specific to complaints about government officials, and thus may be a more direct proxy for a firm's general willingness to be critical of the government.

We use questions from the Business-Government Relations section of the questionnaire, focusing in particular on the questions about the extent to which the following are barrier to business: (a) tax rates; (b) tax administration; (c) business and licensing permits; (d) political instability. We aggregate these into a "Government Kvetch Index" (GKI) which has mean zero and standard deviation one, increasing in a tendency to complain about government.

We first observe that the GKI is positively correlated with *BribeShare* (or the indicator variable for non-zero informal payments), but the correlation is far short of one. For example, the raw correlation between the GKI and informal payments is 0.09, and the correlation with the non-zero dummy variable is 0.13; the correlation continues to hold even when fine-grained controls are included. When we include the GKI as a covariate in our main regression, however, our results are essentially unaffected. We provide these additional results in Appendix Table A17. Overall, while we cannot fully rule out the possibility that respondent demand effects play a role in our main findings, we believe that the discussion and results we report here suggest that it is unlikely to be the case.

5.5.3 Analysis Based on Resurveyed Firms

Enterprise Surveys re-interviewed a small subset of firms between two and eleven years after the initial survey. Of the 87,829 firms in our total sample, drawn from 141 countries,

10,691 (12 percent) were resurveyed, representing 86 countries. Of these, 2,474 were resurveyed a third time, between 2 and 9 years after the second survey.

We may use this subsample to assess the extent to which it is problematic that, in our main analysis, we use contemporaneous bribe payments and growth over the *previous* two years. Implicit in the formulation we use in our baseline specification is that bribe extraction is stationary or at least slow-moving. We can provide a check on whether the timing of bribes versus growth might be driving our results by utilizing data from the resurveyed firms. Because of the much smaller sample size, it is not possible to include the full set of sector×country-region×year fixed effects. We use instead sector, country-region, and year fixed effects (rather than their interactions).

We present these results in Appendix Table A18, in which our measures of bribery come from lagged survey responses, and the two-year sales growth outcome is based on a following-round survey. We include the same covariates as in our main analysis, and also a set of dummy variables to capture the time elapsed between surveys (between two and eleven years, with 67 percent of firms resurveyed between four and six years after the initial survey). In this subsample, the coefficient on Non-zero *BribeShare* is almost identical to the estimates in Table 2, while the coefficient on *BribeShare* is negative though about half the magnitude of the coefficients estimated in our main table; owing to the much smaller sample size, these results are imprecisely estimated, however (p-values of 0.10 and 0.33 respectively). To assess the role played by the different samples in comparing this subsample to our main results, in the second column, we present results for this subsample, but using the specification from our main table (i.e., contemporaneous rather than lagged bribe variables on the right-hand side); these point estimates are virtually identical to those in Table 2 though again imprecisely estimated. Finally, to assess whether the different fixed effects are relevant for comparing these results to our main table, in the third column we use the full sample from Table 2 but the more limited set of fixed effects used in column (1) of Table A18; again the point estimates are very similar to those of our main table. While not dispositive, these patterns suggest that the particular time structure of our data is unlikely to account for the patterns we document in Table 2.

6 The model

We present a simple game-theoretical model of corruption that shows how the empirical findings above can emerge in equilibrium.

6.1 Setup

Consider three sets of risk-neutral agents: principal P, bureaucrat B, and a continuum of firms F normalized to 1. Firms are indexed by $i \in [0,1]$; they differ in their cost structures; the cumulative distribution function is $G(\cdot)$.

The principal is not a strategic player. If a firm reports corrupt behaviour by a bureaucrat, the principal fires the reported bureaucrat with probability $1-k$.[9] The parameter $k \in [0,1]$ is a country-level measure of corruption. If fired, B incurs a non-pecuniary cost z. The parameter z should be understood as a bureaucrat-specific preference parameter.

Each firm i has a growth opportunity which generates additional output y at a firm-specific cost $c_i(y)$. $c_i(y)$ is an increasing convex twice differentiable function: $c_i'(y) > 0, c_i''(y) > 0$. The growth opportunity may involve a fixed cost, so $c(0)$ may be positive. In what follows, it will be convenient to use the profit function:

$$\pi_i(p) \equiv \max_y \{py - c_i(y)\}.$$

Here p is the price of output y. For simplicity, we normalize units of output so that the price in the absence of bribes is equal to 1. Thus, when the firm expects to pay a share b of its output in bribes, its after-bribe profit should be $\pi_i(1-b)$.

We denote the profit-maximizing level of output $y_i^*(p) \equiv \arg\max_y \{py - c_i(y)\}$. By definition, $y_i^*(p)$ is an increasing function. The envelope theorem implies that $y_i^*(p) = \pi_i'(p)$.

The bureaucrat extorts bribes by threatening to block the growth opportunity. He maximizes the expected amount of bribes minus the cost of being fired if caught.

6.2 Timing

The game is as follows:

1. B makes a take-it-or-leave-it offer to F, that it pay a share $b \geq 0$ of output as a bribe, or B will block its growth opportunity. B does *not* observe the cost structure, so the offer is the same for all firms.[10]

2. Each firm i chooses whether to accept or reject the offer.

   (a) If F accepts, it then chooses y_i. F receives $(1-b)y_i - c_i(y_i)$. B receives by_i.

[9] It is easy to provide microfoundations of this behaviour with a strategic principal and multiple bureaucrats.

[10] In Appendix B we consider a more general model where B can offer contract menus with different bribe levels and different outputs and the firm self-select into contracts. In Section 7, we discuss why this model's predictions are not consistent with our empirical findings. Our assumption that B makes the same offer to all firms is related to difficulties of enforcing sophisticated contracts outside the legal system.

(b) If F rejects, it complains to the principal P. The outcome depends on the country's level of corruption k:

i. With probability k, the complaint is neglected, and B denies the growth opportunity to F. Both get zero.[11]

ii. With probability $1-k$, B is fired, and there is no bribe $b=0$. F chooses y_i and receives $y_i - c_i(y_i)$. B pays cost z.

6.3 Assumptions

We make several assumptions that simplify the analysis below. Without loss of generality, we sort the firms by $\xi_i \equiv \frac{\pi_i(1)}{\pi_i'(1)}$.[12] We denote the density function $g(\xi) \equiv G'(\xi)$. We assume that the density is finite and that the distribution $G(\cdot)$ of ξ_i has a finite support $\left[0, \bar{\xi}\right]$:

Assumption 1. *There exists a finite $\bar{\xi} > 0$ such that $G(\bar{\xi}) = 1$.*

The second assumption ensures that the equilibrium bribe share is small $b \ll 1$ (as observed in the data):

Assumption 2. *For all firms $g(0)\frac{\pi_i'(1)}{\pi_i''(1)} \ll 1$.*

As becomes clear later, this assumption allows for a Taylor expansion at $b \ll 1$ which simplifies the analysis.

Finally, we make the following "comparability" assumption:

Assumption 3. *In the absence of bribes, firms have the same output growth $y_i^*(1) = y^*$.*

This assumption implies that the heterogeneity between firms relates to their sensitivity to bribes, while without bribes their output is the same.[13] This implies that even if the bureaucrat observes the output before approaching a firm, he still does not have information regarding its profits and thus does not know whether the firm will accept or reject the offer to pay the bribe.

6.4 Analysis

We first need to determine which firms accept to pay the bribe and which ones refuse. When firm i agrees to pay, it receives $\max_y \{(1-b)y - c_i(y)\} = \pi_i(1-b)$. If it refuses, the

[11] The firm does not pay the fixed cost $c_i(0)$ as the latter is associated with the growth opportunity rather than the firm's current business.

[12] This parameter can be understood as the profit margin (profit/sales ratio) in the absence of bribes. Indeed, the sales in the absence of bribes are $y_i^*(1) = \pi_i'(1)$. In terms of the cost function, ξ_i is a proxy for the relative importance of fixed versus variable costs. The higher the fixed costs, the lower $\frac{\pi_i(1)}{\pi_i'(1)}$.

[13] The assumption of the same output in the absence of bribes does not rule out heterogeneity across firms in terms of cost structures. For example if firms have the same variable costs but different fixed costs, they have the same $y_i^*(1) = \pi_i'(1)$ but different $\pi_i(1)$ and therefore different ξ_i. Firms may also differ in terms of $\pi_i''(\cdot)$ and other characteristics.

expected payoff is $(1-k)\pi_i(1)$. Therefore, firm i agrees if and only if

$$k \geq \frac{\pi_i(1) - \pi_i(1-b)}{\pi_i(1)}.$$

Assuming that the equilibrium bribe share is small ($b \ll 1$), we obtain

$$\frac{b}{k} \leq \frac{\pi_i(1)}{\pi_i'(1)} = \xi_i. \tag{2}$$

Since firms are sorted in the order of increasing ξ_i, for a given b there exists a cutoff $\hat{i}(b/k)$ that for all $i > \hat{i}(b/k)$ firms agree to pay the bribe and for all $i < \hat{i}(b/k)$ firms refuse. Obviously, $\hat{i}(b/k)$ is increasing in bribe b, holding country-level corruption k constant.

Condition (2) implies that firms with higher profit to sales ratios are more likely to accept paying a bribe. This is intuitive as firms that agree to pay a bribe lose a share b of their sales, while firms that refuse lose their profits with probability k. This result is consistent with the data (see Column 3 in Table 1).

We can now solve for the bureaucrat's optimal strategy. His payoff is

$$b \int_{b/k}^{\bar{\xi}} y_i^*(1-b) dG(\xi_i) - (1-k) z G(b/k). \tag{3}$$

where $y_i^*(1-b)$ is the optimal output of firm i, given the bribe, and $y_i^*(1-b) = \pi_i'(1-b) = y^* - b\pi_i''(1) + o(b)$ is a decreasing function of b.

When maximizing (3), the bureaucrat faces a standard trade-off: higher b increases the bribe collected from each firm that agrees to pay the bribe, but also in a greater share of firms refusing to pay the bribe.[14] The trade-off leads to the optimal choice of b as a function of the distribution of firms' types $G(\cdot)$, the bureaucrat's cost of being fired z, and country-level corruption k.

6.5 Comparative statics

We now discuss the comparative statics with regard to exogenous parameters k and z, and show that the results are consistent with the empirical findings from Section 4.

1. Extensive margin.

Let us compare the output growth y of firms with $b = 0$ and $b > 0$. For a given b set by

[14] This trade-off is similar to the one in a standard monopoly model where the monopolist raises its price even if a higher price reduces the volume of sales.

B, firms that refuse to pay a positive bribe have average output of

$$y^0 \equiv (1-k)E\left[y^*|i < \hat{i}(b/k)\right] = (1-k)y^*.$$

Firms that agree to pay a positive bribe have average output of

$$y^+ \equiv E\left[y_i^*(1-b)|i > \hat{i}(b/k)\right] < y^*. \tag{4}$$

We now compare y^0 and y^+ for countries with high and low corruption k. If a country is very clean $k \to 0$ then $b \to 0$;[15] therefore both y^0 and y^+ converge to y^*. So for perfectly non-corrupt countries $y^0 = y^+$.

Now consider $k = 1$. In this case $y^0 = 0$. To find y^+, we solve the bureaucrat's maximization problem. Taking the first derivative of (3) with respect to b, we obtain the first order condition:

$$\int_b^{\bar{\xi}} \left[y^* - 2b\pi_i''(1)\right] dG(\xi_i) = bg(b)\left[y^* - b\pi_{I(b)}''(1)\right].$$

Using $b \ll 1$, we find $b = 1/g(0)$.

As the bribe share is small, each firm that pays a positive bribe has a positive $y_i^*(1-b) = y^* - b\pi_i''(1)$. Therefore, the average output growth for these firms (4) is also positive so $y^+ > y^0$.

This analysis implies that if country-level corruption changes from high $k = 1$ to low $k = 0$, the output of firms refusing to pay bribes $y^0 = (1-k)y^*$ increases from zero to y^*. At the same time, the output of firms agreeing to pay bribes y^+ increases from a positive but inefficiently low level ($y^+ < y^*$) to the efficient level y^* (the latter being the case in the perfectly clean country with $k = 0$ and $b = 0$).

The intuition is straightforward. Firms that refuse to pay bribes $b = 0$ are either (i) the ones denied access to growth opportunities (with probability k) and have $y = 0$, or (ii) those that avoid paying bribes (with probability $1-k$) and produce y^*.[16] As k increases, the average output growth of this group falls from y^* to zero. At the same time, firms with $b > 0$ produce a suboptimal but non-trivial amount $y_i^*(1-b)$, so for sufficiently high k we have $y^0 < y^+$. If there is no corruption at all ($k = 0$ and $b = 0$), then there is no discontinuity at $b = 0$: both y^0 and y^+ converge to the efficient level y^*. If corruption is very high, there is a discontinuity: $y^0 = (1-k)y^* = 0$, while firms that pay a small bribe produce $y^* - b\pi_i''(1)$ which is strictly positive.

2. Intensive margin.

[15] For a given k, B always chooses $b \leq \bar{\xi}k$, otherwise no firm agrees to pay a bribe.

[16] Obviously, the former are more likely to complain about corruption than the latter. Our analysis therefore implies that among non-bribers, we should observe a negative correlation between complaining about corruption and growth. As noted earlier, this is consistent with what we observe in the data (see Appendix Table A10).

We shall now check that once a firm pays a positive bribe, an increase in b reduces the firm's y. As b is an equilibrium outcome in a game between firm and bureaucrat, for exploring this issue, we need to change an exogenous parameter — such as the bureaucrat's propensity to extort larger bribes. Let us consider the comparative statics with regard to the bureaucrat's cost of being fired, z. Suppose that there is a bureaucrat who is less concerned about being fired, i.e., his z is lower. Then for the same country-level and firm-level characteristics (k and $G(\cdot)$), the equilibrium bribe share b is higher. Indeed, the monotone comparative statics imply that the b that maximizes (3) decreases with z.

Facing a higher b, some firms that previously paid the bribe will now refuse to pay. However, for those that continue to pay, output will decline. Indeed, $y_i^*(1-b)$ is a decreasing function of b.

7 Discussion of results and alternative explanations

As we have emphasized from the outset, our empirical findings do not necessarily reflect causal links from corruption to growth. Causation may run the other way, with informal payments made by firms depending on their performance. Firms that grow faster may be targeted for extra checks and inspections by rent-seeking officials in expectation of receiving facilitation payments. In theoretical terms, this would require observability of firms' cost structure (while we assume that firms' costs are their private information). A model in which bureaucrats target more successful firms would imply that high growth causes higher bribe payments, or some third factor lies behind the positive bribe-growth correlation – in line with our result that non-bribers grow slower, but not consistent with the negative correlation between bribes and growth among bribers that we also document. As we show in the Appendix Table A16, this negative correlation is the case not only for bribe as a share of sales but also for the absolute amount of the bribe in dollars.[17]

In order to explain the negative correlation between bribes and growth for the firms with non-zero bribe shares, the targeting theory should therefore be supplemented by a countervailing mechanism. For example, one can assume that very high bribes may attract the attention of the bureaucrat's principal and therefore result in punishment (somewhat similar to the effects of complaints we explicitly consider in our model). This would result in a disincentive for the bureaucrat to demand very high bribe shares from the most successful firms, thus generating a negative correlation between bribe shares and growth. However, this mechanism is unlikely to operate in the most corrupt countries — which is not what we observe in the data (see the Appendix Table A6).

[17] Our model does predict a negative relationship between bribe rate b and output y but has no clear prediction regarding the total bribe amount by. The total bribe amount may increase or decrease with bribe rate and output depending on the second derivative of the cost function $c_i(\cdot)$.

The targeting of firms by bureaucrat may also be driven by other characteristics such as size and profitability. As we discuss in Section 3 and show in Table 1, we find no evidence that larger firms are more likely to pay bribes. However, firms with higher profit margins are. This may be interpreted as evidence of targeting; on the other hand, as we show above, this finding is also consistent with our theory, as firms with higher profits to sales ratios are more likely to accept paying a bribe in our model (see equation (2)). Our theory thus allows for a reconciliation of the positive correlation between profit margins and paying bribes and the negative correlation between bribe share and firm growth.

The negative correlation between bribe share and firm growth is also consistent with a "fixed fee" explanation. If operating a business involves a fixed amount of informal payments, firms that grow their sales will pay a smaller fraction of revenue in bribes (Bai et al., 2017 show that the experiences of firms in Vietnam is line with this theory). However, this "fixed fee" model is not consistent with our empirical results on the "zero bribe penalty" and the fact that the latter is only observed in corrupt countries.

Another important assumption we make in our model is that the bureaucrat makes the same offer to all firms. In principle, even without observing the firms' cost structures, bureaucrats could use second degree price discrimination. In Appendix B, we consider a model in which the bureaucrat offers a menu of contracts with different outputs and different bribe levels. We show that such a model predicts a positive correlation between total bribe amount and firm growth. This is not consistent with the data (see Table A16). While using menus should (at least weakly) increase the bureaucrat's payoff, it requires enforceability of rather complex corruption contracts; our empirical results suggest that the assumption that such contracts are enforceable may not be realistic.

8 Conclusion

This paper investigates the relationship between corruption and growth of individual firms using a comprehensive set of enterprise surveys conducted in 141 economies in 2006-20, based on the experiences of almost 88,000 firms.

We document several empirical regularities. Firms that make zero informal payments have relatively weak growth in sales when compared to other firms in their industry-region-year cell, as do firms with relatively high rates of informal payments. Furthermore, whereas firms that make high informal payments grow slowly in both high- and low-corruption countries, the zero bribe penalty is driven entirely by firms in high-corruption economies.

As we have emphasized throughout, these patterns need not reflect a causal relationship between corruption and growth; however, we also show that they can be rationalized in a simple framework in which profit-maximizing firms confront officials who administer permits

that firms require to operate; some agree to pay a bribe and others refuse, with the latter group suffering particularly negative consequences in high-corruption settings where corrupt officials shut bribe-abstainers out of growth opportunities with high probability. We hope that, by introducing these new facts to the literature as well as a framework for organizing them, we may inspire future work to better develop and test microeconomic models of corruption.

Our theoretical framework not only helps to reconcile our empirical results but also explains why the zero bribe penalty should not be considered as evidence that corruption is socially beneficial. First, in low-corruption countries, there is no zero bribe penalty, and any increase in corruption involves a reduction in firm growth. Second, in high-corruption countries, the zero bribe penalty reflects the fact that corrupt bureaucrats punish honest firms and facilitate the growth of corrupt firms. Given that we always control for country-region fixed effects, we only study the growth differentials within countries and do not analyze the relationship between corruption and growth at the country level. Our evidence on firms that complain about corruption suggests that the even if bribers grow faster than non-bribers in high-corruption countries, the average growth of firms in such economies may be lower than in low-corruption countries. In addition, our analysis by definition considers growth of existing firms but does not include the impact of bribery on "missing entrants" that could have contributed to economic growth but are dissuaded by corruption.

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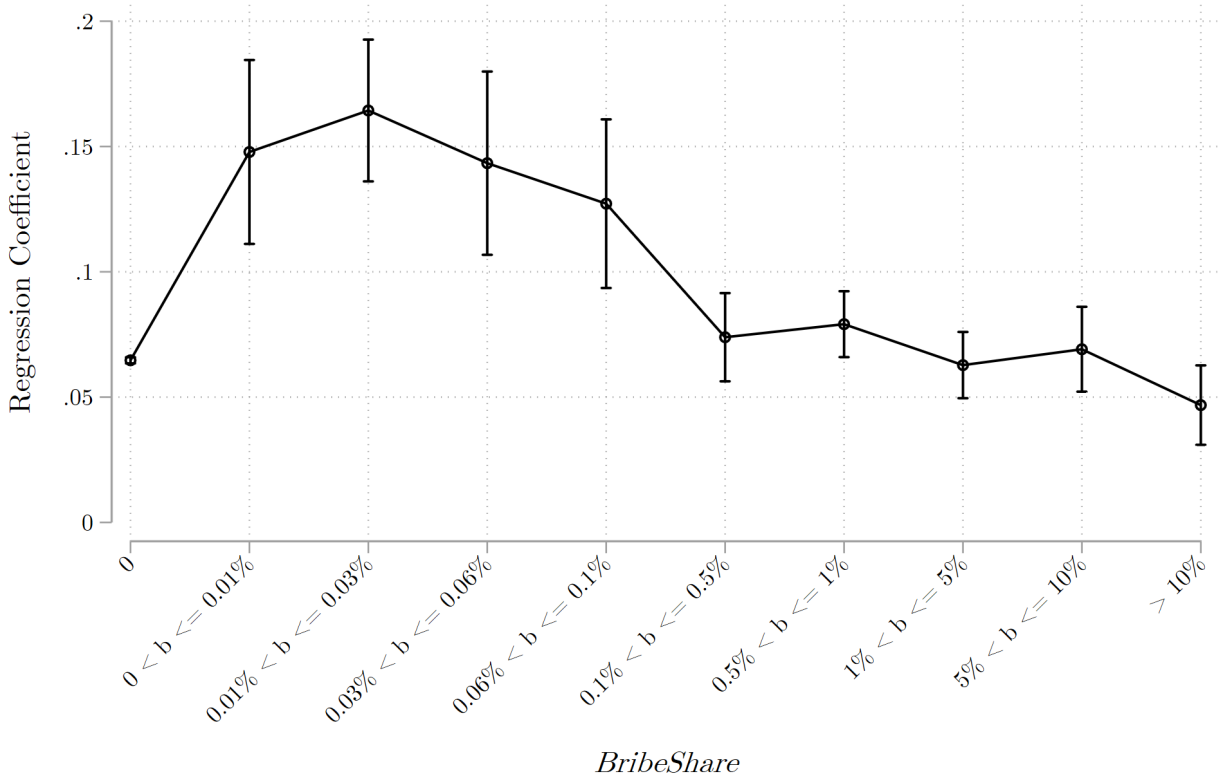
Figure 1: Relationship between *BribeShare* and growth – flexible functional form



Source: Enterprise Surveys and authors' calculations.

Note: This figure graphs the coefficients from a regression of sales growth on a finely partitioned set of indicator variables for *BribeShare* (the first column in Table A15). The dependent variable is annual growth of sales (half of the difference between the logarithm of sales in the last fiscal year and the logarithm of sales three fiscal years ago, both expressed in US dollars at market exchange rates). Control variables include region-sector-year fixed effects, ownership (state/foreign/domestic), the logarithm of firm age, exporter status, propensity to complain (the kvetch index), the logarithm of employment three years ago, the logarithm of sales in US dollars three years ago. We include bars to indicate the 95% confidence intervals of the coefficient estimates, with standard errors clustered at the level of industry*region*survey wave.

Table 1: Selection into paying bribes

Dep. var: Non-zero BribeShare	(1)	(2)	(3)
Sales 3 years ago, USD, log	0.000632	0.000427	-0.000593
	(0.000918)	(0.000955)	(0.00197)
Profit/sales			0.0263**
			(0.0125)
Propensity to complain (kvetch index)		0.0131***	0.00724*
		(0.00200)	(0.00423)
Foreign ownership		-0.0237***	-0.0281**
		(0.00568)	(0.0111)
Exporter		0.0131***	0.0162**
		(0.00338)	(0.00685)
State ownership		-0.000810	0.0352
		(0.0117)	(0.0383)
Age, years, log		-0.00235	-0.00342
		(0.00196)	(0.00358)
R-squared	0.296	0.297	0.343
Observations	87829	87829	14844
Region-Sector-Year FE	Yes	Yes	Yes
Firm-level controls	No	All	All

Source: Enterprise Surveys and authors' calculations.

Note: Standard errors in parentheses are clustered at the level of industry*region*survey wave. ***, **, * denote statistical significance at the 1%, 5% and 10% levels, respectively. Estimated using ordinary least squares. The dependent variable is a dummy variable indicating whether the firm paid non-zero bribes. All regressions control for region-sector-year fixed effects.

Table 2: *BribeShare* and growth of sales

Dep. var.: Growth of sales	1	2	3	4	5
BribeShare	-0.053		-0.139**	-0.232***	
	(0.052)		(0.060)	(0.058)	
Non-zero *BribeShare*		0.010**	0.018***	0.021***	
		(0.004)	(0.005)	(0.005)	
Informal payment categories					
$0 < b \leq 0.5\%$					0.047***
					(0.008)
$0.5 < b \leq 1\%$					0.015**
					(0.007)
$1 < b \leq 5\%$					-0.001
					(0.007)
$5 < b \leq 10\%$					0.005
					(0.009)
$10 < b \leq 20\%$					-0.015*
					(0.009)
$> 20\%$					-0.025
					(0.017)
R-squared	0.237	0.237	0.237	0.293	0.294
Observations	87829	87829	87829	87829	87829
Region-Sector-Year FE	Yes	Yes	Yes	Yes	Yes
Firm-level controls				All	All

Source: Enterprise Surveys and authors' calculations.

Note: Standard errors in parentheses are clustered at the level of industry*region*survey wave. ***, **, * denote statistical significance at the 1%, 5% and 10% levels, respectively. Estimated using ordinary least squares. The dependent variable is annual growth of sales (half of the difference between the logarithm of sales in the last fiscal year and the logarithm of sales three fiscal years ago, both expressed in US dollars at market exchange rates). All regressions control for region-sector-year fixed effects. Specifications in columns 4-5 also control for ownership (state/foreign/domestic), the logarithm of firm age, exporter status, propensity to complain (the kvetch index), the logarithm of employment three years ago, the logarithm of sales in US dollars three years ago. In column (5), the omitted category is $BribeShare = 0$.

Table 3: High-corruption vs low-corruption economies

Dep. var.: Growth of sales	High corruption (1)	Low corruption (2)
BribeShare	-0.194**	-0.301***
	(0.076)	(0.084)
Non-zero *BribeShare*	0.030***	0.007
	(0.007)	(0.007)
R-squared	0.306	0.275
Observations	42341	45488
Region-Sector-Year FE	Yes	Yes
Firm-level controls	All	All

Source: Enterprise Surveys and authors' calculations.

Note: Standard errors in parentheses are clustered at the level of industry*region*survey wave. ***, **, * denote statistical significance at the 1%, 5% and 10% levels, respectively. Estimated using ordinary least squares. The dependent variable is annual growth of sales (half of the difference between the logarithm of sales in the last fiscal year and the logarithm of sales three fiscal years ago, both expressed in US dollars at market exchange rates). All regressions control for ownership (state/foreign/domestic), the logarithm of firm age, exporter status, propensity to complain (the kvetch index), the logarithm of employment three years ago, the logarithm of sales in US dollars three years ago, region-sector-year fixed effects. Low-corruption economies are those with the Worldwide Governance Indicator of control of corruption of -0.43 or above (sample median); the rest are high-corruption economies.

Table 4: Firms that do and do not complain about corruption

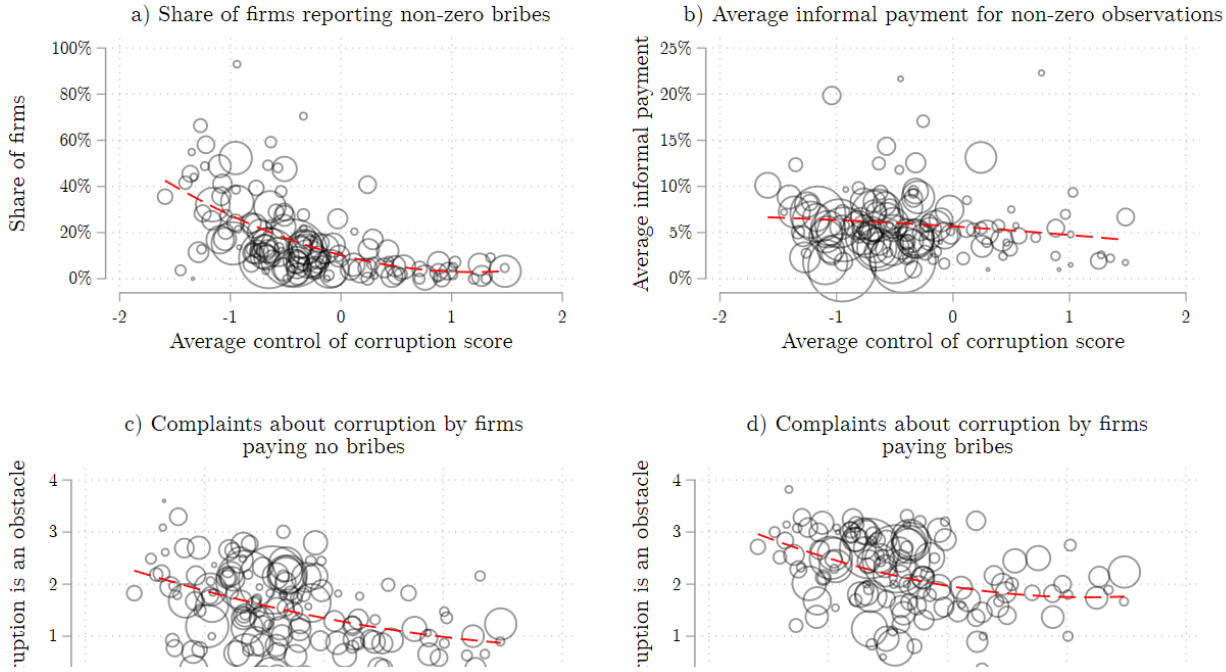
Dep. var.: Growth of sales	Corruption at least a moderate obstacle (1)	Corruption a minor or no obstacle (2)
BribeShare	-0.284***	-0.037
	(0.069)	(0.111)
Non-zero *BribeShare*	0.025***	0.015*
	(0.006)	(0.008)
Propensity to complain (kvetch index)	0.002	0.007***
	(0.002)	(0.003)
R-squared	0.337	0.303
Observations	44572	41591
Region-Sector-Year FE	Yes	Yes
Firm-level controls	All	All

Source: Enterprise Surveys and authors' calculations.

Note: Standard errors in parentheses are clustered at the level of industry*region*survey wave. ***, **, * denote statistical significance at the 1%, 5% and 10% levels, respectively. Estimated using ordinary least squares. The dependent variable is annual growth of sales (half of the difference between the logarithm of sales in the last fiscal year and the logarithm of sales three fiscal years ago, both expressed in US dollars at market exchange rates). All regressions control for ownership (state/foreign/domestic), the logarithm of firm age, exporter status, propensity to complain (the kvetch index), the logarithm of employment three years ago, the logarithm of sales in US dollars three years ago, region-sector-year fixed effects. Column 1 includes only businesses that state that corruption is at least a moderate obstacle, column 2 includes businesses that state that corruption is no obstacle or a minor obstacle to their operations.

Appendix Figures and Tables

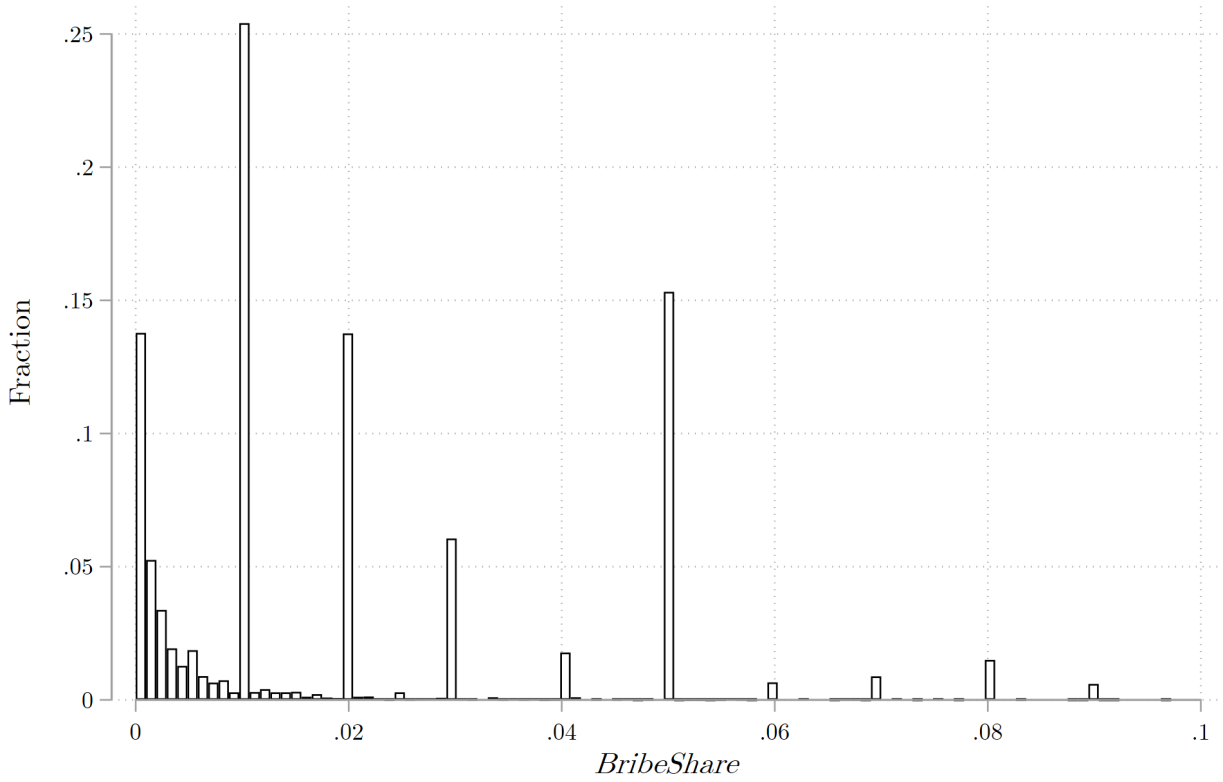
Figure A1: Correlations between *BribeShare* and corruption as an obstacle



Source: Enterprise Surveys and authors' calculations.

Note: Includes observations in the estimation sample only. For countries with multiple surveys, we use the average Control of Corruption score across the survey years. Marker size indicates the number of underlying observations. The "Corruption is an obstacle" question is answered on a 5-point scale from 0 ("not an obstacle") to 4 ("very severe obstacle").

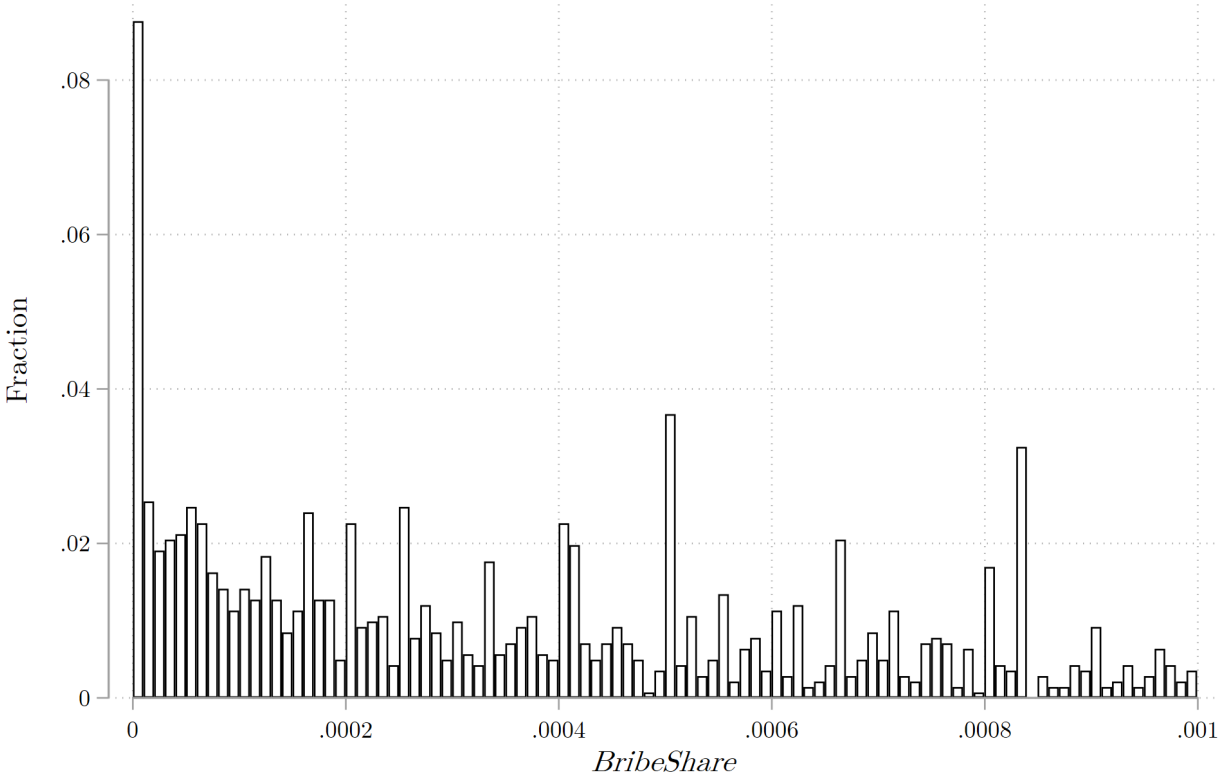
Figure A2: Distribution of *BribeShare* between 0 and 10%



Source: Enterprise Surveys and authors' calculations.

Note: The graph provides a histogram of *BribeShare* for all firms reporting bribes as a fraction of sales between 0 and 10%.

Figure A3: Distribution of *BribeShare* between 0 and 0.1%



Source: Enterprise Surveys and authors' calculations.

Note: The graph provides a histogram of *BribeShare* for all firms reporting bribes as a fraction of sales between 0 and 0.1%.

Table A1: Correlates of missing data

Dep. var.:	Missing informal payment		Missing sales growth	
	(1)	(2)	(3)	(4)
Sales growth, per annum	0.003	-0.001		
	(0.002)	(0.005)		
Exporter	0.010***	0.016**	-0.010***	-0.011***
	(0.003)	(0.007)	(0.003)	(0.003)
State ownership	-0.008	-0.022	-0.002	-0.017*
	(0.010)	(0.021)	(0.010)	(0.009)
Age, years, log	-0.000	-0.000	-0.002***	
	(0.000)	(0.000)	(0.000)	
Log employees		0.006**	-0.008***	-0.003**
		(0.003)	(0.001)	(0.001)
Control of corruption index		-0.011		
		(0.031)		
Foreign ownership			0.020***	0.009*
			(0.005)	(0.005)
Firm age, years				
1				0.719***
				(0.013)
2				0.706***
				(0.009)
3				0.442***
				(0.013)
4				0.111***
				(0.009)
5				0.021***
				(0.006)
6				0.001
				(0.005)
7				0.013**
				(0.005)
8				-0.006
				(0.005)
9				-0.005
				(0.005)
10				0.005
				(0.005)
R-squared	0.277	0.023	0.252	0.334
Observations	112307	114891	149418	149418
Region-Sector-Year FE	Yes	No	Yes	Yes
Sector-Year FE	No	Yes	No	No

Source: Enterprise Surveys and authors' calculations.

Note: Standard errors in parentheses are clustered at the level of industry*region*survey wave. ***, **, * denote statistical significance at the 1%, 5% and 10% levels, respectively. Estimated using ordinary least squares. The dependent variable in columns 1 and 2 is a dummy variable equal to 1 for observations with missing *BribeShare*. The dependent variable in columns 3 and 4 is a dummy variable equal to 1 for observations with missing sales growth data.

Table A2: Descriptive statistics

Variables	Mean	St. dev.	Median	Min	Max
BribeShare	0.008	0.034	0.000	0.000	0.500
Non-zero *BribeShare*	0.148	0.355	0.000	0.000	1.000
Sales growth, per annum	0.066	0.340	0.050	-1.969	1.998
Labor productivity growth, per annum	0.019	0.347	0.008	-3.708	5.300
Sales growth, real terms, per annum	0.035	0.331	0.019	-2.142	2.124
Productivity growth, real terms, p.a.	-0.012	0.341	-0.023	-3.795	5.230
Employment growth, per annum	0.047	0.193	0.000	-4.736	3.719
Sales 3 years ago, USD, log	13.258	2.444	13.215	0.411	28.478
Employment 3 years ago, USD, log	3.248	1.413	2.996	0.000	13.122
Age, years, log	2.760	0.707	2.773	0.000	5.421
Foreign ownership	0.073	0.242	0.000	0.000	1.000
State ownership	0.015	0.121	0.000	0.000	1.000
Exporter	0.199	0.399	0.000	0.000	1.000
Propensity to complain (kvetch index)	0.001	0.684	-0.091	-2.588	2.737

Source: Enterprise Surveys and authors' calculations.

Note: Based on 87,829 firms across 141 economies surveyed as part of Enterprise Surveys in 2006-20.

Table A3: Informal payments over time

Variable	Time period		
	2006-2010	2011-2015	2016-2020
Average bribe share	0.00992	0.00697	0.00610
Average bribe share for firms reporting non-zero bribes	0.0471	0.0493	0.0605
Share of firms reporting non-zero bribe share	0.211	0.141	0.101
Number of observations	25481	33746	28602

Source: Enterprise Surveys and authors' calculations.

Note: Averages across all firms surveyed during the time periods shown.

Table A4: *BribeShare* and growth of sales, with weights

Dep. var.: Growth of sales	(1)	(2)	(3)	(4)	(5)
BribeShare	-0.152*		-0.302***	-0.398***	
	(0.087)		(0.103)	(0.105)	
Non-zero *BribeShare*		0.014*	0.031***	0.037***	
		(0.008)	(0.010)	(0.009)	
Informal payment categories					
$0 < b \leq 0.1\%$					0.111***
					(0.022)
$0.1 < b \leq 0.5\%$					0.041**
					(0.016)
$0.5 < b \leq 1\%$					0.018
					(0.015)
$1 < b \leq 5\%$					0.011
					(0.013)
$5 < b \leq 10\%$					0.009
					(0.019)
$> 10\%$					-0.021
					(0.014)
R-squared	0.302	0.302	0.303	0.361	0.361
Observations	87286	87286	87286	87286	87286
Region-Sector-Year FE	Yes	Yes	Yes	Yes	Yes
Firm-level controls				All	All

Source: Enterprise Surveys and authors' calculations.

Note: Standard errors in parentheses are clustered at the level of industry*region*survey wave. ***, **, * denote statistical significance at the 1%, 5% and 10% levels, respectively. Estimated using ordinary least squares. The dependent variable is annual growth of sales (half of the difference between the logarithm of sales in the last fiscal year and the logarithm of sales three fiscal years ago, both expressed in US dollars at market exchange rates). All regressions control for region-sector-year fixed effects. Specifications in columns 4-5 also control for ownership (state/foreign/domestic), the logarithm of firm age, exporter status, propensity to complain (the kvetch index), the logarithm of employment three years ago, the logarithm of sales in US dollars three years ago. In column (5), the omitted category is $BribeShare = 0$. Observations are weighted using survey weights.

Table A5: Baseline regressions: coefficients on control variables

Dep. var.: Growth of sales	1	2
BribeShare	-0.232***	
	(0.058)	
Non-zero *BribeShare*	0.021***	
	(0.005)	
Informal payment categories		
$0 < b \leq 0.5\%$		0.047***
		(0.008)
$0.5 < b \leq 1\%$		0.015**
		(0.007)
$1 < b \leq 5\%$		-0.001
		(0.007)
$5 < b \leq 10\%$		0.005
		(0.009)
$10 < b \leq 20\%$		-0.015*
		(0.009)
$> 20\%$		-0.025
		(0.017)
Sales 3 years ago, USD, log	-0.061***	-0.061***
	(0.002)	(0.002)
Employment 3 years ago, USD, log	0.056***	0.056***
	(0.002)	(0.002)
Propensity to complain (kvetch index)	0.004**	0.004**
	(0.002)	(0.002)
Foreign ownership	0.049***	0.048***
	(0.005)	(0.005)
Exporter	0.045***	0.044***
	(0.003)	(0.003)
State ownership	0.014	0.013
	(0.012)	(0.012)
Age, years, log	-0.034***	-0.034***
	(0.002)	(0.002)
Constant	0.776***	0.778***
	(0.019)	(0.019)
R-squared	0.293	0.294
Observations	87829	87829
Region-Sector-Year FE	Yes	Yes
Firm-level controls	All	All

Source: Authors' calculations.

Note: Standard errors in parentheses are clustered at the level of industry*region*survey wave. ***, **, * denote statistical significance at the 1%, 5% and 10% levels, respectively. Estimated using ordinary least squares. The specifications are the same as those in Table 2's columns (4) and (5). The dependent variable is annual growth of sales (half of the difference between the logarithm of sales in the last fiscal year and the logarithm of sales three fiscal years ago, both expressed in US dollars at market exchange rates). All regressions control for region-sector-year fixed effects, ownership (state/foreign/domestic), the logarithm of firm age, exporter status, propensity to complain (the kvetch index), the logarithm of employment three years ago, the logarithm of sales in US dollars three years ago.

Table A6: High-corruption vs low-corruption economies by quartile

Dep. var.: Growth of sales	Very high corruption (Q1)		High corruption (Q2)		Low corruption (Q3)		Very low corruption (Q4)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
BribeShare	-0.239**		-0.146		-0.259***		-0.424**	
	(0.106)		(0.104)		(0.084)		(0.187)	
Non-zero *BribeShare*	0.034***		0.026***		0.016**		-0.010	
	(0.009)		(0.009)		(0.008)		(0.013)	
Informal payment categories								
$0 < b \leq 0.1\%$		0.113***		0.093***		0.061***		0.036
		(0.021)		(0.021)		(0.015)		(0.026)
$0.1 < b \leq 0.5\%$		0.030**		0.020		-0.011		-0.060*
		(0.015)		(0.020)		(0.015)		(0.034)
$0.5 < b \leq 1\%$		0.024**		0.018		0.006		0.021
		(0.012)		(0.015)		(0.012)		(0.023)
$1 < b \leq 5\%$		0.003		0.008		-0.000		-0.045**
		(0.012)		(0.015)		(0.012)		(0.019)
$5 < b \leq 10\%$		0.012		0.024		0.007		-0.077***
		(0.016)		(0.017)		(0.014)		(0.026)
$> 10\%$		-0.001		-0.013		-0.023*		-0.076**
		(0.014)		(0.016)		(0.013)		(0.031)
R-squared	0.333	0.334	0.280	0.281	0.284	0.284	0.244	0.245
Observations	18750	18750	21250	21250	30518	30518	17311	17311
Region-Sector-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-level controls	All	All	All	All	All	All	All	All

Source: Enterprise Surveys, Polity IV and authors' calculations.

Note: Standard errors in parentheses are clustered at the level of industry*region*survey wave. ***, **, * denote statistical significance at the 1%, 5% and 10% levels, respectively. Estimated using ordinary least squares. The dependent variable is annual growth of sales (half of the difference between the logarithm of sales in the last fiscal year and the logarithm of sales three fiscal years ago, both expressed in US dollars at market exchange rates). All regressions control for ownership (state/foreign/domestic), the logarithm of firm age, exporter status, propensity to complain (the kvetch index), the logarithm of employment three years ago, the logarithm of sales in US dollars three years ago, region-sector-year fixed effects. Countries that are defined as having very high corruption have a control of corruption score of less than -0.83, countries in the second quartile of less than -0.45, countries in the third quartile of less than -0.02. All other countries are considered to have very low corruption.

Table A7: Informal payments and productivity growth

Dep. var.: Labor productivity growth	1	2	3	4	5
BribeShare	-0.046		-0.112*	-0.211***	
	(0.053)		(0.061)	(0.060)	
Non-zero *BribeShare*		0.008*	0.014***	0.017***	
		(0.004)	(0.005)	(0.005)	
Informal payment categories					
$0 < b \leq 0.5\%$					0.037***
					(0.008)
$0.5 < b \leq 1\%$					0.007
					(0.007)
$1 < b \leq 5\%$					0.000
					(0.007)
$5 < b \leq 10\%$					0.003
					(0.009)
$10 < b \leq 20\%$					-0.010
					(0.009)
$> 20\%$					-0.032*
					(0.018)
Log labor productivity t-2 (USD)				-0.088***	-0.088***
				(0.002)	(0.002)
Employment 3 years ago, USD, log				0.025***	0.025***
				(0.001)	(0.001)
Propensity to complain (kvetch index)				0.002	0.002
				(0.002)	(0.002)
Foreign ownership				0.037***	0.037***
				(0.005)	(0.005)
Exporter				0.015***	0.015***
				(0.003)	(0.003)
State ownership				-0.001	-0.001
				(0.012)	(0.012)
Age, years, log				-0.006***	-0.006***
				(0.002)	(0.002)
Constant	0.020***	0.018***	0.018***	0.831***	0.832***
	(0.000)	(0.001)	(0.001)	(0.021)	(0.021)
R-squared	0.201	0.201	0.201	0.305	0.305
Observations	87780	87780	87780	87780	87780
Region-Sector-Year FE	Yes	Yes	Yes	Yes	Yes
Firm-level controls				All	All

Source: Authors' calculations.

Note: Standard errors in parentheses at clustered at the level of industry*region*survey wave. ***, **, * denote statistical significance at the 1%, 5% and 10% levels, respectively. Estimated using ordinary least squares. The dependent variable is annual growth of sales per worker (half of the difference between the logarithm of sales per worker in the last fiscal year and the logarithm of sales three fiscal years ago, both expressed in US dollars at market exchange rates). All regressions control for region-sector-year fixed effects. Specifications in columns 4-5 also control for ownership (state/foreign/domestic), the logarithm of firm age, exporter status, propensity to complain (the kvetch index), the logarithm of employment three years ago, the logarithm of sales in US dollars three years ago.

Table A8: Informal payments and employment growth

Dep. var.: Employment growth	1	2	3	4	5
BribeShare	-0.010		-0.031	-0.061**	
	(0.028)		(0.032)	(0.031)	
Non-zero *BribeShare*		0.003	0.004	0.006**	
		(0.003)	(0.003)	(0.003)	
Informal payment categories					
$0 < b \leq 0.5\%$					0.017***
					(0.004)
$0.5 < b \leq 1\%$					0.009*
					(0.004)
$1 < b \leq 5\%$					-0.005
					(0.005)
$5 < b \leq 10\%$					0.001
					(0.005)
$10 < b \leq 20\%$					-0.008
					(0.006)
$> 20\%$					-0.001
					(0.009)
Employment 3 years ago, USD, log				-0.029***	-0.029***
				(0.001)	(0.001)
Propensity to complain (kvetch index)				0.003***	0.003***
				(0.001)	(0.001)
Foreign ownership				0.027***	0.027***
				(0.003)	(0.003)
Exporter				0.039***	0.039***
				(0.002)	(0.002)
State ownership				0.012**	0.012**
				(0.006)	(0.006)
Age, years, log				-0.026***	-0.026***
				(0.001)	(0.001)
Constant	0.047***	0.046***	0.046***	0.203***	0.203***
	(0.000)	(0.000)	(0.000)	(0.005)	(0.005)
R-squared	0.135	0.135	0.135	0.180	0.180
Observations	87780	87780	87780	87780	87780
Region-Sector-Year FE	Yes	Yes	Yes	Yes	Yes
Firm-level controls				All	All

Source: Authors' calculations.

Note: Standard errors in parentheses at clustered at the level of industry*region*survey wave. ***, **, * denote statistical significance at the 1%, 5% and 10% levels, respectively. Estimated using ordinary least squares. The dependent variable is annual growth of employment (half of the difference between the logarithm of employment in the last fiscal year and the logarithm of employment three fiscal years ago. All regressions control for region-sector-year fixed effects. Specifications in columns 4-5 also control for ownership (state/foreign/domestic), the logarithm of firm age, exporter status, propensity to complain (the kvetch index), the logarithm of employment three years ago.

Table A9: Firms that do and do not complain about corruption relative to the country average

Dep. var.: Growth of sales	Complain about corruption more than country average (1)	Complain about corruption less than country average (2)
BribeShare	-0.304***	-0.039
	(0.075)	(0.101)
Non-zero *BribeShare*	0.026***	0.010
	(0.007)	(0.007)
Propensity to complain (kvetch index)	0.004	0.004*
	(0.003)	(0.002)
R-squared	0.345	0.306
Observations	37437	45915
Region-Sector-Year FE	Yes	Yes
Firm-level controls	All	All

Source: Enterprise Surveys and authors' calculations.

Note: Standard errors in parentheses are clustered at the level of industry*region*survey wave. ***, **, * denote statistical significance at the 1%, 5% and 10% levels, respectively. Estimated using ordinary least squares. The dependent variable is annual growth of sales (half of the difference between the logarithm of sales in the last fiscal year and the logarithm of sales three fiscal years ago, both expressed in US dollars at market exchange rates). All regressions control for ownership (state/foreign/domestic), the logarithm of firm age, exporter status, propensity to complain (the kvetch index), the logarithm of employment three years ago, the logarithm of sales in US dollars three years ago, region-sector-year fixed effects. Column 1 includes only businesses whose response to the question "How much of an obstacle is corruption" is higher than the country-year average, while column 2 only includes businesses where the response is lower.

Table A10: Firms that do and do not complain about corruption, and do not pay bribes

Dep. var.: Growth of sales	(1)	(2)
Corruption at least a moderate obstacle	-0.012***	
	(0.003)	
Complain about corruption more than country mean		-0.009***
		(0.003)
Propensity to complain (kvetch index)	0.006***	0.006***
	(0.002)	(0.002)
R-squared	0.294	0.294
Observations	71979	71979
Region-Sector-Year FE	Yes	Yes
Firm-level controls	All	All

Source: Enterprise Surveys and authors' calculations.

Note: Standard errors in parentheses are clustered at the level of industry*region*survey wave. ***, **, * denote statistical significance at the 1%, 5% and 10% levels, respectively. Estimated using ordinary least squares. The dependent variable is annual growth of sales (half of the difference between the logarithm of sales in the last fiscal year and the logarithm of sales three fiscal years ago, both expressed in US dollars at market exchange rates). All regressions control for ownership (state/foreign/domestic), the logarithm of firm age, exporter status, propensity to complain (the kvetch index), the logarithm of employment three years ago, the logarithm of sales in US dollars three years ago, region-sector-year fixed effects. Includes only businesses that do not pay bribes.

Table A11: Number of competitors

Dep. var.:	Growth of sales (1)	Non-zero bribe dummy (2)	*BribeShare* (3)
BribeShare	0.002		
	(0.318)		
BribeShare x Competition	-0.071		
	(0.121)		
Non-zero *BribeShare*	0.022		
	(0.024)		
Non-zero *BribeShare* x Competition	-0.003		
	(0.009)		
Number of competitors	-0.007**		
	(0.003)		
Number of competitors			
2-5		0.024***	0.001
		(0.006)	(0.001)
More than 5		0.022***	0.001
		(0.006)	(0.001)
R-squared	0.267	0.268	0.173
Observations	55385	55385	55385
Sector FE	Yes	Yes	Yes
Firm-level controls	All	All	All

Source: Enterprise Surveys and authors' calculations.

Note: Standard errors in parentheses are clustered at the level of industry*region*survey wave. ***, **, * denote statistical significance at the 1%, 5% and 10% levels, respectively. Estimated using ordinary least squares. The dependent variable in column 1 is annual growth of sales (half of the difference between the logarithm of sales in the last fiscal year and the logarithm of sales three fiscal years ago, both expressed in US dollars at market exchange rates). In column 2, the dependent variable is the share of informal payments in sales and in column 3, it is a dummy variable indicating whether the business made non-zero informal payments. Competition is a categorical variable indicating whether the business faces zero or one, two to five, or more than five competitors in its main market. In column 2, zero or one competitors is the baseline category. All regressions control for ownership (state/foreign/domestic), the logarithm of firm age, exporter status, propensity to complain (the kvetch index), the logarithm of employment three years ago, the logarithm of sales in US dollars three years ago, region-sector-year fixed effects.

Table A12: Firms vulnerable to government decision making

Dep. var.: Growth of sales	Government contract		Import		Export	
	(1)	(2)	(3)	(4)	(5)	(6)
	Yes	No	Yes	No	Yes	No
BribeShare	-0.283*	-0.286***	-0.285**	-0.098	-0.391***	-0.226***
	(0.145)	(0.076)	(0.112)	(0.097)	(0.136)	(0.066)
Non-zero *BribeShare*	0.016	0.020***	0.007	0.018*	0.017	0.023***
	(0.012)	(0.006)	(0.009)	(0.009)	(0.011)	(0.005)
R-squared	0.388	0.291	0.292	0.343	0.319	0.307
Observations	13079	65896	18712	17904	16548	70077
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-level controls	All	All	All	All	All	All

Source: Enterprise Surveys and authors' calculations.

Note: Standard errors in parentheses are clustered at the level of industry*region*survey wave. ***, **, * denote statistical significance at the 1%, 5% and 10% levels, respectively. Estimated using ordinary least squares. The dependent variable is annual growth of sales (half of the difference between the logarithm of sales in the last fiscal year and the logarithm of sales three fiscal years ago, both expressed in US dollars at market exchange rates). All regressions control for ownership (state/foreign/domestic), the logarithm of firm age, exporter status, propensity to complain (the kvetch index), the logarithm of employment three years ago, the logarithm of sales in US dollars three years ago, region-sector-year fixed effects. Column 1 includes only businesses that have secured or attempted to secure a government contract in the last 12 months, column 3 only includes businesses that import any of their material inputs and supplies, and column 5 only businesses that export.

Table A13: Baseline results by sector

Dep. var.: Growth of sales	Light manufacturing	Heavy manufacturing	Utilities & construction	Wholesale & retail	Others
	(1)	(2)	(3)	(4)	(5)
BribeShare	-0.236*	-0.274***	-0.554**	-0.226*	-0.284*
	(0.121)	(0.098)	(0.275)	(0.126)	(0.161)
Non-zero *BribeShare*	0.011	0.013*	0.037	0.021**	0.032**
	(0.009)	(0.008)	(0.028)	(0.010)	(0.015)
R-squared	0.228	0.242	0.328	0.248	0.343
Observations	25872	26480	4444	22297	8678
Region, Year FE	Yes	Yes	Yes	Yes	Yes
Firm-level controls	All	All	All	All	All

Source: Enterprise Surveys and authors' calculations.

Note: Standard errors in parentheses are clustered at the level of industry*region*survey wave. ***, **, * denote statistical significance at the 1%, 5% and 10% levels, respectively. Estimated using ordinary least squares. The dependent variable is annual growth of sales (half of the difference between the logarithm of sales in the last fiscal year and the logarithm of sales three fiscal years ago, both expressed in US dollars at market exchange rates). All regressions control for ownership (state/foreign/domestic), the logarithm of firm age, exporter status, propensity to complain (the kvetch index), the logarithm of employment three years ago, the logarithm of sales in US dollars three years ago, region-sector-year fixed effects. Sectors are classified by ISIC Rev. 3.1. Light manufacturing includes manufacturing of food and beverages, textile and paper products. Heavy manufacturing includes production of chemicals, plastic, metal, wood and electrical products, furniture and machinery.

Table A14: Democracies vs non-democracies, low vs middle income countries

Dep. var.: Growth of sales	Democracies	Non-democracies	Low income	Middle income
	(1)	(2)	(3)	(4)
BribeShare	-0.187**	-0.273***	-0.179**	-0.347***
	(0.075)	(0.087)	(0.072)	(0.101)
Non-zero *BribeShare*	0.013**	0.034***	0.026***	0.015*
	(0.006)	(0.008)	(0.006)	(0.009)
R-squared	0.261	0.334	0.280	0.318
Observations	52506	32234	46675	31088
Region-Sector-Year FE	Yes	Yes	Yes	Yes
Firm-level controls	All	All	All	All

Source: Enterprise Surveys and authors' calculations.

Note: Standard errors in parentheses are clustered at the level of industry*region*survey wave. ***, **, * denote statistical significance at the 1%, 5% and 10% levels, respectively. Estimated using ordinary least squares. The dependent variable is annual growth of sales (half of the difference between the logarithm of sales in the last fiscal year and the logarithm of sales three fiscal years ago, both expressed in US dollars at market exchange rates). All regressions control for ownership (state/foreign/domestic), the logarithm of firm age, exporter status, propensity to complain (the kvetch index), the logarithm of employment three years ago, the logarithm of sales in US dollars three years ago, region-sector-year fixed effects. Column 1: countries with Polity IV score of 6 or above; column 2: countries with Polity IV score below 6; column 3: country-years when the World Bank classifies the country as a low-income country (GDP per capita in constant USD of 4035 or less); column 4: country-years when the World Bank classifies the country as a middle-income country (GDP per capita in constant USD of more than 4035 and less or equal 12,475).

Table A15: Fine-grained bribe share dummies

Dep. var.: Growth of sales	(1)	(2)	(3)
0 < b <= 0.01%	0.083***		
	(0.019)		
0.01% < b <= 0.03%	0.100***		
	(0.015)		
0.03% < b <= 0.06%	0.079***		
	(0.019)		
0.06% < b <= 0.1%	0.062***		
	(0.017)		
0.1% < b <= 0.5%	0.009		
	(0.009)		
0.5% < b <= 1%	0.014**		
	(0.007)		
1% < b <= 5%	-0.002		
	(0.007)		
5% < b <= 10%	0.004		
	(0.009)		
> 10%	-0.018**		
	(0.008)		
BribeShare		-0.341***	-0.636***
		(0.122)	(0.205)
BribeShare squared		0.332	2.644*
		(0.380)	(1.545)
BribeShare cubed			-3.742
			(2.568)
Non-zero *BribeShare*		0.024***	0.028***
		(0.005)	(0.006)
R-squared	0.294	0.293	0.293
Observations	87829	87829	87829
Sector FE	Yes	Yes	Yes
Firm-level controls	All	All	All

Source: Enterprise Surveys, Polity IV and authors' calculations.

Note: Standard errors in parentheses are clustered at the level of industry*region*survey wave. ***, **, * denote statistical significance at the 1%, 5% and 10% levels, respectively. Estimated using ordinary least squares. The dependent variable is annual growth of sales (half of the difference between the logarithm of sales in the last fiscal year and the logarithm of sales three fiscal years ago, both expressed in US dollars at market exchange rates). All regressions control for ownership (state/foreign/domestic), the logarithm of firm age, exporter status, propensity to complain (the kvetch index), the logarithm of employment three years ago, the logarithm of sales in US dollars three years ago, region-sector-year fixed effects.

Table A16: Absolute bribes and growth

Dep. var.: Growth of sales	(1)	(2)
Absolute *BribeShare*, USD, log	-0.002***	-0.013***
	(0.000)	(0.002)
Non-zero *BribeShare*		0.126***
		(0.015)
Sales 3 years ago, USD, log		-0.059***
		(0.002)
Employment 3 years ago, USD, log		0.056***
		(0.002)
Propensity to complain (kvetch index)		0.004**
		(0.002)
Foreign ownership		0.048***
		(0.005)
Exporter		0.044***
		(0.003)
State ownership		0.013
		(0.012)
Age, years, log		-0.034***
		(0.002)
R-squared	0.237	0.294
Observations	87829	87829
Sector FE	Yes	Yes
Firm-level controls	No	All

Source: Enterprise Surveys, Polity IV and authors' calculations.

Note: Standard errors in parentheses are clustered at the level of industry*region*survey wave. ***, **, * denote statistical significance at the 1%, 5% and 10% levels, respectively. Estimated using ordinary least squares. The dependent variable is annual growth of sales (half of the difference between the logarithm of sales in the last fiscal year and the logarithm of sales three fiscal years ago, both expressed in US dollars at market exchange rates). All regressions control for ownership (state/foreign/domestic), the logarithm of firm age, exporter status, propensity to complain (the kvetch index), the logarithm of employment three years ago, the logarithm of sales in US dollars three years ago, region-sector-year fixed effects. Absolute *BribeShare* is calculated as the informal payment share plus 1 times total sales in USD three years ago.

Table A17: Government kvetch index

Dep. var.: Growth of sales	(1) Non-zero *BribeShare*	(2) Growth of sales
Sales 3 years ago, USD, log	-0.000	-0.061***
	(0.001)	(0.002)
Propensity to complain (kvetch index)	0.004*	0.004**
	(0.002)	(0.002)
Government kvetch index	0.051***	-0.002
	(0.003)	(0.002)
Foreign ownership	-0.019***	0.048***
	(0.006)	(0.005)
Exporter	0.012***	0.044***
	(0.003)	(0.003)
State ownership	0.004	0.013
	(0.012)	(0.012)
Age, years, log	-0.002	-0.034***
	(0.002)	(0.002)
BribeShare		-0.233***
		(0.058)
Non-zero *BribeShare*		0.022***
		(0.005)
Employment 3 years ago, USD, log		0.056***
		(0.002)
R-squared	0.309	0.294
Observations	87625	87625
Sector FE	Yes	Yes
Firm-level controls	All	All

Source: Enterprise Surveys, Polity IV and authors' calculations.

Note: Standard errors in parentheses are clustered at the level of industry*region*survey wave. ***, **, * denote statistical significance at the 1%, 5% and 10% levels, respectively. Estimated using ordinary least squares. The dependent variable is annual growth of sales (half of the difference between the logarithm of sales in the last fiscal year and the logarithm of sales three fiscal years ago, both expressed in US dollars at market exchange rates). All regressions control for ownership (state/foreign/domestic), the logarithm of firm age, exporter status, propensity to complain (the kvetch index), the logarithm of employment three years ago, the logarithm of sales in US dollars three years ago, region-sector-year fixed effects. The government kvetch index combines complaints about tax rates, tax administration, business licensing and permits, and political instability.

Table A18: Re-surveyed firms

Dep. var.: Growth of sales	(1)	(2)	(3)
BribeShare (lagged)	-0.102		
	(0.105)		
Non-zero *BribeShare* (lagged)	0.020*		
	(0.012)		
BribeShare		-0.193	-0.282***
		(0.126)	(0.059)
Non-zero *BribeShare*		0.019	0.018***
		(0.013)	(0.005)
Years between surveys			
3	-0.016		
	(0.024)		
4	0.001		
	(0.040)		
5	-0.037		
	(0.052)		
6	-0.038		
	(0.056)		
7	-0.124**		
	(0.060)		
8	-0.104*		
	(0.061)		
9	-0.148*		
	(0.089)		
R-squared	0.218	0.216	0.213
Observations	10691	10691	87829
Fixed effects	Region, sector, year	Region, sector, year	Region, sector, year
Firm-level controls	All	All	All

Source: Enterprise Surveys, Polity IV and authors' calculations.

Note: Standard errors in parentheses are clustered at the level of industry*region*survey wave. ***, **, * denote statistical significance at the 1%, 5% and 10% levels, respectively. Estimated using ordinary least squares. The dependent variable is annual growth of sales (half of the difference between the logarithm of sales in the last fiscal year and the logarithm of sales three fiscal years ago, both expressed in US dollars at market exchange rates). All regressions control for ownership (state/foreign/domestic), the logarithm of firm age, exporter status, propensity to complain (the kvetch index), the logarithm of employment three years ago, the logarithm of sales in US dollars three years ago, region-sector-year fixed effects. The specification in column 1 controls for lagged *BribeShare* and non-zero *BribeShare* from the previous survey wave. For comparison purposes, the specification in column 2 is estimated for the same sample as in column 1, but includes contemporaneous informal payment variables. Column 3 repeats the baseline results from Table 2, column 4.

Appendix B: Model with contract menus

In our main model in Section 6 we assume that the bureaucrat does not have information about firms' cost functions and offers the same bribe rate b to all firms. In this Appendix we consider a model in which the bureaucrat offers firms a menu of contracts, and firms rationally self-select into different contracts. Offering a menu should weakly increase the bureaucrat's payoff (as he can always choose a degenerate menu of a single bribe rate). However, this setting relies on the assumption of enforceability of rather complex contracts which may or may not hold given that bribe transactions take place outside of the legal system.

For the sake of simplicity, we consider a setting with only two types of firms: "high" and "low" with cost functions $c_i(y)$, $i \in \{H, L\}$, respectively. The high type has a lower total cost $c_H(y) \leq c_L(y)$ and a lower marginal cost: $c'_H(y) \leq c'_L(y)$. The latter inequality is equivalent to the Spence-Mirrlees single-crossing condition.[18] We assume that the share of high type is $\lambda \in (0, 1)$.

In an equilibrium in which both types choose to pay bribes, B offers (at most) two contracts, each including a bribe rate b_i and an output level y_i so that the contract with b_i and y_i is chosen by type i.

Without loss of generality, we will use the total bribe amount $T_i = b_i y_i$ rather than the bribe rate. The menu of two contracts $\{(y_H, T_H), (y_L, T_L)\}$ should satisfy the following four constraints. First, for each $i = H, L$ there is an incentive compatibility constraint:

$$y_i - c_i(y_i) - T_i \geq y_j - c_i(y_j) - T_j, \tag{5}$$

where $j = H, L$ and $j \neq i$. Second, for each type $i = H, L$ there should be a participation constraint:

$$y_i - c_i(y_i) - T_i \geq (1 - k)\pi_i(1). \tag{6}$$

The right-hand side of this inequality is the firm's payoff in case the firm refuses to pay bribes and complains to the public (see the analysis in section 6.4). Under some sets of parameters there may be equilibria in which the bureaucrat prefers to receive bribes only from one type. Since these equilibria are similar to those in the main model, in this Appendix we will focus on the equilibria in which the participation constraints (6) hold for both types.

The bureaucrat thus chooses y_H, y_L, T_H, T_L subject to (5)-(6) in order to maximize his total bribe:

$$\lambda T_H + (1 - \lambda)T_L. \tag{7}$$

[18] This condition is consistent with Assumption 3. For example, $c'_H(y^*) = c'_L(y^*) = 1$ for a certain y^* but $c'_H(y) \leq c'_L(y)$ for all other y.

Rearranging the terms in the two constraints (5) for $i = L, H$, we obtain

$$(y_H - y_L) - [c_L(y_H) - c_L(y_L)] \leq T_H - T_L \leq (y_H - y_L) - [c_H(y_H) - c_H(y_L)] .$$

The Spence-Mirrlees condition $c'_H(y) \leq c'_L(y)$ implies that the expression in the brackets is weakly smaller for the high type. Thus, if one of these two inequalities is binding, the other one follows from the Spence-Mirrlees condition.

For each type i at least one constraint, (5) and/or (6), should bind — otherwise the bureaucrat can increase T_i, strictly improving his payoff. Let us first explore the conventional case in which the participation constraint (6) is binding for the low type and the incentive compatibility constraint (5) is binding for the high type. Solving for T_H and T_L and substituting into (7), we find the expression for the bureaucrat's objective function: $-(1-k)\pi_L(1) + (1-\lambda)y_L - c_L(y_L) + \lambda c_H(y_L) + \lambda (y_H - c_H(y_H))$. The first order conditions $c'_H(y_H) = 1$ and $c'_L(y_L) - \lambda c'_H(y_L) = 1 - \lambda$ imply that $y_H = y^*$ and $y_L \leq y^*$. This in turn implies that $T_H \geq T_L$. Therefore, if we assume that bureaucrats can offer menus of contracts, we should observe a positive correlation between total bribe amount and firm growth, a prediction that is at odds with our empirical findings.

Ruling out other equilibria. While the equilibrium with binding incentive compatibility constraint for the high type is standard in conventional adverse selection settings (where the reservation utility is the same for both types), in our case there may also be equilibria in which the high type's participation constraint is binding. Indeed, in our case, the reservation utility $(1-k)\pi_i(1)$ is higher for the high type. Let us first rule out equilibria in which (6) is binding for the high type and (5) is binding for the low type. If this were the case, the first order conditions $c'_L(y_L) = 1$ and $c'_H(y_H) - (1-\lambda)c'_L(y_H) = \lambda$ would imply that $y_H \geq y_L = y^*$. Let us now check when the remaining constraints would be satisfied in this case. The high type's incentive compatibility constraint is $y_H - c_H(y_H) - T_H \geq y_L - c_H(y_L) - T_L$. As the left-hand side equals $(1-k)\pi_H(1)$ and $y_L = y^*$, this constraint is equivalent to $T_L \geq k\pi_H(1)$. On the other hand, the low type's participation constraint $y_L - c_i(y_L) - T_i \geq (1-k)\pi_L(1)$ is equivalent to $T_L \leq k\pi_L(1)$. These are only compatible in the case where $\pi_H(1) = \pi_L(1)$; however, in this case all constraints are binding, so this is a special case of the equilibrium we considered above.

Let us now rule out equilibria where both participation constraints (6) bind and neither incentive compatibility constraint does. In this case, the bureaucrat's first order conditions imply that both types produce efficient amounts $y_i = y^*$ and $T_i = k\pi_i(1)$. We now need to check if these satisfy incentive compatibility constraints (5). The low type's incentive compatibility constraint is equivalent to $\pi_H(1) \geq \pi_L(1)$ while the high type's incentive compatibility constraint is equivalent to $\pi_H(1) \leq \pi_L(1)$. Again, these are only compatible in the degenerate case where $\pi_H(1) = \pi_L(1)$. This is the case where all four constraints are binding, again a special case of the equilibrium we considered above.