Does over-regulation lead to corruption?

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ABSTRACT

Cross-country studies have shown corrupt countries have more burdensome regulations than other countries do. Some of these studies argue heavy regulation leads to corruption. In countries where regulations are onerous, firms might bribe government officials to avoid having to comply with the regulations. Other studies argue the opposite is true; rather than causing corruption, heavy regulation might be the result of corruption. When corruption is high, policymakers might impose regulations so they, or their supporters, can demand bribes from managers trying to avoid the regulations. This paper uses data from over 30,000 firms in over 100 low and middle-income countries to show that firms that spend more time dealing with regulations are more likely to pay bribes and pay more when they do. This paper shows that regulation has an important and causal effect on corruption. Increasing the time managers spend dealing with regulation from the amount they spend at the 25th percentile to the amount they spend at the 75th percentile increases the likelihood the average firm will pay bribes by 42 percentage points. The results, therefore, strongly suggest that removing burdensome regulations would cut corruption.

Keywords: Corruption, Regulation, Governance, Developing Countries, Institutions.

INTRODUCTION

Regulation is more onerous in corrupt countries than it is in less corrupt countries (Knack & Keefer, 1995; Mauro, 1995). Using country-level data, Langbein and Knack (2010), for example, show experts report high corruption in countries where they report burdensome regulation. This is not, however, just because experts' opinions about different areas of governance are highly correlated. Experts also report high corruption in countries where registering a business takes a long time (Djankov, La Porta, Lopez-de-Silanes, & Shleifer, 2002; Svensson, 2005).

Regulation and corruption are also linked at the firm level. Studies using firm-level data from single countries have found managers who spend more time with government officials are more likely to say they pay bribes than managers who spend less time with officials (Clarke, 2012; Malomo, 2013). Similarly, Clarke (2014) shows managers who report paying bribes are more likely to say regulation is a serious problem than managers who do not report paying bribes.

The studies discussed above suggest corruption and regulation are related. This might be because heavy regulation leads to corruption. Managers might bribe government officials either to avoid complying with regulations or to speed up license approvals. Managers might, however, be more likely to do this when regulation is heavy and approvals are slow than when they are not. This could explain why corruption and regulation are linked at the firm and country levels.

Although regulation might lead to corruption, the reverse is also possible: corruption might lead to more regulation. Government officials in corrupt countries might create regulations so they can extract bribes from firms that want to avoid complying with the regulations. Shleifer and Vishny (1993, p. 601) argue many regulations exist "to give officials the power to deny them and to collect bribes in return for providing the permits." Corruption might also encourage officials to work slowly if they believe managers will pay higher bribes when delays are greater than they would delays are short. Heavy regulation in corrupt countries might, therefore, be caused by officials in these countries imposing regulations and carrying out their duties slowly to extract bribes.

Firms with managers who are willing to pay bribes might also find they are more heavily regulated than firms with managers who refuse to do so. The main reason for this is managers who are willing to pay bribes might choose to interact more often with government officials than would managers who refuse to pay bribes. That is, managers who refuse to pay bribes, anticipating slow procedures and possible rejection, might try to avoid government officials when they can. Managers who are willing to pay bribes might, for example, construct new buildings that need water and power connections and construction licenses when they want to expand. Managers who refuse to pay bribes could avoid doing this by either not expanding or by leasing or buying existing buildings that already have utility connections. Similarly, managers who are willing to pay bribes might buy new equipment from abroad that need import licenses. To avoid having to get import licenses, managers who refuse to pay bribes could buy used equipment or new equipment produced domestically instead. The second possible reason is corrupt officials might target firms known to pay bribes. Demanding bribes—and creating delays—is costly for corrupt officials. They could spend the time they spend negotiating bribe payments with difficult managers extracting bribes from other managers who are more willing to pay. The officials might, therefore, focus on managers with a reputation for paying bribes. The

second reason, however, is less likely than the first; it is not clear whether firms will easily develop reputations given neither the firm nor the corrupt official is likely to advertise bribe payments.

Third, it might be that corruption does not lead to overregulation and that overregulation does not lead to corruption; instead, both might be the result of weak governance. Regulation is more time-consuming when the government is ineffective than when it is not. Similarly, when the government is ineffective, officials might be more likely to demand bribes. Many studies have noted the strong negative relationship between corruption and regulation, and bureaucratic quality (Knack & Keefer, 1995; Mauro, 1995). Langbein and Knack (2010), for example, argue corruption, regulation, and government effectiveness measures are so correlated that it is not clear they measure distinct concepts.[1]

It is important for policymakers to know whether regulation causes corruption. If regulation causes corruption, then corruption will fall when the government removes regulations and enforces them more efficiently. If, in contrast, corruption causes overregulation or weak governance results in corruption and overregulation, then improving regulation might not cut corruption.

This paper looks at whether regulation causes corruption using firm data from the World Bank's Enterprise Surveys. It contributes to the literature on corruption and regulation in three ways. First, using data on over 30,000 firms from over 100 countries, it confirms that regulation is related to firms' decisions to pay bribes. Previous firm-level studies have used smaller samples from single countries (Clarke, 2012; Malomo, 2013). The results confirm the relationship holds across many countries.

As discussed above, although regulation is linked to corruption, it might not cause corruption. The paper's second contribution is to show that it does: overregulation encourages firms to pay bribes and to pay more in bribes when they do. This does not imply that corruption does not also result in more regulation. It does, however, suggest that cutting red-tape would lower corruption.

Third, it shows regulation affects corruption more after controlling for endogeneity. Before controlling for endogeneity, the results suggest that increasing the time managers spend dealing with regulation from the amount the manager at the 25th percentile spends to the amount the manager at the 75th percentile spends would increase the likelihood the average firm would pay bribes by 10 percentage points. After controlling for endogeneity, increasing the time managers spend dealing with regulation by the same amount increases the likelihood the average firm will pay bribes by 42 percentage points.

MEASURING CORRUPTION AND REGULATION

This paper looks at the relationship between corruption and regulation using firm data from the World Bank's Enterprise Surveys (http://www.enterprisesurveys.org).[2] The World Bank has conducted over 100 of these surveys in low and middle-income countries. The survey covers retail and wholesale trade, construction, hotels and restaurants, manufacturing, transportation and communications, and information technology in between two and six large cities in each country. The paper only uses surveys conducted after 2006; the questionnaire and

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[1] They focus on measures from the in the Worldwide Governance Indicators (Kaufmann, Kraay, & Mastruzzi, 2010b). Kaufmann, Kraay, and Mastruzzi (2010a) respond in detail to Langbein and Knack (2010).
[2] World Bank (2007a, 2009) discusses how the survey was implemented and the questionnaire in more detail.

survey design changed significantly in 2006 meaning the earlier surveys cannot be compared with the surveys conducted after 2006.[3]

Corruption.

The paper's measure of corruption comes from a general question about how much firms spend bribing government officials. The question is:

> (j.7) We've heard that establishments are sometimes required to make gifts or informal payments to public officials to "get things done" with regard to customs, taxes, licenses, regulations, services etc. On average, what percent of total annual sales, or estimated total annual value, do establishments like this one pay in informal payments or gifts to public officials for this purpose? (World Bank, 2007b, p. 15)

The question asks managers what they think other firms do rather than asking them directly about their experience. This allows managers to report bribes without incriminating themselves. Because the question asks about what other firms do, the coefficient on regulation, therefore, technically describes how regulation affects managers' beliefs about other firms' bribes not how regulation affects the firms' own bribes.

When researchers use indirect questions like this one, however, they usually assume the manager is talking about what they do rather than about what they believe others do.[4] This can be justified in two ways. The first is to assume managers recognize the question is asking about their firm rather than about other firms. Johnson et al. (2002, p. 11337-1338), for example, note a manager in their survey told the interviewers he knew they were asking about his firm rather than some other firm. The second way is to argue that managers who pay bribes are more likely to think other firms pay bribes than managers who don't pay bribes. Managers who pay bribes would, therefore, be more likely to respond others pay bribes than would managers who do not pay bribes even if they think about other firms when they answer the question. Ross, Greene, and House (1977) call the idea that people believe others behave like they do as the 'false consensus effect.' For brevity, this paper sticks with the convention that managers answer the question thinking about their behavior rather than others' behavior. So if, for example, exporting firms' managers report firms like theirs are more likely to pay bribes than non-exporting firms' managers are, the paper will describe this as exporting firms' managers being more likely to report paying bribes than non-exporting firms' managers.

Another issue is that managers can answer the question either in local currency or as a percent of sales. In principle, this should not matter. If managers accurately report bribes and sales and divide bribes by sales correctly, then it would not matter whether they answer in local currency or as a percent of sales. In practice, however, the way they answer the question affects how much they report. Using data on African firms, Clarke (2011) shows firms report bribes

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[3] The survey instrument and sampling methodology were standardized in 2006. The question on government sales was added in 2007 (i.e., after the 2006 surveys).

[4] Clarke and Xu (2004), Johnson et al. (2000; 2002), Malomo (2013) and Svensson (2003), for example, explicitly make this assumption. Treisman (2007) notes this is common.

between four and fifteen times higher when they report amounts as a percent of sales.[5] The regressions, therefore, include a dummy variable indicating whether the manager answered the question in local currency or as a percent of sales to control for this.

Regulation.

The most important independent variable is a measure of the burden of regulation. Although the survey asks several questions about regulation, the paper uses the most comprehensive objective measure—the percent of their time that senior managers devote to dealing with regulations. The question is:

 (j2) In a typical week over the last 12 months, what percentage of total senior management's time was spent in dealing with requirements imposed by government regulations? (World Bank, 2007b, p. 14)

Although the survey asks several questions about regulation, the question above is the best measure for this study. First, many of the other questions are subjective; rather than asking about managers' experiences, they ask for the managers' opinions about regulation. If different managers interpret phrases like 'major obstacle' and 'minor obstacle' differently, then it will be difficult to compare their answers.[6] Second, the other objective questions are narrow; for example, the survey includes questions asking whether the firm had applied for an import license or had been inspected by the tax authorities. Although these questions are objective, they are not comprehensive.

One concern about the measure of regulation is that it might be endogenous. Rather than excessive regulation causing firms to pay bribes, firms' willingness to pay bribes might affect how they deal with regulators. As discussed above, managers who refuse to pay bribes might try to avoid government officials when possible. The regressions are, therefore, estimated using instrumental variable (IV) estimation to allow regulation to be endogenous. An instrument that is not correlated with corruption is, therefore, needed.

The study uses the number of times the tax authorities inspected the firms as an instrument for the burden of regulation. As discussed above, the main way that corruption affects how much individual firms are regulated is that firms that refuse to pay bribes might avoid government officials when they can. A firm can avoid getting a construction permit, for example, by buying or leasing an existing building rather than building a new one. Firms, however, do not choose whether tax inspectors visit them; the number of times tax inspectors visit the firm might, therefore, be a good instrument.

An alternative instrument, the average regulation other firms' managers in the same city, sector, and size group report, is used as a robustness check. Because the average omits the manager's own response many people refer to it as a leave-one-out average.[7] If similar firms have similar regulatory burdens, the leave-one-out average will be correlated with the manager's own response. Because the average only includes other firms' responses, it should, however, be uncorrelated with the manager's own experience with corruption. Many papers using firm-level data, including several papers on corruption, use averages or leave-one-out averages to reduce

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[5] Clarke (2011) shows this is not due to observable differences between firms that report amounts in local currency and firms that report amounts as a percent of sales. Malomo (2013) finds similar results for Nigeria.
[6] Bertrand and Mullainathan (2001) discuss subjective questions in economics.
[7] Angrist (2014) discusses the advantages of leave-one-out averages over simple averages.

endeavor problems.[8] Because there are two leave-one-out averages, the average number of tax inspections and the average time spent with regulators, the over-identifying assumption can be tested to confirm the leave-one-out averages are uncorrelated with corruption.

EMPIRICAL RESULTS

Following previous studies, the decision of whether to pay a bribe and how much to pay are modelled separately with a decision regression and an extent regression (Malomo, 2013; Svensson, 2003). The decision regression looks at whether the firm pays any bribes, while the extent regression looks at how much the firm pays. Firms that do not pay bribes are omitted from the extent regression. Although the decision and extent regressions could be estimated with one Tobit regression, the Tobit model assumes the coefficients in the decision and extent regressions are the same. Malomo (2013) and Svensson (2003), however, show this is not the case. The Tobit model is, therefore, not appropriate.

The first question is how regulation affects the decision to pay bribes. The model is the following:

$$Propensity\ to\ pay\ bribes_{ij} = \alpha_j + \beta \ln\left(regulation_{ij}\right) + \gamma x_{ij} + \varepsilon_{ij} \tag{1}$$

Firm i in country j's propensity to pay bribes depends on the regulatory burden ($regulation_{ij}$), firm-level characteristics (x_{ij}), and an error term (ε_{ij}). The regulatory burden is the natural log of the percent of senior management's time spent dealing with government regulations.[9]

The regression includes country-time dummies (α_j) to control for omitted country characteristics that affect corruption and regulation. The strength of the government bureaucracy is one such omitted characteristic; as discussed earlier, countries with weak bureaucracies often have burdensome regulation and high corruption. The country dummies can control for this and other omitted country characteristics. Because the same country has separate dummies for different years, the dummies also allow the omitted characteristics to change over time within countries.

The regressions also include several firm characteristics such as size, ownership, age, and performance. An appendix discusses the reasons for including each characteristic.

The firm's propensity to pay bribes cannot be observed. The dependent variable is, therefore, a dummy variable equal to one if the firm reports paying bribes rather than the firm's propensity to pay bribes. The firm pays bribes when its propensity to pay exceeds some level, which is normalized to 0. This implies:

$$Firm\ pays\ bribes_{ij} = \begin{cases} 1 & if \quad Propensity_{ij} > 0 \\ 0 & if \quad Propensity_{ij} < 0 \end{cases} \tag{2}$$

Because the error term, ε_{ij}, is assumed to be normally distributed, the model is a Probit model.

The next question is whether regulation affects how much firms pay in bribes. A second regression is, therefore, estimated with the amount the firm pays in bribes as a percent of sales as the dependent variable. The model is:

$$\ln\left(bribe_{ij}\right) = \alpha_j + \beta \ln\left(regulation_{ij}\right) + \gamma x_{ij} + \varepsilon_{ij} \tag{3}$$

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[8] For studies of corruption see, for example, Svensson (2003), Fisman and Svensson (2007), and Clarke (2014). Xu (2011) discusses the use of these averages using firm level data in a broader context.

[9] To avoid dropping observations where managers report spending no time dealing with regulation, 1 is added to the percent of time.

Because the dependent variable is the natural log of bribes paid, the regression automatically excludes firms that do not pay bribes. This model shows how the independent variables affect how much firm i in country j pays in bribes when it pays bribes.

The independent variables are the same as in the first equation with one difference; the regression includes an extra variable showing whether the manager answered the question in local currency or as a percent of sales. As discussed earlier, managers who answer the question about how much they pay in local currency report paying much less in bribes than managers who answer the question as a percent of sales (Clarke, 2011; Malomo, 2013).[10] The extra variable controls for this.

Empirical Results: Regulation

The models are first estimated assuming regulation is exogenous (see columns 1 and 2 in Table 1). As in previous studies (Clarke, 2012; Malomo, 2013), managers who spend more time dealing with regulation are more likely to pay bribes (i.e., in the decision regression) and pay more in bribes when they do (i.e., in the extent regression) than managers who spend less time. This confirms that the earlier results from single country studies also hold for the larger cross-country sample in this study. On average, managers would have about a 13 percent chance of paying a bribe if they were at the 25th percentile in terms of the time they spend dealing with regulation.[11] In contrast, they would have about a 23 percent chance of paying a bribe if they were at the 75th percentile. In the extent regression, a 1 percent increase in time spent dealing with regulation is associated with a 0.1 percent increase in how much the manager pays in bribes.

As discussed above, however, regulation might be endogenous. Managers who pay bribes might be more willing to interact with corrupt government officials (i.e., if it allows them to get what they want) than managers who refuse to pay bribes. In addition, corrupt officials might target managers whom the officials suspect of paying bribes.

The models are re-estimated using IV methods to control for endogeneity. The instrument is the number of times tax inspectors inspected the firm. The previous section discusses the identification strategy and the next subsection presents robustness checks with different instruments.

Controlling for endogeneity results in the coefficients on the regulation variable remaining statistically significant and becoming larger (see columns 3 and 4 in Table 1). The average manager would have about a 6 percent chance of paying a bribe if he or she were at the 25th percentile in terms of the time he or she spent dealing with regulation. The same manager would have about a 48 percent chance of paying a bribe if he or she were at the 75th percentile. Moving from the 25th to 75th percentile, therefore, increases the average likelihood a manager would pay a bribe by 42 percentage points. The effect is also larger in the extent regression after controlling for endogeneity: a 1 percent increase in time spent dealing with regulation leads to a 0.5 percent increase in how much the manager pays in bribes.

The results suggest regulation is endogenous. The null hypothesis that regulation is exogenous is rejected in both the decision and extent regressions (see Table 2). This favors the

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[10] All amounts are converted to percent of sales by dividing bribes by sales for firms that reported the amounts in local currency.

[11] Probabilities are calculated for all managers in the sample replaced their actual time spent dealing with regulation at the level for the manager at the 25 percentile in terms of time spend with government officials. The probabilities are then averaged across the sample.

larger coefficients from the IV estimation. Because the system is only just identified, it is not possible to test over-identifying assumptions.

The instruments appear strong in both regressions (see Table 2). This is important because IV estimates are biased when the instruments are weak (Staiger & Stock, 1997). Although instrument strength cannot be tested in the decision regression when using maximum likelihood estimation (MLE), it can be tested when using a two-step Newey estimator (Newey, 1987) or a linear probability model.[12] The null hypothesis of weak instruments is rejected at a 1 percent significance level in both cases. In the extent regression, the null hypothesis of weak instruments is rejected even though the sample is much smaller after omitting firms that do not pay bribes.

Empirical Results: Other Variables.

Many of the coefficients on the other control variables are statistically significant in one or both regressions. The coefficients, however, are often different in the two regressions; for example, although exporters are more likely to say they pay bribes than non-exporters are, they say they pay less than non-exporters do. This supports the decision to estimate the decision and extent regressions separately. Tobit estimation, which would force the coefficients to be the same in the two regressions, is, therefore, not appropriate.

Large firms are less likely to pay bribes than small firms and report paying lower bribes when they do. Corruption might, therefore, disadvantage small firms especially. In contrast, firm age does not affect either the likelihood the firm pays bribes or how much they pay after controlling for other things.

Ownership also matters. Firms with female owners are less likely to pay bribes and pay less when then do than firms without any female owners. Foreign-owned firms are also less likely to pay bribes than domestic firms. This might be because they risk prosecution in their home countries if they pay bribes. Interestingly, however, foreign firms do not pay less in bribes than domestic firms when they pay bribes. The results are similar for government-owned firms.

Firm performance affects bribe payments. Firms that are growing quickly and exporters are more likely to pay bribes than other firms. They do not, however, pay more in bribes when they do. The coefficients on exporting and firm growth are negative and statistically significant in the extent regression, suggesting they pay less, not more, in bribes.

Firms that sell goods to the government are more likely to pay bribes than other firms. This might be because even though the question does not specifically ask about contracts, managers might not distinguish between bribes paid for licenses and government services and bribes paid to win contracts when they answer the question. They might, therefore, include bribes for contracts in the amount they report. An alternative explanation is firms that do business with the government might need to comply more fully with other government regulations meaning that they interact more with government officials. This might be because they need to remain formal to compete for government contracts or might be because they are more visible to government regulators. Consistent with the second explanation, Clarke (2014) finds these same firms report regulations are more burdensome than firms that do not compete for government contracts.

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[12] Results from the two-step Newey estimator are almost identical to results from MLE. Results from the linear probability model are similar in terms of statistical significance.

Finally, consistent with Clarke (2011), firms that report amounts in local currency report far lower bribes than firms that report bribes as a percent of sales. This suggests that it is important to control for this in the extent regression.

Robustness Check: Alternative Instruments

One concern is the instrument, the number of times that tax inspectors visit the firm, might itself be endogenous. Measures of regulation might be endogenous for two reasons. The first, and most important reason, is that managers who are willing to pay bribes might be more willing to have voluntary transactions with government officials than managers who refuse to do so. This, however, is not a major concern for tax inspections: managers who refuse to pay bribes cannot easily avoid them. The instrument, therefore, deals with the most important source of endogeneity. It does not, however, deal with another possible source: corrupt tax officials might target firms if the officials think the firm pays bribes. Although the second reason for endogeneity is a lesser concern than the first—officials might not know which firms pay bribes because few managers will admit to doing so—it might remain a concern.

A different instrument, the average percent of their time that managers of other similar firms report that they spend dealing with regulation, is, therefore, used as a robustness check. The leave-one-out average is the average for other similar sized firms in the same city and sector omitting the firm's own response. A leave-one-out average is used rather than a simple average because if the firm's own response is endogenous, then the simple average including the firm's own response will also be endogenous.[13]

The leave-one-out average needs to be strongly correlated with the firm's own response to be a good instrument. Firms' responses could be correlated for two reasons. First, if omitted variables affect the regulatory burden for all firms in each city and sector then the leave-one-out average will be correlated with the firm's own response. This might be the case if, for example, the local government's administrative capacity affects the regulatory burden facing all similar firms. Firms' responses might also be correlated if peer effects are important: that is, if firms decide how to deal with regulation after considering how other similar firms behave.

The leave-one-out average is a strong instrument in the decision regression. The null hypothesis that the instrument is weak is rejected at a 0 percent level.[14] The instrument performs less well, however, in the extent regression. This might be because the sample in the extent regression, which excludes firms that do not pay bribes, is much smaller (6,204 compared with 35,576 observations). Perhaps because of the smaller sample size, the null hypothesis that the instruments are weak cannot be rejected at even a 10 percent level in the extent regression.

The results in the decision (IV Probit) regression are robust. The coefficient on time spent dealing with regulation remains positive and statistically significant in the two-step and MLE regressions (see Table 3).[15] This provides further evidence that firms that spend more time dealing with regulation are more likely to pay bribes than those that spend less time. The coefficient is, however, smaller than it was in the previous IV regressions. Regulation might,

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[13] In addition, as discussed in Angrist (2014), the simple average (i.e., including the firm's response) is mechanically correlated with the firms' own response.

[14] As before, the weak IV test is for the two-step estimator.

[15] For presentational purposes, Table 3 only includes the coefficients on the regulation variable. As noted in the table, the regressions include all the independent variables included in Table 1. Full results are available on request.

therefore, affect corruption less than the previous IV results suggest; it still, however, affects it more than the results that do not control for endogeneity suggest.

In contrast, the results for the extent regressions, which look at how much the firm pays in bribes, are less robust than the results from the decision regression. Although the coefficient remains positive, it is statistically insignificant at even a 10 percent level and is close to the ordinary least squares (OLS) estimate in size (see Table 3 and Table 1). This could be because the instrument in the smaller second stage regression is weak; two-stage least squares (2SLS) results are biased in the same direction as OLS when this is the case.

As a final exercise, leave-one-out averages for both instruments are used. One advantage of using two instruments rather than one is the over-identifying assumptions can now be tested. The null hypothesis that the over-identifying assumptions are valid cannot be rejected at even a 10 percent significance level.[16]

The results using both instruments are similar to the results using only the leave-one-out average of the percent of time spent dealing with regulations. The coefficient on the regulation variable remains positive, statistically significant and about the same size in the decision regression. Similarly, it remains positive but statistically insignificant in the extent regression.

CONCLUSIONS

Using a large cross-country data set, this paper confirms there is a link between regulation and corruption. Managers who spend more time dealing with regulations, inspections, and licenses are more likely to report firms like theirs pay bribes and report they pay more in bribes when they do than managers who spend less time. This result is consistent with previous results from single country studies (Clarke, 2012; Malomo, 2013).

Previous empirical studies have assumed regulation affects corruption, but corruption does not affect regulation. This, however, might not true. Knowing it is difficult to get optional licenses and services without paying bribes, managers who refuse to pay bribes might avoid having to do so by not trying to get the optional licenses or services. The results in this paper confirm that this is the case: regulation is endogenous to corruption.

The paper shows that after controlling for endogeneity, heavily regulated firms are more likely to pay bribes than less regulated firms and that they pay more in bribes when they do. The coefficients on regulation are larger in the IV regressions than in the regressions where regulation is exogenous. The results controlling for endogeneity imply increasing the time managers spend dealing with regulation from the 25th to the 75th percentile would increase the likelihood the average firm would pay a bribe by 42 percentage points. The results assuming regulation is exogenous suggest a similar increase in the regulatory burden would increase the likelihood the firm pays a bribe by much less: only ten percentage points. The impact is also greater in the extent regressions. IV regressions suggest that increasing the time the average manager spends dealing with regulation by 1 percent increases how much the manager pays in bribes by 0.5 percent. In comparison, the results from the regressions that assume regulation is exogenous suggest the increase would only be 0.1 percent.

The results suggest that cutting the regulatory burden would reduce corruption; this would not be true if causation only went from corruption to regulation. In countries with weak institutions, cutting red-tape is likely to be especially useful because other methods, such as

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[16] In the decision regression, the over-identifying assumptions cannot be rejected at a 28 percent significance level. In the extent regression, the over-identifying assumptions cannot be rejected at an 11 percent significance level

relying on the courts or an anti-corruption agency, work less well in these countries. When firms can bribe judges, prosecutors, and anti-corruption agency officials—as is likely to be the case in countries with weak institutional environments—stricter laws and more money to enforce them are unlikely to reduce corruption.

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APPENDIX: ADDITIONAL CONTROL VARIABLES INCLUDED IN THE ANALYSIS

The regressions includes additional control variables that have been suggested in previous studies. The first additional variable is a proxy for firm size: the number of workers. Corruption might affect large firms differently than smaller firms. One reason is that large firms are more visible than small firms. This will make it harder for large firms to avoid corrupt government officials demanding bribes. Moreover, corrupt officials might target large firms with greater ability to pay bribes. Finally, large firms often have to comply with more regulations than small firms. In Sri Lanka, for example, small firms with fewer than 15 workers are not subject to the Termination of Employment of Workmen Act (Abidoye, Orazem, & Vodopivec, 2009). This increases the likelihood that large firms will have to interact with corrupt government officials. Although this suggests that large firms might pay more bribes than small firms, the reverse might also be true. If large firms are better connected this might affect how they deal with government officials and, therefore, their experience with corruption (Campos & Giovannoni, 2006). Managers of large firms are more likely to be able to avoid bribes by appealing to higher level officials.

Older firms might also have different experiences than young firms. Young firms might be less visible, reducing bribe demands. On the other hand, new firms might need to get more permits and licenses than older firms, possibly increasing bribe demands.   Because corruption might affect domestic firms differently than foreign firms, the regressions also include a variable indicating that the firm is foreign owned. As with large firms, corrupt officials might target foreign owned firms, believing that they are able to pay more bribes than domestic firms. Foreign-owned firms, however, have a stronger incentive than domestic firms not to pay bribes. Foreign investors from developed economies, in particular, might be concerned about laws in their home countries, such as the US Foreign Corrupt Practices Act of 1977 or other laws related to the Organisation for Economic Co-operation and Development's (OECD's) Convention on Combating Bribery of Foreign Public Officials, that make them liable for prosecution in their home country. Even if this does not discourage them from paying bribes, it might discourage them from admitting to paying bribes during surveys.

As well as the dummy for foreign ownership, the regressions also include two other ownership dummies: a dummy indicating partial government ownership and a dummy variable indicating that the firm is female-owned. Although fully government owned firms are excluded from the *Enterprise Surveys*, some partially government owned firms are included. Because government owned firms are likely to have better connections within the government, they might find it easier to avoid bribe demands than private firms. Female-owned firms might also behave differently than male-owned firms. Several studies have found that the is less corruption when women are better represented in government and the workforce (Dollar, Fisman, & Gatti, 2001; Swamy, Knack, Lee, & Azfar, 2001)

The regressions also include a dummy variable indicating that the firm exports. Exporters might have to pay higher bribes than other firms for two reasons. First, exporters might have more interactions with potentially corrupt government officials, especially those involved with customs administration. Second, corrupt officials might believe that they are more willing and able to pay bribes—exporters are usually larger, more capital intensive, and better performing than other firms (Bernard, Jensen, Redding, & Schott, 2007).

Several studies have found that corruption is a greater problem for high performing firms than it is for low performing firms (Clarke & Xu, 2004; Safavian, Graham, & Gonzalez-Vega, 2001; Svensson, 2003). This might be because corrupt bureaucrats target high performing firms

or because managers of high performing firms are more able to pay bribes. Although there are many ways to measure firm performance, the measures used in this study are sales growth and a dummy variable indicating that the firm has audited accounts. The main reason to use these variables rather than profitability or total factor productivity is that profitability and labor productivity can only be calculated for manufacturing firms using Enterprise Survey data.[17] Including these other measures of performance would result in a significant drop in sample size. For the same reason, the regressions do not include any measure of capital use or intensity. Growth might also affect bribe demands if fast growing firms are more likely to interact with government officials as they expand their business. If they need to expand their facilities, for example, they might be more likely to apply for construction permits, utility connections or import licenses for new equipment.

Selling goods and services to the government might affect the amount that the firm pays in bribes. Although the question on corruption refers explicitly to petty corruption—that is, bribes for customs, taxes, licenses, regulations, and services—it is possible that managers might include bribes paid to win government contracts. Even if most managers do not interpret it this way, firms that do business with the government might find themselves vulnerable to bribe demands if they become more visible to government officials when they bid for contracts or if they are required to comply with regulations and tax laws to participate in government contracts. Consistent with this, Clarke (2014) finds that firms that sell goods and services to the government are more likely to say that various areas of regulation are a serious problem than are other firms. For this reason, the regressions include a dummy variables indicating whether the firm had tried to secure a government contracts within the past year.[18]

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[17] Information on intermediate inputs and capital are only collected for manufacturing firms.
[18] More detailed measures (e.g., government sales as a percent of sales) are not available.

TABLES

Table 1: Effect of regulation on probability that firm pays bribe and amount of bribes.

Model	Probit	OLS	IV Probit (Two-step)	2SLS
Dependent Variable	Firm paid bribe (dummy)	Amount of bribe (nat. log)	Firm paid bribe (dummy)	Amount of bribe (nat. log)
Observations	35,575	6,548	33,818	6,104
Country Dummies	Yes	Yes	Yes	Yes
Regulation				
% of time with regulators (nat. log)	0.169***	0.103***	0.705***	0.543**
	(22.23)	(6.11)	(16.55)	(2.06)
Firm Characteristics				
Number of Workers (nat. log)	-0.014*	-0.229***	-0.057***	-0.276***
	(-1.78)	(-13.45)	(-7.57)	(-9.99)
Firm Age (nat. log)	-0.036**	0.001	-0.009	0.004
	(-2.52)	(0.02)	(-0.69)	(0.11)
Female owner (dummy)	0.003	-0.050	-0.048***	-0.080*
	(0.16)	(-1.25)	(-2.85)	(-1.72)
Firm exports (dummy)	0.154***	-0.134***	0.066***	-0.157***
	(6.78)	(-2.77)	(2.85)	(-2.81)
Firm is foreign-owned (dummy)	-0.076**	-0.052	-0.055*	-0.028
	(-2.25)	(-0.68)	(-1.84)	(-0.32)
Firm is partly government owned (dummy)	-0.146**	-0.084	-0.107*	-0.015
	(-2.19)	(-0.59)	(-1.80)	(-0.10)
Growth of Sales (percent)	0.001**	-0.003***	0.000	-0.004***
	(2.08)	(-5.09)	(0.86)	(-4.97)
Firm has audited accounts (dummy)	-0.036*	-0.174***	-0.108***	-0.254***
	(-1.75)	(-4.01)	(-5.69)	(-3.83)
Firm sells to government (dummy)	0.338***	0.216***	0.167***	0.163***
	(15.47)	(4.89)	(5.20)	(2.66)
Firm in manufacturing sector [a]	-0.073***	-0.086	-0.024	-0.055
	(-2.90)	(-1.61)	(-1.05)	(-0.95)
Firm in retail trade sector [a]	-0.056**	-0.449***	0.013	-0.420***
	(-2.08)	(-7.66)	(0.54)	(-6.39)
Answered bribe question in currency (dummy)		-2.901***		-2.853***
		(-63.74)		(-54.13)
R Squared/Pseudo R-Squared	0.20	0.54	---	0.49

Source: Authors' calculations based on data from the World Bank Enterprise Surveys.
[a] Omitted sector is other services. ***, **, * means statistically significant at a 10%, 5%, and 1% level.
Note: T-statistics in parentheses. All regressions include a full set of country-year dummies. Instrument is the number of tax inspections in previous year.

Table 2: Test for instrument strength and exogeneity

Model	Firm paid bribe			Amount of Bribe
	Linear Prob. Model	Two-Step (Newey)	IV Probit (MLE)	2SLS
AR test for weak instruments (χ^2[1])	96.07***	80.64***	---	4.67**
AR test (p-value)	(0.00)	(0.00)	---	(0.03)
Exogeneity test (χ^2 [1])	70.29***	56.56***	61.29***	3.21*
Exogeneity test (p-value)	(0.00)	(0.00)	(0.00)	(0.07)

Source: Authors' calculations based on data from the World Bank Enterprise Surveys.

***, **, * means statistically significant at a 10%, 5%, and 1% level.

Note: Weak instrument tests are Anderson-Rubin test (Anderson & Rubin, 1949) calculated using the weakiv package in Stata (Finlay, Magnusson, & Schaffer, 2013)

Table 3: Coefficients on regulation variables, robustness checks

Model	Dependent Variable	Instruments	Obs.	% of time with regulators	
				Coef.	T-stat
IV Probit (two-step)	Firm paid bribe	Leave-one-out average (% of time)	35,576	0.279***	(4.94)
IV Probit (MLE)	Firm paid bribe		33,209	0.277***	(5.14)
2SLS	Amount of bribe		6,204	0.070	(0.35)
IV Probit (two-step)	Firm paid bribe	Leave-one-out averages (% of time, # of tax insp.)	35,576	0.297***	(5.18)
IV Probit (MLE)	Firm paid bribe		31,458	0.294***	(5.46)
2SLS	Amount of bribe		5,761	0.136	(0.66)

Source: Authors' calculations based on data from the World Bank Enterprise Surveys.

***, **, * means statistically significant at a 10%, 5%, and 1% level.

Note: Regressions include country dummies and independent variables from Table 1. Weak instrument tests are Anderson-Rubin test (Anderson & Rubin, 1949) calculated using the weakiv package in Stata (Finlay et al., 2013).