WHO MUST PAY BRIBES AND HOW MUCH? EVIDENCE FROM A CROSS SECTION OF FIRMS*

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This paper uses a unique data set on corruption containing quantitative information on bribe payments of Ugandan firms. The data have two striking features: not all firms report that they need to pay bribes, and there is considerable variation in reported graft across firms facing similar institutions/policies. We propose an explanation for these patterns, based on differences in control rights and bargaining strength across firms. Consistent with the control rights/bargaining hypotheses, we find that the incidence of corruption can be explained by the variation in policies/regulations across industries. How much must bribe-paying firms pay? Combining the quantitative data on corruption with detailed financial information from the surveyed firms, we show that firms' "ability to pay" and firms' "refusal power" can explain a large part of the variation in bribes across graft-reporting firms. These results suggest that public officials act as price (bribe) discriminators, and that prices of public services are partly determined in order to extract bribes.

I. INTRODUCTION

With few exceptions, research on the determinants of corruption has three common features.[1] It is based on cross-country analyses; it exploits data on corruption derived from perception indices, typically constructed from foreign experts' assessments of overall corruption in a country; and it explains corruption as a function of countries' policy-institutional environment.[2] These features are interlinked. The use of cross-country data naturally lends itself to study macro-determinants of corruption (and vice

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1. A (incomplete) list of contributions include Mauro [1995], Ades and Di Tella [1997, 1999], Persson, Tabellini, and Trebbi [2001], Svensson [2000], and Treisman [2000]. For recent surveys of the literature on corruption, see Bardhan [1997].

2. Kaufmann and Wei [1998] also use firm-level data (based on the Global Competitiveness Report index) to assess the validation of the "grease argument," but the data are perception based and derived from questions referring to country characteristics. Ades and Di Tella [1999] utilize the same source but use country averages. Hellman et al. [2000a,b] also use firm-level data. The data are numerical but ordinal (based on multicategory responses to questions on corruption). In line with the cross-country literature, they explain corruption as a function of the political-institutional environment. Di Tella and Schargrodsky [2003] use quantitative micro data (from hospitals) to study the relationship between corruption, wages, and audits.

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versa), and given the difficulties (and costs) of collecting quantitative data on corruption, the use of perception data makes it feasible to study a large cross section of countries.

While the literature has provided important insights on the aggregate determinants of corruption, it also has its drawbacks. First, the use of perception indices raises concern about perception biases. Second, due to the aggregate nature of the data, it tells us little about the relationship between corruption and individual agents (i.e., an aggregation problem). Most importantly, macro-determinants cannot, by definition, explain the within-country variation in corruption. Specifically, firms facing similar institutions and policies may still end up paying different amounts in bribes (for the same set of services received).

This paper avoids these problems by using a unique data set on corruption containing quantitative information on bribe payments of Ugandan firms. We ask two questions: who must pay bribes and how much? As in the cross-country work, we refer to the variation in policies/regulations (but across industries) to answer the question of the incidence of corruption. We find that firms typically have to pay bribes when dealing with public officials whose actions directly affect the firms' business operations. Such dealings cannot be easily avoided when, for example, exporting, importing, or requiring public infrastructure services.

How much must graft-paying firms pay? Consider a scenario where firms, if forced to pay bribes to continue their operations, bargain about the amount with a rent-maximizing public official. The group of graft-paying firms faces the same set of rules and regulations, but they differ in profitability and choice of technology. These firm characteristics determine a firm's ability to pay bribes and the cost of reallocating its business elsewhere so as to avoid this, i.e., the value of a firm's outside option. We combine the quantitative data on corruption with detailed financial information from the surveyed firms to test this bargaining hypothesis and find that firms' "ability to pay," proxied with their current and expected future profitability, and firms' "refusal power," measured by the estimated alternative return on capital, can explain a large part of the variation in bribes across graft-reporting firms. The results are statistically robust and remain intact when instrumenting for profits. These findings suggest that public officials act as price (bribe) discriminators, and that the prices of public services are determined in a bargaining process where firms' outside options matter.

Modern research on the economics of corruption began with Rose-Ackerman [1975, 1978]. Despite more than two decades of research, however, economic studies on corruption at the firm level are rather limited. Shleifer and Vishny [1993] analyze a bureaucracy selling a government-produced good (e.g., a permit), noting that if the officials do not coordinate the extraction of bribes, they fail to internalize the effect of their demands for bribes on other officials' income, thereby leading to very high corruption levels. Bliss and Di Tella [1997] study the relationship between corruption and competition. They show that if bureaucrats have the power to extract money from firms under their control, they will drive the most inefficient firms out of business, thereby enhancing the profitability of remaining firms, which, in turn, makes it possible to demand larger bribes. Choi and Thum [1999] use a similar model to study the effects of repeated extortion. The bargaining hypothesis we propose builds on this body of work, although it differs in one key aspect: firms' ability to pay bribes or their power to avoid them differs in observable ways, so that public officials make different bribe demands across firms.

This paper is organized as follows. In Section II we briefly outline the two key hypotheses on the incidence and level of graft. Section III presents the data. In Section IV we discuss the empirical specification, and in Section V we present the results. Section VI concludes.

II. A Framework to Study the Incidence and Level of Graft

The Uganda firm-level survey was designed to be representative of the population of firms in five main industrial categories. In such a data set, why would one expect to find some firms that need to pay bribes while others do not?[3] Clearly, there might be several reasons. For instance, firms deal with public officials who differ with respect to the personal (moral) cost of demanding bribes. Public officials' perception of the likelihood of getting caught if being corrupt and the perceived punishment if found guilty may also differ. However, possibly the most important explanation is that officials' opportunity to extract bribes, i.e., their opportunity to influence the firms' business decisions and cash flows, differs across sectors and locations. With private

3. The working paper version provides a formal model underlying the discussion in this section.

firms, these control rights stem from the existing regulatory system and the discretion public officials have in implementing, executing, and enforcing rules and benefits that affect firms, such as business regulations, licensing requirements, permissions, taxes, exemptions, and public-goods provision.

Initial differences in control rights across sectors may be compounded by the endogenous response by public officials. Specifically, public officials more prone to demand bribes will choose to work in agencies with discretionary power over firms; see Wade [1982].

The control rights determine the threat point in the negotiation between a public official and a firm (cf. Shleifer and Vishny [1994]). A firm manager with full control rights has enough leverage to avoid paying bribes without any significant impact on her business operations. When public officials maintain control over firms through regulation, the firms must either pay the required bribe or exit the market.[4] We do not explicitly observe the officials' control over the firms. However, we can measure a firm's (required) dealings with the public sector. If a firm operates in a sector, or organizes production in such a way that the need/demand for public services is minimized, then it is also more likely able to avoid paying bribes without any major impact on its business. If, on the contrary, a firm is under public control, in the sense that it benefits from public services and operates in a sector regulated by public officials, then it is costly to refuse to pay. Formally, the control rights hypothesis can be stated as

$$p_i = \chi' \mathbf{w}_i + \nu_i, \tag{1}$$

where p_i is the probability that firm i must pay bribes, $\mathbf{w}_i$ is a vector measuring (required) dealings with the public sector, χ is a coefficient vector, and ν_i is an unobserved error term.

How much must graft-paying firms pay? If the firms face the same set of rules and regulations and there are no differences in the number (or the extent) of interactions with the public sector, the answer must be firm specific. Consider a firm forced to pay bribes to continue its operations and is bargaining with a rent-maximizing public official. The official will try to extort as high a bribe as possible, subject to the constraints that she might get

4. Exit can be conceptualized in a variety of ways, from shifting to another sector or location (including moving funds abroad) to reorganizing business so as to avoid contacts with the public sector.

caught and punished and that the firm might exit. Two firm-specific features would influence the magnitude of the graft demand: the firm's ability to pay the bribe and the firm's refusal power, i.e., the cost of not paying.

A firm's ability to pay could be proxied by its current and expected future flows of profits. Everything else equal, higher profits today or higher expected future profits will "weaken" the firm's bargaining position, since the public official can demand a higher bribe for a given service and the firm can also afford to pay it.

To measure a firm's cost of refusing to pay, we must determine the alternative return on the firm's capital stock, given that refusal to pay will force the firm to exit. The relative cost of exiting is the difference between the forgone net expected profits (gross profit net of bribes) today and the next period and the expected profits the firm could make elsewhere (next period) if divesting and reallocating its production to another sector/location, or investing the divested funds abroad. Since capital is partly sunk, the firm's choice of technology will determine the cost of refusing to pay bribes. Let $\pi(k)$ denote profit as a function of the (observed) capital stock. Assume that a share $\alpha \in (0, 1)$ of invested capital can be resold and reinvested. Then, changing business reduces profits to $\pi(\alpha k)$. Having a technology with a low sunk cost component (high α) will strengthen the firm's bargaining position in that exiting becomes more profitable. As a result, the public official will be forced to demand a lower bribe.

The bargaining hypothesis thus suggests that the amount of bribes a firm needs to pay depends positively on current and expected future profits and negatively on the expected alternative return to capital. Assuming a linear relationship, the bargaining hypothesis can be stated as

$$g_i = \beta_0 + \beta_1 \pi_i(k) + \beta_2 E\pi_i(k) + \beta_3 E\pi_i(\alpha k) + \epsilon_i, \tag{2}$$

where g is graft, $\pi_i(k)$ is current profit, $E\pi_i(k)$ is expected future (next period) profit, $E\pi_i(\alpha k)$ is the expected alternative return on capital (next period), ϵ_i is an error term, and β_0, β_1, β_2, β_3, are coefficients. We expect $\beta_1 > 0$, $\beta_2 > 0$, and $\beta_3 < 0$. Let the vector characterizing the firm's bargaining position be denoted by $\mathbf{z} = \{\pi_i(k), E\pi_i(k), E\pi_i(\alpha k)\}$.

III. Data

The data used in the paper are from the 1998 Ugandan enterprise survey; see Reinikka and Svensson [2001] for details. The survey, carried out during January–June 1998, was initiated by the World Bank and the Uganda Private Sector Foundation. Its primary goal was to collect data on constraints facing private enterprises in Uganda.

The sampling frame was based on an industrial census from 1996 and was confined to five general industrial categories (commercial agriculture, agro-processing, light manufacturing, construction, and tourism).[5] These five sectors employ 80 percent of the total labor force in the industrial sector. The sample size was 250 establishments (out of 1282 enterprises in the census in the five industrial categories). Five geographical regions were covered in the sample (Kampala, Jinja/Iganga, Mbale/Tororo, Mukono, and Mbarara). Seventy percent of total employment is confined to these regions. Three general criteria governed the choice of procedure in selecting the sample from the eligible establishments. First, the sample should be representative of the population of establishments in the specified industrial categories. Second, the establishments surveyed should account for a substantial share of national output in each of the industrial categories. Third, the sample should be sufficiently diverse in terms of firm size to enable empirical analysis on the effects of firm size. To account for these three considerations, a stratified random sample was chosen using employment shares as weights.

The empirical strategy used to collect information on bribe payments across firms in Uganda featured the following five key components. (1) An employers' association (Ugandan Manufacturers' Association) carried out the survey. In Uganda, as in many other countries, people have a deep-rooted distrust of the public sector. To avoid suspicion of the overall objective of the data collection effort, the survey was done by a body in which firms had confidence. The cooperation with the main private sector organizations had the additional advantage of most entrepreneurs feeling obliged to participate in the survey. (2) Questions on corruption were phrased indirectly to avoid implicating the respondent of wrongdoing. For example, the key question on bribe payments

5. The five sectors could be further classified into 14 three-digit ISIC-categories.

was reported under the following question: "Many business people have told us that firms are often required to make informal payments to public officials to deal with customs, taxes, licenses, regulations, services, etc. Can you estimate what a firm in your line of business and of similar size and characteristics typically pays each year?" (3) Corruption-related questions were asked at the end of the interview, when the enumerator(s) had presumably established credibility and trust. (4) Multiple questions on corruption were asked in different sections of the questionnaire.[6] (5) Each firm was typically visited at least twice by one or two enumerators (to accommodate the manager's time schedule). The data collection effort was also aided by the fact that the issue of corruption has been desensitized in Uganda, in part due to a number of awareness-raising campaigns on the subject.

We were able to collect bribery data for 176 firms out of the 243 sampled. Summary statistics are reported in Appendix 2. Twenty-seven of the sixty-seven firms that did not respond to the main corruption question also declined to answer other sensitive questions—for example, about cost, sales, and investment—while the remaining forty firms specifically declined to answer the main question on corruption. The missing bribery data raise concern about possible selection bias. Although we do not have information on why some firms did not volunteer how much they pay in bribes (if any), we can check whether the groups of responders and nonresponders differ on observables. In Appendix 3 we report a set of regressions using observable firm characteristics such as firm size, profit, a measure of the capital stock, and total investment (all variables are defined in the Appendix) as dependent variables. The regressor is a dummy variable taking the value 1 if a firm has missing data on corruption. As is evident, the group of firms missing information on corruption (67 firms), reported in column (1), and the group of firms only missing information on corruption (40 firms), column (2), do not differ significantly in observables (size, profit, and investment) from the group of graft-

6. The survey instrument contained roughly 150 questions, and a handful were related to corruption. As discussed in Svensson [2001], the reported bribe payment is highly correlated with other corruption-related variables derived from the survey data. The consistent findings across measures significantly enhance the reliability of the bribe data.

reporting firms. Thus, there is no (observable) evidence suggesting that the sample of 176 firms is not representative.[7]

IV. Specification

The framework laid out in Section II suggests that there are two processes, captured by the vectors, $\mathbf{w}_i$ and $\mathbf{z}_i$, that drive the incidence and level of bribes across firms. For simplicity, in discussing the conceptual framework, we have treated these processes independently, suggesting a unique set of variables determining the incidence of graft and another (unique) set of variables affecting the magnitude. However, in reality it is possible that the factors determining the likelihood of paying bribes also influence the magnitude of the bribes and vice versa. Therefore, in the baseline specification, we include both vectors ($\mathbf{w}$ and $\mathbf{z}$) of controls.

Since the probability that a randomly drawn firm i must pay bribes p_i is not directly observable, the incidence equation is reformulated as a probit model:

$$\Pr(corrdum_i = 1) = \Phi(\chi_w' \mathbf{w}_i + \chi_z' \mathbf{z}_i), \tag{3}$$

where $corrdum_i = 1$ [$corrdum_i = 0$] is the event that a firm must [must not] pay bribes, and Φ is the standard normal distribution function. As proxies for firms' (required) dealings with the public sector ($\mathbf{w}$), we use a measure of the extent to which the firm receives public services (*infrastructure services*); a dummy indicating whether the firm is engaged in trade (*trade*); and an index variable reflecting the types and number of taxes a firm pays (*pay tax*). We also include employment size (*employment*) as an additional control. Presumably, smaller firms can more easily avoid detection by government authorities. All variables are defined in detail in Appendix 1.

Of the $\mathbf{z}$-variables, only current profit π can directly be derived from the survey data. We replace the unobserved expected future (next period) profit $E\pi(k)$ with the firm's stock of capital k, and the unobserved alternative return on capital, $E\pi(\alpha k)$, with a

7. Although the groups of firms do not differ in observables (profit, capital, etc.), the nonrespondents may still differ in some unobserved dimension. They may have something to hide (thereby inducing a downward bias on the incidence number), or a nonresponse may simply be a "0" (thereby inducing a upward bias on the incidence number).

proxy of the sunk-cost component (defined below) times the capital stock αk.

To estimate the graft level equation (2), we rescale the measures of a firm's bargaining position ($\mathbf{z}$) with employment size (l). The rescaling will ensure that the results are not driven by spurious correlation (all variables are correlated with size).[8] The regression equation is thus

$$\bar{g}_i = \gamma_0 + \gamma_\pi \bar{\pi}_i + \gamma_k \bar{k}_i + \gamma_{\alpha k} \alpha_i \bar{k}_i + \gamma'_w \mathbf{w}_i + \epsilon_i, \tag{4}$$

where $\bar{g}_i$ is reported bribe payments to public officials (in 1997 US dollars) per employee, $\bar{\pi}_i$ is profit per employee, $\bar{k} \equiv k/l$, and γ_0, γ_π, γ_k, $\gamma_{\alpha k}$ are coefficients. We expect that γ_π, $\gamma_k > 0$ and $\gamma_{\alpha k} < 0$. That is, higher current or expected future profits or a lower alternative return on installed capital will force a firm to pay higher bribes when matched with a corrupt official.

π_i is calculated as gross sales less operating costs and interest payments (*profit*). The capital stock k is measured as the "resale value" of plant and equipment (*capital stock*), i.e., the monetary value the firm manager reported it would obtain if selling all its machinery and equipment. All data are for 1997, and the monetary values are expressed in US dollars.

We estimate the sunk cost component, α, using data on reported capital stock values. Apart from resale values, the firms also reported how much it would cost to replace all machinery and equipment with similar new assets, i.e., the "replace value." The ratio of resale to replace values captures capital mobility, and the extent of physical depreciation; e.g., the older the capital stock, the less productive it is and the lower the resale/replace ratio. α is closely related to the former. To capture capital mobility, we regress the ratio of resale to replace values on the average age of the capital stock and a constant. Our proxy of α is the residual from this regression. The residual (α) captures the part of the divergence between the resale and replacement values of capital that is independent of age (i.e., physical depreciation); i.e., it gives us a measure of to what extent the capital stock is sunk. A negative value indicates that the capital stock is irreversible.[9]

8. In the working paper version we also estimate the model in levels, with employment as an additional control. The results are qualitatively unaffected.

9. Ramey and Shapiro [2001] derive a similar measure to estimate the cost of reallocation of capital across firms and sectors. They estimate an average discount value on capital using equipment-level data from aerospace auctions and show that the discount is a function of the specificity of capital and the thinness of resale markets.

As a starting point, we estimate the two equations (3) and (4) separately. If the error terms in (3) and (4) are uncorrelated, this will yield consistent estimates. We later allow the errors to be correlated.

V. Results

A. Basic Findings

Who must pay bribes? Thirty-three (19 percent) of the 176 firms that replied to the question on graft reported that they did not have to pay bribes, while 143 (81 percent) reported that they did. Table I reports a series of probit regressions, corresponding to equation (3). The first three columns depict the partial effects of the control rights measures. In line with the control rights hypothesis, firms receiving public services (*infrastructure services*), firms engaged in trade (*trade*), and firms paying more types of taxes (*pay tax*), face a higher probability of having to pay bribes.

The three proxies are highly correlated, although capturing different aspects of a firm's dealings with the public sector. To overcome the multicollinearity problem, but also to simply capture the aggregate "control" public officials maintain over the firm, we combine the explanatory variables into a "formal sector index" by principal components analysis. The composite variable *formal sector* is the first principal component. The baseline regression with *formal sector* and the **z**-variables as regressors is depicted in column (4). There are three main findings. First, *formal sector* enters significantly positive.[10] A firm with extensive dealings with the public sector is more likely to be under bureaucratic control and (therefore) faces a higher probability of having to pay bribes. Second, there is no evidence that the firm's profitability or alternative return on capital influences the likelihood of having to pay bribes. The **z**-variables are both individually and jointly insignificant. Thus, even firms with low profits will be forced to pay bribes (but possibly small ones) if officials have control rights over the firms' business. This result highlights an important empirical finding: firms reporting zero graft and firms reporting positive graft do not, as a group, differ significantly in

10. If **z** is dropped from the regression, the coefficient estimate on the *formal sector* rises slightly (0.151), and the standard errors are reduced (p-value is 0.038). See the working paper for details.

TABLE I

PROBIT REGRESSIONS ON THE INCIDENCE OF CORRUPTION

Specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	0.203	0.647	0.428	0.254	0.206	−0.090	
	(.342)	(.155)	(.276)	(.356)	(.467)	(.461)	
	[.554]	[.000]	[.121]	[.476]	[.659]	[.846]	
Employment	8.4E-5	−7.9E-5	−8.2E-5	0.001	0.001	0.001	0.001
	(4.3E-4)	(4.4E-4)	(4.4E-4)	(.001)	(.001)	(.001)	(.001)
	[.848]	[.857]	[.852]	(.280)	(.278)	(.477)	(.380)
Infrastructure service	0.192						
	(.094)						
	[.041]						
Trade		0.430					
		(.238)					
		[.070]					
Pay tax			0.374				
			(.220)				
			(.089)				
Formal sector				0.140	0.141	0.213	0.200
				(.082)	(.083)	(.099)	(.074)
				[.088]	[.087]	[.032]	[.007]
Profit				−2.6E-9	−4.0E-9	1.7E-8	2.4E-9
				(4.8E-8)	(4.8E-8)	(4.9E-8)	(5.3E-8)
				[.957]	[.935]	[.730]	[.964]
Capital stock				−3.2E-7	−3.1E-7	−4.2E-7	−3.4E-7
				(2.5E-7)	(2.6E-7)	(2.5E-7)	(2.8E-7)
				[.199]	[.224]	[.090]	[.224]
Alternative return				−8.8E-7	−7.6E-7	2.4E-7	−6.3E-7
				(1.1E-5)	(1.1E-5)	(1.1E-5)	(1.1E-5)
				[.934]	[.884]	[.983]	[.956]
Competition					0.003		
					(.018)		
					[.884]		
Sell to government						−0.337	
						(.272)	
						[.216]	
Exemption						0.515	
						(.216)	
						[.017]	
Industry	—	—	—	—	—	—	5.09
							[.885]
LR(z)				6.15	5.84	7.05	4.86
				[.104]	[.119]	[.070]	[.183]
Observations	176	167	173	149	148	134	149

a. Dependent variable "incidence of graft" takes the value 1 if the firm reported positive bribe payments and 0 otherwise.

b. Standard errors are in parentheses, and p-values are in brackets.

c. Industry is the likelihood-ratio test statistic for the H_0 that the industry effects are equal.

d. LR(z) is the likelihood-ratio test statistic for the H_0 that the coefficients on the bargaining measures (profit, capital stock, alternative return) are zero.

profit or alternative return (see Appendix 2). Finally, larger firms also appear to be more likely to have to pay bribes, but the estimates are not significant.[11]

Additional support for the control rights hypothesis is found by studying the relationship between the incidence of corruption and two direct measures of dealings with the public sector. As discussed in Svensson [2002], senior management in firms reporting that they had to pay bribes spend significantly more time dealing with government regulations and have significantly higher costs for accountants and specialized service providers to deal with regulations and taxes.[12]

We next turn to an examination of the amount of bribes paid. For the firms reporting positive bribes, the average amount of corrupt payments was about US$ 8300 (in 1997), with a median payment of US$ 1800 (see Appendix 2). These are large amounts, corresponding, on average, to US$ 88 per worker, or roughly 8 percent of the total costs.

Table II (Regression 1) reports the baseline specification. There are two main findings. First, consistent with the bargaining hypothesis, the **z**-variables enter significantly and with the expected signs. The bribe rate (corruption per employee) is positively correlated with current and expected future profits per employee, the latter proxied by the capital-labor ratio. Firms with refusal power, i.e., with a higher alternative return to capital, pay lower bribes. Second, the formal sector index has no explanatory power, thereby suggesting that while officials' control rights play a role in separating firms that must pay bribes from those that do not, the "degree of formality" is of no importance once the firm has been matched with a corrupt bureaucrat with the power to extract bribes.

There are two apparent outliers in the sample.[13] Regression

11. If three outliers (i.e., firms with two standard-deviations more employees in the subsample) are dropped from the sample of nonbribing firms, the difference is significant.

12. While the two groups differ in the amount of contacts with the public sector, they are similar with respect to other observables (apart from π, k, αk). For instance, the cost of security and the incidence of robbery and theft do not differ across groups. These results suggest that while being in sectors where public officials have few control rights insulates the firm from public corruption, it is not protected from other sources of discretionary redistribution, such as theft.

13. One firm reported (negative) profits six standard deviations below the second lowest profit value in the sample (and seven standard deviations below the mean), and one firm reported bribe payments nine standard deviations above the second highest value in the sample (eight standard deviations above the mean). We suspect that the outliers are due to reporting errors.

TABLE II
CORRUPTION REGRESSIONS

Specification	(1)	(2)	(3)	(4)	(5)
Constant	17.1	14.2	38.8	−3.19	
	(37.1)	(35.9)	(49.1)	(46.2)	
	[.646]	[.694]	[.432]	[.945]	
Profit per employee	0.0040	0.0040	0.0042	0.0042	0.0038
	(.0008)	(.0008)	(.0008)	(.0008)	(.0008)
	[.000]	[.000]	[.000]	[.000]	[.000]
Capital stock per employee	0.0041	0.0043	0.0040	0.0047	0.0041
	(.0024)	(.0022)	(.0024)	(.0023)	(.0027)
	[.089]	[.062]	[.090]	[.043]	[.123]
Alternative return per employee	−0.234	−0.239	−0.235	−0.253	−0.228
	(.096)	(.093)	(.094)	(.092)	(.099)
	[.017]	[.012]	[.014]	[.007]	[.024]
Formal sector	9.83	9.61	8.20	12.2	7.13
	(7.41)	(7.22)	(7.52)	(8.31)	(8.72)
	[.187]	[.186]	[.278]	[.145]	[.416]
Competition			−1.30		
			(1.75)		
			[.460]		
Sell to government				−3.29	
				(24.0)	
				[.891]	
Exemption				0.977	
				(17.2)	
				[.955]	
Industry	—	—	—	—	8.41
					[.752]
LR(**z**)[c]	27.8	30.1	30.4	32.7	27.9
	[.000]	[.000]	[.000]	[.000]	[.000]
Observations	119	117	116	105	117

a. Dependent variable is graft in US$ per employee.
b. Least-squares estimates with standard errors are in parentheses, and p-values are in brackets.
c. Specification (1) includes two outliers.
d. Industry is the likelihood-ratio test statistic for the H_0 that the industry effects are equal.
e. LR(z) is the likelihood-ratio test statistic for the H_0 that the coefficients on the bargaining measures (profit, capital stock, alternative return) are zero.

2 displays the same regression once these outliers have been dropped. The fit of the regression improves, and the standard errors of all bargaining measures are reduced.

Summarizing the basic findings on the magnitude of graft, the more a firm can pay; i.e., the higher are its current and expected future profits, the more it must pay. The more profitable

is the outside option for the firm, the less it must pay. In the following, we show that these qualitative results are robust.

B. Robustness

One concern is that other variables confounded with the formal sector index, profit or the alternative return on capital might influence the amount firms need to pay. In Table I, columns (5)–(7), and Table II, columns (3)–(5), the base specification is augmented with additional controls. Regression 5 (Table I) and Regression 3 (Table II) add a measure of the degree of competition (number of competitors for the firm's principal product). An approach to corruption control often put forward suggests that increasing competition may be a way of reducing the returns from corrupt activities (see Rose-Ackerman [1999]). However, the competition measure adds no new information.

Regression 6 (Table I) and Regression 4 (Table II) add two variables capturing firms' incentives to pay bribes: a dummy variable taking the value 1 if the firm sells part of its output to the government (*sell to government*), and an index of tax exemptions (*exemptions*). Since data on these variables are missing for some firms, we lose roughly 10 percent of the observations. In the incidence equation, *exemptions* enter as significantly positive, a result consistent with the control rights hypothesis. Taxes (one component of the formal sector index) and tax exemptions are two means of regulating firms, and firms appear not to be able to avoid paying bribes if such dealings are required. In the regression equation (Table II) neither *sell to government* nor *exemptions* have any explanatory power, while the current and expected future profits and the alternative return to capital remain highly significant. By itself, this result does not exclude the possibility that firms are bribing public officials for contracts and exemptions, but it suggests that the "prices" of such favors are functions of firms' abilities to pay or their power to refuse.

We experimented with several other controls, including industrial category dummies, reported in Regression 7 (Table I) and Regression 5 (Table II), regional dummies, and market share. None of these variables had any significant effect. The fact that industry is of no importance in the incidence regression may seem surprising. However, it points to a common phenomenon in many poor developing countries. Sectoral classifications are less important than how firms actually organize production. Most types of goods/services (and especially goods in the categories included in

the survey) are produced in both the formal and the less formal sector. It is this choice of production strategy that determines the likelihood of paying bribes, not the type of good the firm is producing.

We have estimated the two equations (3) and (4) separately, although with a uniform set of control variables. An alternative approach is to estimate the model as a censored regression model (i.e., tobit model); results reported in Table III, column (1). As is evident, the data do not support this alternative specification. We cannot reject the joint hypothesis that the coefficients on **z** and *formal sector* are all zero. This finding is consistent with the results reported in Table I and Table II, which suggest that the incidence and magnitude of graft are driven by different processes.

Another concern is sample selection bias. In fact, it is straightforward to interpret the empirical model (3)–(4) as a standard selection model.[14] If the error terms in (3) and (4) are correlated, least-squares applied to (4) will yield biased results. The selection model can be estimated with maximum likelihood to yield information on both the incidence and the level of graft across firms.[15] Although the model can be identified on the basis of the (arbitrary) distributional assumption, we choose to identify the effects by restricting the incidence of graft to be a function of (only) the control rights variables (**w**). Table I provides the empirical support for this exclusion restriction. In Table III, column (2), we report the estimates of the regression equation. The proxies for firms' current and future profitability and firms' refusal power (**z**) remain significant, while *formal sector* enters insignificantly. Interestingly, we cannot reject the null hypothesis that ρ is zero, which explains why the estimates in column (2) are similar to the least-squares estimates reported in Table II.

Up until now, we have treated the technology choice (α_i) and profit (π_i) as given. However, in reality, the choice of α_i may be related to expected graft, and there might be a feedback from corruption to equilibrium profits.

In the bargaining framework, low sunk costs imply that the

14. As in the standard selection model, we assume that ν and ϵ are distributed bivariate normal with means zero and correlation ρ.

15. Alternatively, the model can be estimated by a two-step procedure (see Heckman [1979]) where (3) is estimated by probit and (4) with least squares, using estimates of the inverse Mills ratio from the first stage to adjust for sample selection bias.

TABLE III
ROBUSTNESS REGRESSIONS

Specification method	(1) tobit	(2) heckit	(3) IV	(4) IV
Constant	−6022	21.7	−7.31	6.82
	[.249]	[.672]	[.876]	[.857]
Employment	19.2			
	[.014]			
Formal sector	1650	9.14	11.4	10.6
	[.141]	[.224]	[.182]	[.157]
Profit	−3.6E-4			
	[.540]			
Capital stock	0.001			
	[.631]			
Alternative return	−0.200			
	[.099]			
Profit per employee		0.0040	0.0076	0.0051
		[.000]	[.054]	[.004]
Capital stock per		0.0043	0.0036	0.0040
employee		[.054]	[.177]	[.089]
Alternative return		−0.239	−0.267	−0.247
per employee		[.009]	[.012]	[.010]
LR (**w** & **z**)	7.33			
	[.119]			
LR(**z**)	5.22	30.6		
	[.157]	[.000]		
F(**z**)			3.18	4.95
			[.027]	[.003]
ρ		−0.084		
		[.854]		
Hausman			3.04	
			[.551]	
Observations	149	117	114	117

a. Dependent variable is graft in US$ per employee.
b. P-values are in brackets.
c. In tobit specification, 30 observations are left-censored (at $g = 0$), 119 observations are uncensored.
c. Instrument vector in Regression 3 consists of the variables *university, experience, foreign, age, cost of security per employee,* and the covariates in Regression 3.
d. Instrument vector in Regression 4 consists of industry-location averages of the profit rate and the covariates in Regression 4.
e. LR(**w** & **z**) is the likelihood-ratio test statistic for the H_0 that the coefficients on the bargaining measures (profit, capital stock, alternative return) *and formal sector* are zero.
f. LR(**z**) is the likelihood-ratio test statistic for the H_0 that the coefficients on the bargaining measures (profit, capital stock, alternative return) are zero.
g. $F(z)$ is the F-statistic for the H_0 that the coefficients on the bargaining measures (profit, capital stock, alternative return) are zero.
h. ρ is the correlation between errors in selection and regression equation.
i. Hausman is the TR^2-test statistic for the null hypothesis of no overidentifying restrictions.

cost of exiting becomes smaller and thus lower graft when matched with a corrupt official. Expecting high bribe demands, a firm might find it profitable to choose a "technology" yielding

higher per-period operation costs and thus lower profits, but indirectly reduces the amount of bribes the firm needs to pay. As discussed in Svensson [2002], this "technology-effect" would tend to mask the relationship between the alternative return, profit, and corruption, and thus would work against us. That is, a positive graft shock (ϵ_i) may lead the manager to choose a more reversible capital stock, even though this would reduce per-period profits, thereby biasing the coefficients on π and αk toward zero.

How would the results change if we allowed feedback, either directly or indirectly, from corruption to profits? The rent-seeking and regulatory capture approach also predicts a positive relationship between profits and corruption. There the association arises because bureaucrats and politicians compete for rents associated with bribes and kickbacks by selling government favors. Alternatively, regulations benefiting firms are "acquired" by industries through bribes. Thus, the relationship is driven by reverse causation. The extortion model of Bliss and Di Tella [1997] also suggests a positive association between bribes and profits. The interpretation, however, is different: profitable firms are forced to pay higher bribes, but one reason why they are profitable in the first place is that other potential competitors have been driven out of the market.

Not allowing feedback from corruption to profit is, we believe, a reasonable first approximation. Most firms in the sample are small. Casual empiricism suggests that the regulatory process is not captured by these types of firms but by a set of large, politically powerful enterprises. Moreover, advanced dynamic graft-schemes that intend to maximize revenue by implicitly controlling entry and exit are likely not to work, given the inherent uncertainty of tenure for those in government posts (see Thomas [1999]). Finally, for the reverse causation argument to bias the results, it must be the case that the size of the government favor (and the resulting gain for the firm) is linked to the amount paid in bribes. Our identifying assumption is that the price of a government favor is determined by the firm's ability to pay and its power to refuse.

Despite these arguments, treating profit as exogenous is questionable. As a robustness test, we therefore experimented with instrumenting for profits, using two sets of instruments. The first set consists of firm-specific variables which we argue to be uncorrelated with both the error term in (4) and reported bribes, but correlated with firms' profits. The instrument set includes

proxies of human and social capital: a dummy variable indicating if the owner/manager has a university diploma (*university*); a dummy indicating if the owner/manager has previous experience from working abroad (*experience*); age of the firm (*age*); and a measure of foreign ownership (*foreign*). In a large panel of firms from five African countries, Reinikka and Svensson [2001] show that foreign ownership, age, and experience explain a large part of the variation of profits across firms. We also include the cost of security per employee (*cost of security per employee*). As discussed in Collier and Gunning [1999], risk arising from crime is an important determinant of the performance of African enterprises. The cost of security is one proxy of the cost of risk management.

We also experimented with a different set of instruments, i.e., industry-location averages of profits. Presumably, having netted out the firm-specific component of profits, the differences in observed profits depend on the underlying characteristics of the industries or locations determining their profitability. Furthermore, we know that the industrial and regional dummies are uncorrelated with the reported level of bribe payments.

Regressions 3 and 4 report the results using instrument variables techniques. All variables continue to enter significantly. The coefficients on the profit rate are, in fact, even larger than those reported in Table II, a finding consistent with the claim that there is a "technology bias" in the noninstrumented results. However, it is also consistent with the claim that the noninstrumented results suffer from an attenuation bias due to measurement errors in the profit term.[16] The instruments perform well. The partial R^2 (netting out the common variables) in the first-stage regression is 0.05, implying that more than half of the explained variation in the profit rate is picked up by the vector of firm-specific instruments. Moreover, we cannot reject the null hypothesis of the validity of the instruments; that is, we find no evidence that the instruments for $\bar{\pi}$ belong in the corruption regression. The results using industry-location averages as instrument are similar.

We have shown the results to be statistically robust. The estimated relationships are also economically important. For example, a one-standard deviation increase in profits is associated

16. Due to the lack of valid instruments, we cannot also instrument for the capital stock and the alternative return. Estimating a reduced-form version of Regression 4, excluding $\bar{k}$ and $\alpha\bar{k}$, gives results (for *profit*) similar to those reported above.

with US$ 113 in additional bribe payments per employee (equal to a 0.82 standard deviation), while a one-standard-deviation reduction in the sunk cost component α implies a reduction in bribes of around one-third standard deviation.[17]

VI. Concluding Remarks

Fifteen years ago in the *Handbook of Econometrics* survey of economic data issues, Griliches [1986] observed that " . . . since it is the 'badness' of the data that provides us with our living, perhaps it is not at all surprising that we have shown little interest in improving it, in getting involved in the grubby task of designing and collecting original data sets of our own." Griliches' observation is still a fair one when it comes to data on governance and corruption. One contribution of this paper has been the collection of what we believe to be a unique data set with cardinal measures of corruption and detailed financial information of surveyed firms to analyze the causes and consequences of corruption at the firm level. Despite our data collection strategy, however, cases of misreporting are likely to remain in the sample. For this reason, the paper has not focused on the level or incidence of bribes per se, but rather on their correlates. We believe that the strategy used to collect information on grafts has minimized any systematic biases in the correlation between reported grafts and the set of explanatory variables.

Our starting point was the interaction between private firms and a rent-maximizing public sector (or public officials). We have been purposefully silent on the government's role. The simplest way of reconciling the government's passive actions with those of a rational agent would be to assume that also (parts of) the government derives benefits from the collection of bribes.[18] However, the fact that we observe self-motivated public officials and firms forced to pay bribes, does not necessarily imply that the government is not benevolent. As stressed by Banerjee [1997] and Acemoglu and Verdier [2000], corruption may be an inadvertent consequence of benevolent regulation. For example, if high profits

17. Based on the coefficients reported in Table III, column (3), and the sample of 117 firms.

18. In a case study of the political economy of corruption in sub-Saharan Africa, Thomas [1999] argues that officeholders can and do demand a share of the collected bribes (cf. Wade's [1982] account of the distribution of water and contracts in India). These findings are consistent with Djankov et al.'s [2002] cross-country findings on the regulation of entry of start-up of firms.

are correlated with market power (or some other market failure), a benevolent social planner may employ a larger number of public officials to monitor the firms, even if she realizes that the officials will extort bribes from the firms they monitor. It is difficult to identify the government's preferences using firm-level data. However, available data do not support the constrained social planner hypothesis. If firm characteristics (say profit) are correlated with market failures and these, in turn, are correlated with the extent of regulation, and as a side effect corruption, we should observe a close relationship between the extent of regulations and firm attributes (π,k,αk). There is no evidence of that in the data. The striking feature of the data is that there is considerable variation in reported bribes for firms facing similar policies/regulations.

These results have clear policy implications (see Svensson [2001]). If the bribe a firm needs to pay is an outcome of a bargaining process and given that corruption is not simply an inadvertent consequence of benevolent regulation, collective action on the part of the business community so as to strengthen the bargaining position of individual firms may be a successful strategy to reduce the cost of doing business. Collecting and disseminating information about corrupt practices; informing the private sector and the public about service standard, guidelines, and norms of major service providers; increasing the individual firms' ability to commit to nonbribery; and recognizing those who are doing a good job by resisting corruption, are examples of such measures.

APPENDIX 1: DATA DESCRIPTION

Variable name	Definition
Age	Age of the firm.
Alternative return	Capital stock * sunk cost component.
Capital stock:	Resale value of plant and equipment.
Competitors:	Number of competitors for the firm's principal product.
Cost of accountant	Monthly cost of accountant, lawyer, agent, specialized service provider to deal with regulation and taxes.
Cost of security	Annual cost of security.
Employment	Total employment.
Exemption	Index (0–2) of tax exemptions. The index is the sum of two variables indicating exemptions from corporate tax and import duties (exemption = 0 if no exemptions, 1 = partial exemptions, and 2 = full exemptions).

APPENDIX 1: DATA DESCRIPTION

Variable name	Definition
Experience	Binary variable taking the value 1 if the owner/manager has had previous experience from working abroad or in a foreign-owned firm.
Foreign	Foreign ownership in percent.
Formal sector	First principal component derived from a principal components analysis of the variables "trade," "pay tax," "infrastructure service."
Graft	Reported bribe payment.
Infrastructure service	Index (0–5) of availability of public services. The index is the sum of five dummy variables indicating if electricity, water, telephones, waste disposal, and paved roads are available (service dummy = 1 if available, 0 otherwise).
Investment	Total investment in machinery and equipment.
Pay tax	Log of (1 + tax index).
Profit	Gross sales less operating costs and interest payments.
Regulations	Percentage of senior management's time spent dealing with government regulations each month.
Sunk cost component	Residual from the regression of the ratio of resale to replace values of the capital stock to the average age of the capital stock and a constant (all variables in logs).
Sell to government	Binary variable taking the value 1 if the firm sells part of its output to the government, 0 otherwise.
Tax index	Index (0–6) reflecting types of taxes the firm pays. The index is the sum of six dummies indicating if import duty, import commission, withholding tax, excise tax, VAT, corporate tax are paid (tax dummy = 1 if tax paid, 0 otherwise).
Trade	Binary variable taking the value 1 if the firm either exports or imports itself or both and zero otherwise.
University	Binary variable taking the value 1 if the owner/manager has a university diploma.

a. All monetary units are in 1997 US$.

APPENDIX 2: SUMMARY STATISTICS

	All firms reporting graft	Firms reporting graft > 0	Firms reporting graft = 0	Firms missing graft data
Graft—mean	6,727	8,279		
—median	455	1,818		
—std	17,049	18,582		
Graft per	71.4	87.9		
employee	18.2	32.3		
	127	135		
Employment	129	133	114	109
	37	38	32	20
	274	283	236	215
Profit per	3,759	3,923	3,079	2,527
employee	742	770	605	946
	13,358	14,090	9,901	11,098
Capital per	5,900	5,065	9,400	7,638
employee	1,855	1,951	1,653	1,460
	11,416	8,256	19,655	14,756
Sunk cost	−4.9e-5	−5.8e-4	−2.7e-3	−1.3e-4
component (α)	0.010	0.011	0.008	0.005
	0.032	0.034	0.026	0.028
Formal sector	4.7	4.8	4.2	3.8
	4.9	5.0	4.3	3.6
	1.6	1.6	1.7	2.4
Number of obs.	176	143	33	67

a. In each column, for each variable, the mean, median, and standard deviation are reported in consecutive rows. The number of observations (last row) is the maximum number in the subsample.

APPENDIX 3: COMPARISON OF FIRMS REPORTING AND NOT REPORTING BRIBE DATA

Dependent variable [no. observations]	Firms missing corruption data	Firms *only* missing corruption data
Firm size	−19.9	−39.9
[no. 243]	(33.4)	(33.9)
	[.552]	[.240]
Profit	−34,199	529,658
[no. 219]	(696,442)	(795,730)
	[.961]	[.506]
Capital stock	1,145,134	1,466,153
[no. 220]	(978,374)	(1,388,074)
	[.243]	[.292]
Investment	3,502	−24,758
[no. 191]	(199,960)	(220,432)
	[.986]	[.911]

a. The dependent variable is in the left column with the number of observations in brackets.

b. Coefficient estimates from OLS regressions are in the second and third columns on missing variable dummy taking the value 1 if corruption data are missing and 0 otherwise, with standard errors in parentheses, and p-values in brackets.

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REFERENCES

Acemoglu, Daron, and Thierry Verdier, "The Choice between Market Failures and Corruption," *American Economic Review,* XC (2000), 194–211.

Ades, Alberto, and Rafael Di Tella, "National Champions and Corruption: Some Unpleasant Interventionist Arithmetic," *Economic Journal,* CVII (1997), 1023–1042.

Ades, Alberto, and Rafael Di Tella, "Rents, Competition, and Corruption," *American Economic Review,* LXXXIX (1999), 982–993.

Banerjee, Abhijit, "A Theory of Misgovernance," *Quarterly Journal of Economics,* CXII (1997), 1289–1332.

Bardhan, Pranab, "Corruption and Development: A Review of Issues," *Journal of Economic Literature,* XXXV (1997), 1320–1346.

Bliss, Christopher, and Rafael Di Tella, "Does Competition Kill Corruption," *Journal of Political Economy,* CV (1997), 1001–1023.

Choi, Jay Pil, and Marcel Thum, "The Economics of Repeated Extortion," Columbia University, mimeo, 1999.

Collier, Paul, and Jan Willem Gunning, "Why Has Africa Grown Slowly?" *Journal of Economic Perspectives,* XIII (1999), 3–22.

Di Tella, Rafael, and Ernesto Schargrodsky, "The Role of Wages and Auditing during a Crackdown on Corruption in the City of Buenos Aires," *Journal of Law and Economics* (2003), forthcoming.

Djankov, Simeon, Rafael La Porta, Florencio Lopez-de-Silanes, and Andrei Shleifer, "The Regulation of Entry," *Quarterly Journal of Economics,* CXVII (2002), 1–37.

Griliches, Zvi, "Economic Data Issues," *Handbook of Econometrics,* Z. Griliches and M. D. Intriligator, eds. (Amsterdam, The Netherlands: North-Holland, 1986).

Heckman, James J., "Sample Selection Bias as a Specification Error," *Econometrica,* XLVII (1979), 53–161.

Hellman, Joel S., Geraint Jones, Daniel Kaufmann, and Mark Schankerman, "Measuring Governance, Corruption, and State Capture," Policy Research Working Paper No. 2312, The World Bank, Washington, DC, 2000a.

Hellman, Joel S., Geraint Jones, and Daniel Kaufmann, "Seize the State, Seize the Day: State Capture, Corruption, and Influence in Transition," Policy Research Working Paper No. 2444, The World Bank, Washington, DC, 2000b.

Kaufmann, Daniel, and Shang-Jin Wei, "Does Grease Money Speed up the Wheels of Commerce?" Harvard University, mimeo, 1998.

Mauro, Paolo, "Corruption and Growth," *Quarterly Journal of Economics,* CX (1995), 681–712.

Persson, Torsten, Guido Tabellini, and Francesco Trebbi, "Electoral Rules and Corruption," NBER Working Paper No. 8154, Cambridge, MA, 2001.

Ramey, Valerie A., and Matthew D. Shapiro, "Displaced Capital: A Study of Aerospace Plant Closings," *Journal of Political Economy,* CIX (2001), 958–992.

Reinikka, Ritva, and Jakob Svensson, "Confronting Competition: Investment, Profit, and Risk," *Uganda's Recovery: The Role of Farms, Firms, and Government,* R. Reinikka and P. Collier, eds. (Washington, DC: The World Bank, 2001).

Rose-Ackerman, Susan, "The Economics of Corruption," *Journal of Public Economics,* IV (1975), 187–203.

——, *Corruption: A Study in Political Economy* (New York: Academic Press, 1978).

——, *Corruption and Government: Causes, Consequences, and Reform* (New York: Cambridge University Press, 1999).

Shleifer, Andrei, and Robert W. Vishny, "Corruption," *Quarterly Journal of Economics,* CVIII (1993), 599–617.

Shleifer, Andrei, and Robert Vishny, "Politicians and Firms," *Quarterly Journal of Economics,* CIX (1994), 995–1025.
Svensson, Jakob, "Foreign Aid and Rent-Seeking," *Journal of International Economics,* LI (2000), 437–461.
——, "The Cost of Doing Business: Ugandan Firms Experiences with Corruption," *Uganda's Recovery: The Role of Farms, Firms, and Government,* R. Reinikka and P. Collier, eds. (Washington, DC: The World Bank, 2001).
——, "Who Must Pay Bribes and How Much?" Evidence from a Cross-Section of Firms, Seminar Paper No. 713, Institute for International Economic Studies, Stockholm University, 2002.
Thomas, Melissa, "The Incentive Structure of Systemic Corruption," The World Bank, mimeo, 1999.
Treisman, Daniel, "The Causes of Corruption: A Cross-National Study," *Journal of Public Economics,* LXXVI (2000), 399–457.
Wade, Robert, "The System of Administrative and Political Corruption: Canal Irrigation in South India," *Journal of Development Studies,* XVIII (1982), 287–328.