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Estimating How Firm Characteristics Affect Corruption Using Enterprise Survey Data

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The World Bank Enterprise Surveys contain several questions about corruption. One popular question asks how much ‘establishments like this one’ typically pay in bribes. The manager can answer in two ways: as a percent of sales or in local currency. In principle, the manager’s response should not depend upon how they answer. In practice, it does. Managers who answer as percentages report paying far more than managers who answer in local currency. This paper shows this holds in most countries. Further, it proposes a method of estimating the difference and other model coefficients taking this into account. Hypothesis tests consistently favor the modified model over a simple model that does not control for the different reporting methods.

I. Introduction

Numerous papers study corruption’s causes and consequences using data from the World Bank’s Enterprise Surveys [WBES] (Xu 2011).² As well as having familiar problems related to sensitivity, the WBES’ main question about corruption has a lesser-known problem. The survey allows managers to answer in two ways: in local currency or as a percent of sales. Letting managers choose how to respond would not affect how much they reported paying if managers diligently calculated payments and divided these payments by sales. The way they respond, however, matters. Using Enterprise Surveys from 15 African countries, Clarke (2011) shows managers who answer as a percent of sales report paying 4 to 15 times more than managers who answer in local currency.³

Although it is unclear why managers who answer in local currency claim to pay less than managers who respond in percentages, Clarke (2011) rules out some plausible explanations. First, the lower bribes are not because of observable or unobservable firm attributes. Firms that respond in local currency claim to pay less after controlling for observable firm characteristics. Further, they also claim to pay less in panel regressions that control for unobservable firm characteristics with firm fixed effects. Second, they do not claim to pay less because of something specific regarding corruption; firms answering in local currency also report lower amounts when responding to less sensitive questions about power outages and security. Clarke (2011, 1128)

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² The Enterprise Surveys website (www.enterprisesurveys.org) has a long—although not exhaustive—list of over 750 studies using Enterprise Survey data to examine firm behavior and performance. Of these, more than 75 focus on corruption. Other studies use data on corruption as control variables.

³ Other papers have also noted this inconsistency (Breen et al. 2017; Malomo 2013).

concludes it is most likely that “firm managers might not accurately estimate amounts in percentage terms.” Managers might give incorrect answers because they cannot estimate percentages in their heads, conflate revenue and profits when answering, or answer without even trying to calculate exact numbers.

This paper further explores why managers who respond in local currency report paying less than managers who respond as a percent of sales. We contribute to the literature in two ways. First, we show managers who respond in local currency say they pay less almost everywhere enough firms answer both ways; thus, the difference is not unique to Africa. Second, the paper proposes a modified Tobit model that allows managers to report different amounts when they answer in different ways. The model enables us to assess how much firms overestimate payments more rigorously than earlier papers do. Moreover, it lets us estimate how other firm characteristics affect bribes more accurately than approaches that do not consider the different responses.

II. Data

This paper uses data from the World Bank Enterprise Surveys (WBES) to look at how firms answer questions about bribes.⁴ The WBES covers private firms with more than five employees in manufacturing, services, and retail and wholesale trade.⁵ We use data from 286 surveys from 145 mostly low and middle-income countries conducted between 2005 and 2020.

Question about bribes

The question we use to estimate bribes 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?

Rather than asking about the firm’s bribe payments, the question asks about other firms’ payments. The WBES poses the question indirectly to allow managers to answer without admitting to illegal or immoral acts (Iarossi 2006). This deniability might encourage managers to tell the truth.⁶ However, indirect questions are difficult to interpret. In this case, researchers cannot know whether managers answer thinking about their firm’s behavior or their beliefs about other firms’ behaviors.⁷ Further, evidence on whether indirect questions encourage candid responses is mixed (Clarke, Friesenbichler, and Wong 2015).

⁴ The data are available for free on the World Bank Enterprise Surveys website (www.enterprisesurveys.org).

⁵ The sampling frames only include firms with some private owners. The survey should, therefore, omit fully government-owned firms. This exclusion, however, was incomplete; 69 of 159,205 firms reported the government was their sole owner.

⁶ Because paying bribes is often illegal, and most people see it as immoral, managers often lie about bribing officials (Azfar and Murrell 2009; Kraay and Murrell 2016).

⁷ Fisher and Tellis (1998, 563) argue indirect questions “may introduce attitude-irrelevant variance as respondents try to make accurate predictions about the third party specified in the indirect question.”

For ease of exposition, this paper follows the usual practice of discussing results as if managers answer indirect questions thinking about their firm's behavior.⁸ For example, if the exporting dummy's coefficient is positive, we will say exporting firms pay higher bribes than non-exporting firms. This approach is more straightforward than stating that exporting firms' managers believe firms like theirs pay higher bribes than non-exporting firms' managers.

This paper, however, focuses on the question's second notable feature: managers can answer either as a percent of sales or in local currency. Of the 131,476 firms that answered the question, 111,450 claimed firms like theirs do not pay bribes, 15,131 answered as a percent of sales, and 4,895 answered in local currency.⁹ As discussed earlier, although the manager's response should be identical regardless of how they answer, earlier studies have found that the response method matters.

Bribe payments by firms reporting in local currency and as percentages

Using WBES data from 15 Sub-Saharan African countries, Clarke (2011) found firms that report bribes in local currency claim to pay lower bribes than firms that report bribes as a percent of sales. The difference stays significant after including firm-level controls and fixed effects, suggesting the difference is not due to observed or unobserved differences between firms. The paper also shows the difference is not due to sensitivity or the question's indirect format. Other WBES questions that allow respondents to choose how they answer—on power outages, crime, and security costs—show similar differences even though these other questions are neither indirect nor sensitive.

Clarke (2011) argues it is unclear why firms that answer in local currency report paying lower bribes. If managers who reported bribes as percentages calculated percentages by dividing bribes by sales, then the reporting method should not matter. The fact that the method matters suggests managers who answer as percentages are not calculating percentages in this manner.

This paper extends Clarke's (2011) analysis by expanding the sample from 15 African countries to 145 mostly middle- and low-income countries throughout the world.¹⁰ The results confirm that firms that answer in local currency report paying less than firms that answer as a percent of sales outside of Sub-Saharan Africa. The median firm that reported bribes as a percent of sales said bribes were about 5% of sales. By comparison, the median firm that reported bribes in local currency said bribes were about 0.16% of sales. The same is true at other percentiles (see Table 1). Figure 2 shows probability density estimates for firms reporting in local currency and as a percent of sales. For firms that report in local currency, the peak is 0.04% of sales. For firms that report as percentages, the peak is 1.5%.

⁸ Most researchers who use this or similar indirect questions assume, either implicitly or explicitly, managers answer thinking about their own firm. Treisman (2007, 214), for example, notes that although most surveys phrase questions indirectly about what other firms do, "it is hoped and assumed that respondents reply based on their own experience."

⁹ An additional 1,517 firms have payments reported as both a percent of sales and in local currency. Most are in four countries where all—or most—firms have bribes reported in both ways (Kenya 2007, Nigeria 2007, Lao PDR 2009, and Cambodia 2007). It seems likely that the survey firm calculated payments in the other way either during or after the interview. Because we cannot be sure how the managers answered, we excluded these 1,517 firms from the analysis.

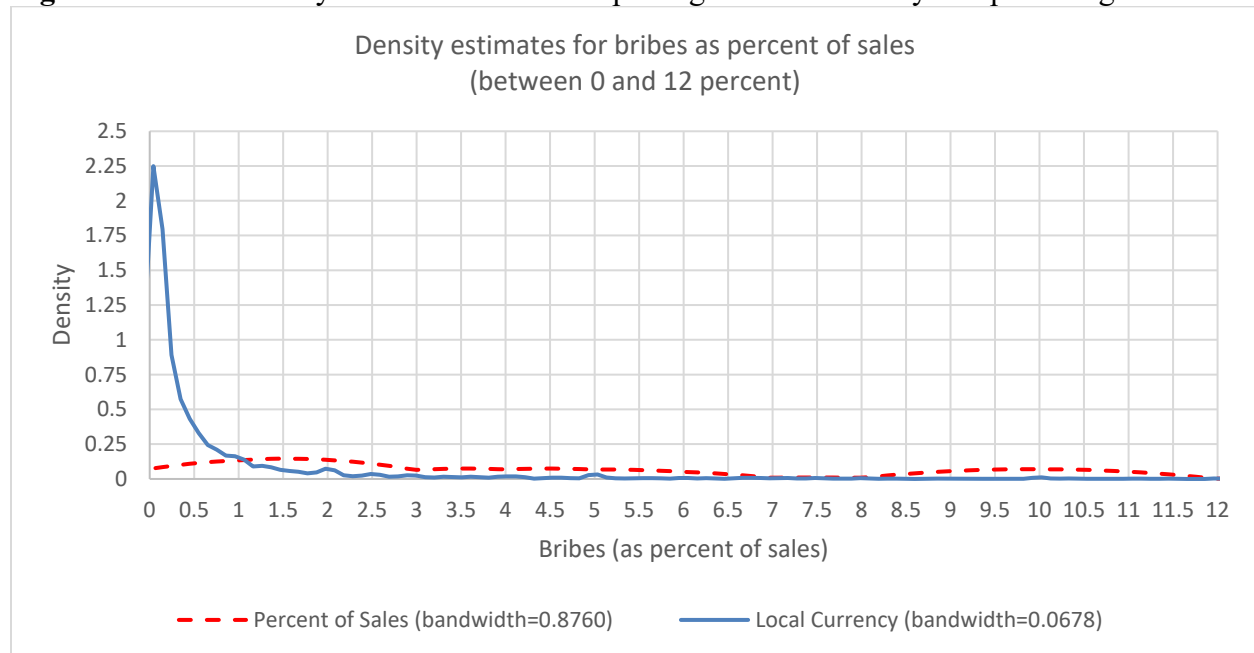
¹⁰ The paper includes firms from 286 WBES surveys in 145 countries.

Table 1: Summary statistics for bribe payments for firms reporting payments in different ways.

Group	Percent of sales	Local Currency	Local Currency, Outliers Excluded
Observations	15,131	4,905	4,895
Percentiles			
1%	0.400	0.000	0.000
5%	1.000	0.003	0.003
10%	1.000	0.009	0.009
25%	1.000	0.045	0.044
50%	5.000	0.164	0.164
75%	10.000	0.600	0.600
90%	20.000	2.000	1.986
95%	30.000	4.167	4.167
99%	70.000	24.000	20.833
Other Stats			
Mean	8.5	43.3	1.2
Std. dev.	13.0	2782.2	5.6

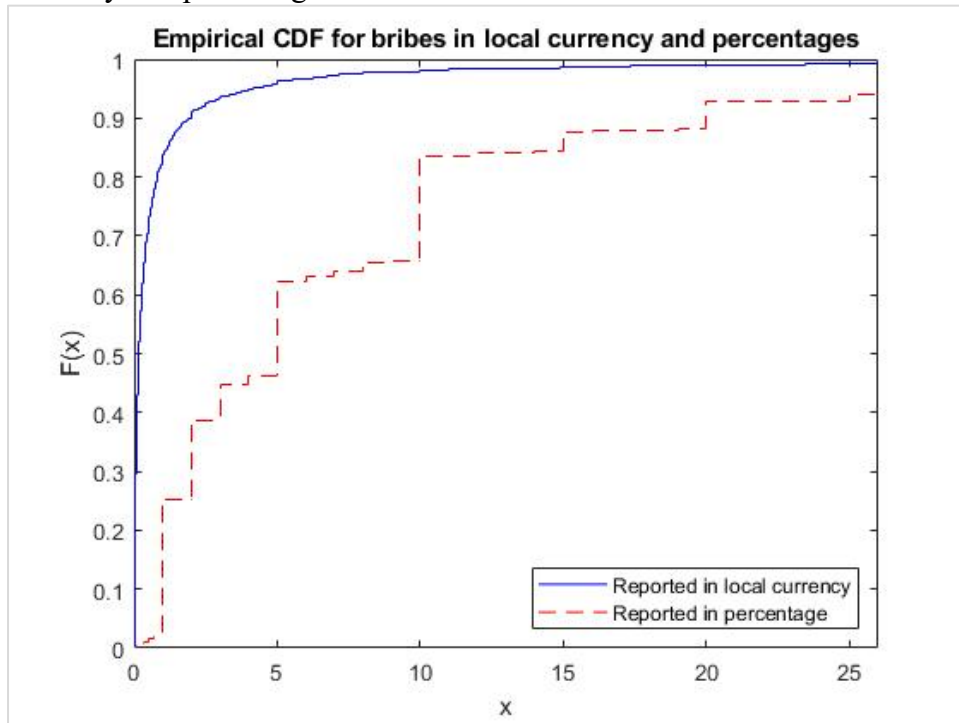
Note: Outliers are firms that reported bribe payments of more than 100% of sales. This only affects firms that reported in local currency because no firms that reported as a percent of sales reported sales greater than 100% of sales.

Figure 1: Kernel density estimates for firms reporting in local currency and percentages.



Note: Density estimates use the Epanechnikov kernel and each subsample's optimal bandwidth (Silverman 1986). Because the distribution is more spread out for firms that reported amounts as percentages, the bandwidth is wider for these firms leading to a smoother density estimate. Density estimates are calculated using all observations that report positive bribes that are less than or equal to 100% of sales. Firms that reported no bribes are excluded because we do not know whether they would have reported bribes as a percent of sales or in local currency. Outliers that reported bribes greater than 100% of sales are excluded from the estimation (10 observations of over 21,000 reporting positive amounts). In the graph, density estimates for above 12% of sales are not shown for presentational purposes because the estimates are zero or close to zero.

Figure 2: Empirical cumulative density function for firms reporting in local currency and percentages.



Note: Figure is truncated at 26 for visual purposes. Figure shows the percent of firms that report bribes less than or equal to x percent of sales for firms that reported bribes as a percent of sales and that reported bribes in local currency.

The empirical cumulative distribution function (CDF) further confirms how different the answers are for firms using different reporting methods (see Figure 2). About 82% of firms that answered in local currency reported bribes were less than 1% of sales. By comparison, only 1.8% of firms that answered as percentages reported the same.

The empirical CDF shows a second anomaly; nearly 85% of firms that answered as percentages gave seven specific round numbers (1, 2, 3, 5, 10, 15, and 20%). These round numbers suggest the percentages are only rough estimates. Moreover, firms are not simply rounding to the closest integer. If they were, similar numbers of firms should report bribes of 4 or 6% of sales (1.5 and 0.8% of firms) as 5% (16.1%). Likewise, a similar number of firms should answer 9 or 11% of sales (0.5 and 0.1%) as 10% (17.8%). The clumping at specific round numbers suggests respondents are not calculating precise results.

A final observation is the sample has several extreme outliers among the firms reporting bribes in local currency. Ten of the 5,080 firms that reported bribes in local currency claimed bribes exceeded their sales—something no firm reporting as percentages did.¹¹ Because about 15,000 firms reported bribes as percentages and about 5,000 reported bribes in local currency, these outliers do not affect the quantile estimates; they do, however, affect the means. One firm, which

¹¹ 0.1% of firms that reported bribes in local currency and 0.67% that reported bribes as percentages reported bribes equal to 100% of sales.

reported annual sales of less than \$1, reported bribes were close to 200,000% of its sales. Including this single firm increases the mean for firms reporting in local currency from 3.6% to 43.3% of sales. Given that less than 0.5% of firms reported bribes greater than 43.3% of sales, this one observation disproportionately affects the mean.

We, therefore, exclude firms that reported bribes above 100% of sales—10 of about 130,000 firms.¹² Excluding these estimates seems reasonable because they are likely due to mistakes during data entry or due to respondents exaggerating. Even if correct, these outliers would reflect idiosyncratic firm characteristics that the model would be unlikely to explain.

III. Econometric Model

As noted above, managers who reported payments in local currency reported paying lower bribes than managers who reported payments as a percent of sales. This section introduces a modified Tobit model that allows us to estimate the extent to which the reported payments differ. As a first step, we assume firm i in country c in period t 's desired payment, y_{ict}^* , depends on firm and country characteristics:

$$y_{ict}^* = \beta x_{ict} + \lambda_{ct} + \varepsilon_{ict}$$

The firm-level controls (x_{ict}) include controls for exporting, firm size, foreign ownership, and government ownership. Studies looking at how much firms pay in bribes often include similar controls.¹³ Since desired payments might vary over time and across countries, we also include a fixed effect for each individual survey (λ_{ct}). When the World Bank has surveyed a country multiple times, the model includes separate dummies for each survey.

Since firms cannot pay negative bribes, the bribe payment is censored below at 0. The actual payment, y_{ict} , is therefore:

$$y_{ict} = \begin{cases} y_{ict}^* & \text{if } y_{ict}^* > 0 \\ 0 & \text{if } y_{ict}^* \leq 0 \end{cases}$$

As discussed above, firms that report payments as a percent of sales claim to pay significantly higher bribes than firms that report payments in local currency. To control for the possibility that firms that report in percentage terms (local currency) over-report (under-report) payments, we allow firms that report in percentage terms to report a multiple of their actual payment ($\kappa \cdot y_{ict}$) rather than their actual payment (y_{ict}), where κ is an unknown constant.¹⁴

¹² The model does not converge if we include these observations.

¹³ For example, Breen and others (2017) include similar variables. The main differences with the specification in this paper is that we use workers rather than sales as a proxy of firm size, we omit female ownership, and we include country-time dummies rather than macroeconomic control variables. We use workers because it is available for more firms and omit female ownership because it was not available in the earliest surveys. We include country-time dummies because they control better for country-level differences than country-level variables do.

¹⁴ We do not force k to be greater than one. If people who reported in percentage terms reported, on average, lower payments than people who reported in cash, it would be smaller than one. Since all people reported positive or zero bribes, it should be positive (i.e., $k > 0$).

Letting y_{ict}^r be the reported bribe payment and $I_c = 1$ be an observed dummy indicating the person reported the payment in local currency, the reported payment becomes:

$$y_{ict}^r = \begin{cases} \kappa y_{ict}^* & y_{ict}^* > 0 \text{ and } I_c = 0 \\ y_{ict}^* & \text{if } y_{ict}^* > 0 \text{ and } I_c = 1 \\ 0 & y_{ict}^* \leq 0 \end{cases}$$

If the person reports the payment in cash ($I_c = 1$), then $y_{ict}^r = \beta x_{ict} + \lambda_{ct} + \varepsilon_{ict}$. Assuming ε_{ict} has a normal distribution with a standard deviation of σ , $y_{ict}^r \sim N(\beta x_{ict} + \lambda_{ct}, \sigma^2)$ for firms reporting in cash. If the person reports the payment in percentage terms, then $y_{ict}^r = \kappa \beta x_{ict} + \kappa \lambda_{ct} + \kappa \varepsilon_{ict}$, implying $y_{ict}^r \sim N(\kappa \beta x_{ict} + \kappa \lambda_{ct}, \kappa^2 \sigma^2)$. Note that $\kappa \cdot y_{ict}^* > 0$ if and only if $y_{ict}^* > 0$ when $\kappa > 0$.

Because the coefficients and standard errors are both κ times bigger for firms reporting percentages, it doesn't matter whether people who report no bribes would have reported in local currency or as a percentage.¹⁵ That is, $\Phi\left(\frac{\kappa(\beta x_{ict} + \lambda_{ct})}{\kappa \sigma}\right) = \Phi\left(\frac{\beta x_{ict} + \lambda_{ct}}{\sigma}\right)$, where $\Phi(\cdot)$ is the cumulative distribution function of a standard normal distribution.

Letting $\phi(\cdot)$ represent the probability distribution function for a standard normal distribution, the log-likelihood function for firm i in country c at time t is:

$$\begin{aligned} \ln L_{ict} = & I(y_{ict}^* \leq 0) \cdot \ln\left(1 - \Phi\left(\frac{\beta x_{ict} + \lambda_{ct}}{\sigma}\right)\right) \\ & + I(y_{ict}^* > 0 \text{ and } I_c = 1) \cdot \left(\phi\left(\frac{1}{\sigma}(y_{ict}^r - \beta x_{ict} - \lambda_{ct})\right) - \frac{1}{2} \ln(\sigma^2)\right) \\ & + I(y_{ict}^* > 0 \text{ and } I_c = 0) \cdot \left(\phi\left(\frac{1}{\sigma \kappa}(y_{ict}^r - \kappa \beta x_{ict} - \kappa \lambda_{ct})\right) - \frac{1}{2} \ln(\kappa^2 \sigma^2)\right) \end{aligned}$$

We estimate the model using the ml package in Stata (Gould, Pitblado, and Poi 2010).

We have discussed the model assuming that individuals who report payments in local currency do so accurately, while people who report payments as percentages do not. In practice, it does not matter who misreports payments. If we assumed that people who report bribes as percentages reported accurately, we would get:

$$y_{ict}^r = \begin{cases} \kappa^* y_{ict}^* & y_{ict}^* > 0 \text{ and } I_c = 1 \\ y_{ict}^* & \text{if } y_{ict}^* > 0 \text{ and } I_c = 0 \\ 0 & y_{ict}^* \leq 0 \end{cases}$$

¹⁵ The implied underlying model is different in Clarke (2011). Clarke (2011) allowed only the intercept to differ for people reporting in local currency. In a Tobit model, allowing only the intercept to differ would imply that the reporting method would affect whether the person reported paying no bribes. However, this assumption is problematic because we do not know how people who claimed they did not pay bribes would have reported bribes.

When we estimate this model, the estimates for β , λ , and σ are the coefficients from the earlier model multiplied by κ and the new coefficient κ^* equals $\frac{1}{\kappa}$. This means the estimated marginal effects of the controls are larger in the second model.

IV. Empirical Results

Simple Tobit vs. Modified Tobit

Columns (1) and (2) of Table 2 show results from the simple and modified Tobit regressions. In the modified model, we assume people who report bribes as percentages misstate what they pay.¹⁶ As discussed earlier, the model would be identical if we assumed people who report bribes in local currency misstate payments. Both models include country-year dummies—separate dummies for each survey—and some standard firm-level controls.

The most interesting coefficient is kappa (κ), which measures how much managers who answer as a percent of sales over- or under-report payments compared with managers who answer in local currency. The point estimate is 3.02, suggesting that managers who responded in percentages reported paying over three times as much as managers who responded in local currency. A Wald test rejects the null hypothesis that κ equals 1 ($\chi^2[1] = 2955$, p-value = 0.000). We, therefore, reject the null hypothesis that the two groups report paying similar amounts after controlling for differences between them. This test, and a similar likelihood ratio test, favors the modified over the simple Tobit model (see Table 2).

Although these results support the idea that managers who report bribes as percentages overstate their payments, we could interpret them differently. The model is also consistent with managers who report in local currency understating payments. We can reestimate the model assuming firms that report bribes as percentages report accurately, while firms that report in local currency underreport payments. With this setup, kappa star (κ^*) equals $\frac{1}{\kappa}$ from the original model. Similarly, the coefficients on the independent variables, β^* , equal $\kappa\beta$ from the original model.¹⁷ Column (3) shows these results.

Coefficients on Control Variables

Both the modified and simple models lead to similar conclusions about who pays bribes. The export dummy, foreign-ownership dummy, and the number of employees have significant coefficients in both models. These results imply exporters pay more than non-exporters, foreign-owned firms pay less than their domestic rivals, and large firms pay less than small firms. In contrast, the government ownership dummy's coefficient is insignificant in both models, suggesting partly government-owned firms pay similar amounts to fully private firms.

¹⁶ As noted above, κ can take any value between 0 and ∞ . If $0 < \kappa < 1$, people who answer in percentages report lower payments than people who report in local currency. If $1 < \kappa < \infty$, they report higher payments.

¹⁷ Because the coefficients and κ are rounded to three decimal places, the calculations are not exact.

Table 2: Pooled results for simple Tobit and modified Tobit models.

	Tobit	Modified Tobit	Modified Tobit (inverted)
Observations	128,248	128,248	128,248
Country Dummies	Yes	Yes	Yes
Workers (nat. log)	-0.157*** (-2.60)	-0.0722*** (-3.11)	-0.218*** (-3.11)
Firm exports (dummy)	1.824*** (9.43)	0.694*** (9.32)	2.099*** (9.35)
Foreign ownership share (%)	-0.0117*** (-3.82)	-0.00452*** (-3.86)	-0.0137*** (-3.86)
Government ownership share (%)	-0.0066 (-0.57)	-0.0038 (-0.85)	-0.0115 (-0.85)
Manufacturing firm (dummy) ^a	0.528*** (2.79)	0.205*** (2.83)	0.621*** (2.84)
Service firm (dummy) ^a	1.517*** (6.84)	0.586*** (6.88)	1.773*** (6.90)
Constant	15.42*** (8.67)	4.956*** (7.22)	14.99*** (7.26)
Sigma	15.90*** (178.16)	6.08*** (94.67)	18.39*** (153.13)
Kappa		3.02*** (80.81)	0.33*** (80.81)
Log-likelihood	-107596	-104863	-104863
Hypothesis Test: Kappa = 1			
Likelihood ratio test ($\chi^2[1]$)		5466	
(p-value)		(0.000)	
Wald Test ($\chi^2[1]$)		2925	
(p-value)		(0.000)	

Notes: ^aOmitted category is retail trade. ***, **, and * statistically significant at the 1%, 5%, and 10% significance levels. Source: Author's calculation based upon data from the World Bank's Enterprise Surveys.

Although the two models' results are similar qualitatively, they differ quantitatively. Firm size, foreign ownership, and export status affect bribes far more dramatically in the simple model. For example, the marginal effect of foreign ownership is 2.6 times greater in the simple model.¹⁸

V. Discussion and Conclusions

This paper contributes to the literature on corruption in several ways. First, it confirms that Clarke's (2011) results for WBES surveys for fifteen Sub-Saharan African countries hold in almost all WBES surveys. Managers who report bribes as a percent of sales claim to pay three times more than similar managers who report bribes in local currency. The difference in reported bribes is statistically significant in the pooled sample and most countries with sufficient data. Therefore,

¹⁸ The marginal effect compares the effect of the independent variable on the underlying dependent variable, y^* .

researchers using WBES data to study corruption's causes and consequences should control for how managers answer the question.

Second, the paper suggests a new, more consistent approach to modeling managers' different responses. Clarke (2011) includes a dummy variable showing whether the manager answered in local currency or percentages.¹⁹ However, including a dummy is problematic in a simple Tobit model because it means that how the manager answers might affect whether they admit to paying bribes or not. The Tobit model could imply that the same manager would deny bribing officials when answering in local currency but confess when answering in percentages. This paper's model avoids this problem.

Third, the paper estimates how other variables affect bribes after controlling for how the manager answered. The modified model suggests firm characteristics affect bribes less than a simple Tobit model would. However, these lesser effects will only be correct if firms answering as percentages overestimate bribes. The effects will be larger if firms answering in local currency underestimate bribes instead. However, we believe firms answering in percentages are more likely to overreport bribes than firms answering in local currency are to underreport them for reasons discussed below.

Although the paper extends earlier work, it has several limitations. First, it does not resolve which managers answer accurately. Managers answering in local currency might downplay corruption, while managers answering as percentages might exaggerate it.²⁰ The paper's model cannot distinguish between these two possibilities. We can transform parameters from a model where managers answering in local currency underreport to parameters from a model where managers answering in percentages exaggerate. However, we need to know which managers are answering accurately to assess how much bribes cost firms and how firm characteristics affect bribes.

Second, the paper fails to explain why firms reporting in local currency claim to pay lower bribes than firms reporting in percentages. Clarke (2011) rejects some plausible ways of explaining the discrepancy. First, observed and unobserved differences between firms with different reporting methods do not explain the discrepancy. Second, the question's sensitivity does not cause it; Clarke (2011) finds similar inconsistencies for less sensitive questions. Understanding why the response method matters might help us determine who is reporting accurately.

One plausible way to explain the difference is that respondents who answer in percentages do not calculate exact amounts. Instead, they give impressionistic answers intended to illustrate how serious corruption is. About 70% of respondents who answered as percentages answered 1%, 2%, 5%, or 10% of sales.²¹ These round numbers were far more common than other integers.²² For example, although 18% of firms reported paying bribes equal to 10% of sales, only 0.5% reported 9%, and only 0.1% reported 11%. Similarly, although 16% of managers answered 5%, only 1.5% answered 4%, and 0.8% answered 6%. If managers answering in percentages give impressionistic answers, they might report 1 or 2% of sales—the smallest integer amounts possible—to imply

¹⁹ Clarke (2011) also ignores firms that did not pay bribes by dropping firms where the manager said the firm did not pay bribes and estimating an OLS model.

²⁰ Further, both may be true—managers who answer in percentage terms might overestimate bribes, and managers who answer in local currency may underestimate them.

²¹ Moreover, 15% answered 3%, 15%, or 20%.

²² Only 2% of respondents gave non-integer answers. About 1.8% gave amounts less than 1%, and about .2% gave non-integer answers greater than 1%.

bribes are not overwhelming.²³ Similarly, a manager reporting 5 or 10% of sales might be implying that bribes are prohibitively costly.

Third, we could allow firm characteristics to affect whether the firm pays bribes differently than how much the firm pays. We could model the decision and extent decisions separately by adjusting Cragg's (1971) model to allow firms who report bribes differently to over- or underreport payments in the model's second stage.

Fourth, we could try to endogenize the decision on how to answer the question. In the analysis in this paper, we treat the decision on how to answer the question as exogenous. In practice, characteristics of either the firm or respondent might affect whether the respondent answers in percentages or in local currency.²⁴ Allowing this to be determined endogenously might be useful.

References

- Azfar, O., and Murrell, P. 2009. "Identifying Reticent Respondents: Assessing the Quality of Survey Data on Corruption and Values." *Economic Development and Cultural Change*, 57 (2): 387-411. <https://doi.org/10.1086/592840>
- Breen, M., Gillanders, R., McNulty, G., and Suzuki, A. 2017. "Gender and Corruption in Business." *Journal of Development Studies* 53 (9): 1486-1501. <https://doi.org/10.1080/00220388.2016.1234036>
- Clarke, G. R. G. 2011. "How Petty is Petty Corruption? Evidence from Firm Surveys in Africa." *World Development* 39 (7): 1122-1132. <https://doi.org/10.1016/j.worlddev.2010.11.002>
- Clarke, G. R. G., Friesenbichler, K. S., and Wong, M. 2015. "Do Indirect Questions Reduce Lying about Corruption? Evidence from a Quasi-Field Experiment." *Comparative Economic Studies* 57 (1): 103-135. <https://doi.org/10.1057/ces.2014.43>
- Cragg, J. G. 1971. "Some Statistical Models for Limited Dependent Variables with Application to the Demand for Durable Goods." *Econometrica* 39 (5): 829-844. <https://doi.org/10.2307/1909582>
- Fisher, R. J., and Tellis, G. J. 1998. "Removing Social Desirability Bias with Indirect Questioning: Is the Cure Worse than the Disease?" *Advances in Consumer Research* 25 (1): 563-567.
- Gould, W., Pitblado, J., and Poi, B. 2010. *Maximum Likelihood Estimation with Stata, fourth edition*. College Station, TX: Stata Press.
- Iarossi, G. 2006. *The power of survey design*. Washington, DC: World Bank. <http://documents.worldbank.org/curated/en/726001468331753353/The-power-of-survey-design-a-users-guide-for-managing-surveys-interpreting-results-and-influencing-respondents>
- Kraay, A., and Murrell, P. 2016. "Misunderestimating Corruption." *The Review of Economics and Statistics* 98 (3): 455-466. https://doi.org/10.1162/REST_a_00536
- Malomo, F. 2013. *Factors Influencing The Propensity To Bribe And Size Of Bribe Payments: Evidence From Formal Manufacturing Firms In West Africa*. Brighton, UK: University of Sussex.

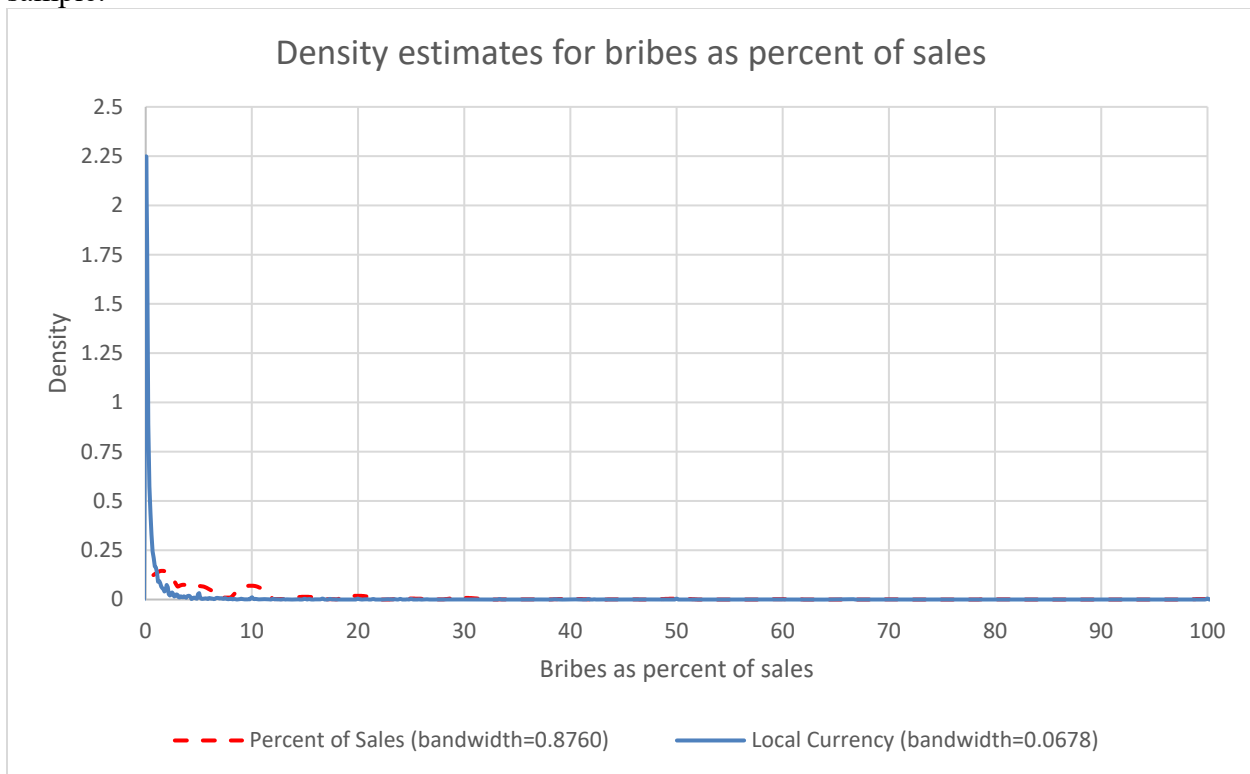
²³ In practice, however, managers reporting in local currency report paying less than 1 or 2% of sales. About 82% reported bribes of less than 1% of sales, and 90% reported bribes of less than 2%.

²⁴ One factor that does seem to play a role in how the respondent answers is the identity of the interviewer. Some interviewers appear to encourage answers in percentages, and some do the same in local currency.

- Silverman, B. W. 1986. *Density Estimation for Statistics and Data Analysis*. London: Chapman and Hall.
- Treisman, D. 2007. "What Have We Learned About the Causes of Corruption From Ten Years of Cross-National Empirical Research?" *Annual Review of Political Science* 10 (1): 211-244. <https://doi.org/10.1146/annurev.polisci.10.081205.095418>
- Xu, L. C. 2011. "The Effects of Business Environments on Development: Surveying New Firm-level Evidence." *World Bank Research Observer* 26 (2): 310-340. <https://doi.org/10.1093/wbro/lkq012>

Appendix

Figure A1: Kernel density estimates for firms reporting in local currency and percentages, full sample.



Note: Density estimates use the Epanechnikov kernel and each subsample's optimal bandwidth (Silverman 1986). Because the distribution is more spread out for firms that reported amounts as percentages, the bandwidth is wider for these firms leading to a smoother density estimate. Density estimates are calculated using all observations that report positive bribes that are less than or equal to 100% of sales. Firms that reported no bribes are excluded because we do not know whether they would have reported bribes as a percent of sales or in local currency. Outliers that reported bribes greater than 100% of sales are excluded from the estimation (10 observations of over 21,000 reporting positive amounts).