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Corruption and Market Competition: Evidence from Post-Communist Countries

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Summary. — This paper empirically examines whether market competition is associated with greater bribe payments. We use firm-level data from the Business Environment and Enterprise Performance Surveys. Since market competition could be endogenous and some firms report zero bribes, we employ a tobit estimation methodology instrumenting for market competition. We find that greater market competition increases the amount of bribes paid. Results are robust across several measures of market competition. However, market competition is less strongly associated with bribes in the presence of other obstacles of doing business that could also lead to more bribes.

Key words — corruption, competition, post-communist countries

1. INTRODUCTION

Many papers have concluded that corruption lowers economic growth and investment. See Mauro (1995), Svensson (2005) and Asieudu and Freeman (2009) for surveys. Hence, finding ways to lower corruption has attracted the attention of researchers, policy makers, and international organizations. Doing so requires that researchers identify what factors cause and influence the extent of corruption. Treisman (2000) provides one example of this search as he considers many country-wide factors such as colonial history, legal origin, and culture. Another factor considered in the literature is the degree of market competition (see Bardhan, 1997; Klitgaard, 1988). The effect of private sector competition on the level of corruption as denoted by the amount of bribery is theoretically ambiguous. Increased competition among firms drives firm and industry profits to zero thereby reducing a firm's ability to pay bribes. But other researchers have considered instances where competition could lead to more bribery as firms use bribes to gain advantages over their competition. Bliss and Di Tella (1997), Ades and Di Tella (1999) and Laffont and N'Guessan (1999) explore such possibilities (and we describe these papers in greater detail in Section 2).

The aforementioned papers model an extortion type of corruption where government officials extort firms thereby shifting the surplus from the firm to the official. An example would be a firm complying with environmental regulations but dealing with an official that will report noncompliance unless a bribe is paid. Another type of corruption involves collusion, also known as cost-reducing corruption. In this case, a firm pays an official to look the other way when it violates the environmental regulation to lower operating costs. Market competition need not affect these two types of corruption identically. If market competition drives profits to zero, then officials can extort little since little surplus exists from which firms can pay bribes. On the other hand, falling profits could cause firms to bribe more so as to gain advantages over their competition as argued in Alexeev and Song (2013) [AS]. They empirically consider this issue using a sample of manufacturing firms. They find that bribes increase with the number of competing firms although their results are not always robust to other measures of competition.

This paper builds upon this literature in three ways. First, we also consider firm-level data as in AS and so can examine within-country variation between competition and corruption. Country-level empirical work as found in Ades and Di Tella (1999) and Laffont and N'Guessan (1999) use more crude indicators such as the import to GDP ratio as a proxy for competition. Not only does such a measure not allow for within-country variation but the import to GDP ratio would overstate competition in cases where imports do not have domestic substitutes but understate competition in cases where firms face several domestic rivals. Second, our sample considers a wider array of firms than manufacturing and so we can examine if the results in AS apply to firms in other sectors such as services. Environmental and safety regulations could be more onerous for manufacturing firms and this could influence the association between competition and corruption. Do similar associations hold for service industries, for example?

A third difference is that our paper will also consider whether associations between market competition and corruption strengthen or weaken when firms face greater obstacles with regard to obtaining permits or complying with regulations. The existence of such obstacles could raise bribery when competition is fierce because firms have greater incentives to obtain competitive advantages. On the other hand, where such obstacles are onerous, they could weaken the association between competition and corruption because firms are more likely to pay bribes to circumvent these obstacles regardless of whether they face strong competitors. Either way, such differences would point to a more nuanced association between competition and corruption. The degree of government regulations would then influence how market competition affects the level of corruption, in addition to any direct influence that such regulations would have upon corruption.

We use the BEEPS III dataset that covers 9,500 firms in 26 post-communist countries. In our baseline specifications, we

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estimate the effect of private market competition on the amount of bribes paid by firms, both in general and in order to obtain government contracts. Given that many firms do not report any bribe payments, we use a tobit methodology. We also instrument for competition since it could be endogenous to the corruption environment as bureaucrats influence the number of firms in order to extract as much as possible through bribe payments.

We find this sample extremely applicable as problems of corruption could be of particular interest in these former communist countries. Hillman and Schnytzer (1986) detail extensive corruption in the Soviet Union. Firms paid bribes throughout supply chains and individuals often paid bribes to procure government offices. Even political purges, they argue, were a tool to protect and obtain rents by removing rival claimants. Boettke (2001) views communism within the Soviet Union as akin to mercantilism long ago where kings could acquire needed revenue by selling monopoly rights. Boettke argues that the move away from a market economy under communism allowed the government to extract rents by limiting competition. Government officials could then extract the surplus from the few suppliers through bribe payments. Although Boettke (2001) and Hillman and Schnytzer (1986) focus upon the Soviet system and other communist countries, such systems are unlikely to have completely changed following the fall of communism. Bayar (2011) and Mishra (2006) discuss why the extent of corruption could persist over time, including when governments take active steps to eliminate it. Vachudova (2009) describes corruption in the European Union's post-communist members, suggesting that such environments survived the fall of communism. Therefore, corruption has been a longstanding issue for these countries and remains an ongoing one. [1] AS argue that the firms in their sample primarily pay bribes to reduce costs and facilitate business operations. Even if this view is correct, firms could still find other ways to reduce costs such as investing in better production technologies or finding cheaper suppliers. What makes this sample of post-communist countries applicable to our analysis is that the prevalence of corruption in these countries suggests that cutting costs through bribes is more cost-effective than are many alternative ways of reducing costs. [2]

On a final note, this paper's focus on market competition does not mean to imply that market competition is the only or even the primary determinant of corruption. Culture, history, the characteristics of government agencies, *etc.* likely all play a role. Nevertheless, to the extent that the prevalence of corruption is mutable, then better understanding what factors influence the degree of corruption – even at the margin – could hold important policy implications.

The rest of the paper is organized as follows. Section 2 provides a more detailed background discussion, including an extension of the model from AS. Section 3 describes our empirical strategy and our data. Section 4 presents results and Section 5 concludes the paper.

2. BACKGROUND

One view maintains that competition among firms deters corruption by driving profits toward zero, a point raised by Rose-Ackerman (1978). However, several papers question this premise. Bliss and Di Tella (1997) develop a model where firms differ in their profit functions and their overhead costs. These differences allow rents to differ across firms. Corrupt officials could then try to drive the less efficient firms out of business so as to maximize the bribes extracted from the remaining firms who will now see a greater pre-bribe rent. Therefore, the number of firms is not exogenous in their model but is determined endogenously through interactions between firms and potentially corrupt officials. They then show in what cases greater competition, as proxied by lower overhead costs, for example, affects the degree of corruption and the number of firms in equilibrium. They report that greater competition can lead to more corruption.

Ades and Di Tella (1999) give another instance where the relationship between corruption and competition might be unclear. In a simple model where firms receive positive rents, competition has two effects on corruption. First, increasing competition as measured by the number of firms lowers corruption by reducing rent. Since corruption is lower, the gains from further reducing corruption become smaller. This leads to the second effect. Since the benefits of reducing corruption decline, the government has incentive to lower the compensation it pays to government agents since such compensation is used to induce the honest behavior of officials. Thus, officials might compensate for this loss by asking for a larger bribe.

Campos, Estrin, and Proto (2010), Emerson (2006), Dutta and Mishra (2004), and Aidt and Dutta (2002) also present models of corruption and competition where government officials can restrict entry although with disparate findings. The model in Emerson (2006) can produce multiple equilibria, one with high competition and low corruption and another with the opposite outcome. The number of firms is exogenous in Straub (2009) but the effect upon corruption remains ambiguous. In this model, production creates a negative externality that requires regulatory intervention. Firms can pay a bribe to an inspector to avoid adopting the "good" technology. Whether or not an increase in the number of firms increases or reduces corruption depends upon the nature of the externality and how addressing it affects the cost structure of the firm.

Many of the above models consider corruption as extortion as bureaucrats confiscate some of the rent accruing to firms. Shleifer (2004) considers two general cases of corruption: with and without theft. In corruption with theft, an agent pays a bribe to an official so as to lower his taxes or import tariffs thereby reducing total costs. In corruption without theft, the agent pays a bribe to an official to receive a permit to which he is otherwise entitled and so the official extorts the agent. Shleifer argues that competition increases corruption in the first case as cost pressures force all firms to pay bribes.

AS consider cost-reducing corruption. They present a simple model of Cournot competition where firms face linear demand curves. Firms are willing to pay bribes in order to lower fixed or variable costs. AS show that the bribe firms pay increases with the number of firms.

Given the ambiguity of the theoretical literature, researchers have also undertaken empirical research. Most empirical studies examining the impact of competition on corruption are cross-country studies. Ades and Di Tella (1999), Laffont and N'Guessan (1999), Emerson (2006), and Treisman (2000) use different country-level measures of both corruption and competition (where competition is assumed to lower rents) and find negative associations between the two. To the best of our knowledge, only AS examine this issue at the firm level. [3] Using data from manufacturing firms, they report a positive association between bribes and the degree of competition even after correcting for endogeneity using capacity utilization rates and capital–labor ratios to instrument for the degree of competition. They argue that their finding supports the presence of

cost-reducing corruption that is more likely to increase with market competition.

However, even if market competition leads to more bribery as AS argue, the association between the two could be more nuanced than it first appears. We revisit the example from AS but consider a different aspect to it. Assume a set of $N > 0$ Cournot competitors producing a homogenous good with constant marginal cost, c, and the same fixed cost, f. Each firm faces the same inverse demand curve: $p = a - Q$ where Q is the sum of output over all N firms in the market. Let q_i denote the output of firm i. Firms can reduce marginal costs by paying a bribe. Like AS, we assume that the government official receiving the bribe is able to extract all of the benefits of paying the bribe. The reduction in marginal cost is denoted as gc where $0 < g < 1$. The higher is g, the bigger the reduction in cost that a bribe provides. An example of such a potential reduction in a marginal cost could arise if a government official turns his head while a firm, for example, employs a less costly but legally inadequate pollution abatement technology. Finally, assume $a - c > 0$ so that profits are positive.

From AS, the bribe that a firm pays as a percentage of its sales, denoted as the bribe tax, is determined to be:

$$b = \frac{gc(N+1)}{a+NC} \tag{1}$$

Taking the derivative of (1) with respect to N shows that the bribe tax b is increasing with N:

$$\frac{\partial b}{\partial N} = \frac{gc(a-c)}{(a+Nc)^2} \equiv w > 0 \tag{2}$$

An increase of the number of firms increases the bribe tax. This is the result from AS. But consider how the marginal cost influences the strength of how N affects the bribe tax. Taking the derivative of w with respect to c yields:

$$\frac{\partial w}{\partial c} = \frac{a^3 - aN^2c^2 - 2a^2c - 2Nac^2}{(a+Nc)^4} \tag{3}$$

The sign of this derivative solely depends upon the numerator. When it is positive, it suggests that higher marginal costs will increase the influence that competition has upon the bribe tax. A negative numerator implies the opposite, that higher marginal costs will weaken competition's effect upon b. The numerator is positive when: $a^2 - N^2c^2 - 2ac - 2Nc^2 > 0$.

Since "high" is a relative designation, consider letting $a = mc$ where $m > 1$ and so m is the factor by which the market potential, a, compares to the firm's marginal cost, c. To the extent that regulatory obstacles increase marginal costs then the inverse of this parameter m can capture the severity of the obstacle. When m is high (obstacles are not severe), the gap between a and c is large indicating the potential for large profits. After replacing a with mc, the condition for the numerator to be positive becomes: $m(m-2) - N(N+2) > 0$.

Suppose $1 < m < 2$ so that the marginal cost is relatively high compared to the market potential. The numerator in this case is negative. Thus, an increase in c lowers the expression in (2), indicating that high marginal cost reduces the influence of the number of competitors on the bribe tax. In other words, when regulatory obstacles become sufficiently burdensome (relative to the potential of the market signified by a), the number of competitors becomes less important for the size of the bribe tax. The intuition is that firms have incentive to circumvent these more stringent regulations regardless of the degree of competition.

The empirical work below will not only consider if competition increases bribe payments but whether competition's influence upon corruption strengthens or weakens when regulatory obstacles are severe.

3. EMPIRICAL METHODOLOGY

We use the 2005 "EBRD-World Bank Business Environment and Enterprise Performance Survey" (BEEPS III) that covers 9,500 firms in 26 post-communist countries, Spain, Ireland, and Turkey (although we remove these latter three in the empirical work).[4] BEEPS I was launched in 1999 by the European Bank for Reconstruction and Development and the World Bank to understand the constraints that private companies face when creating or doing business in Eastern Europe countries. The survey investigates firms' experiences with business-government relations, firm financing, labor, infrastructure, informal payments, and corruption. Later surveys were conducted in 2002, 2004, 2005, and 2009. Unfortunately, panel techniques cannot be employed. Not only do firms differ across surveys but so can questions. We primarily employ the 2005 survey since its survey questions are most applicable to our examination. The 1999 survey does not consider market competition. The 2009 survey also provides little information regarding how many competitors firms face. The 2002 survey asks such a question but data are missing for the majority of observations. We focus on the 2005 sample but will use a slightly different measure of market competition from the 2004 survey when conducting robustness checks. The appendix provides details regarding all the variables used in the paper. The two main variables concern bribery and market competition.

(a) *Bribery*

The variable we use, BRIBE, comes from the following question: "On average, what percent of total annual sales do firms like yours typically pay in unofficial payments/gifts to public officials?" A weakness of this question is that for obvious reasons the surveyor does not ask the amount of any actual bribe paid by the firm. The presumption is that the firm's response will be highly correlated with its own experiences. The bribe variables in Clarke and Xu (2004), Berg *et al.* (2012), and AS also originate from similar survey questions that do not ask a firm about its own bribe payments but about its perceptions of the industry in general. Nevertheless, not only must one be concerned that respondents answer truthfully but that responses are accurate. Of course, not just the presence of inaccuracies but how they arise are relevant for results. If any inaccuracies in responses are pure noise, then this noise would weaken the association between competition and bribery and so drive the coefficient upon competition to zero, suggesting that the effect from competition upon bribery is greater in magnitude than what we report below. The same would hold if inaccuracies are intentional in that firms do not want to provide any hint of suspicion of paying bribes. As long as any such dishonest reporting is random, then it would only weaken measured associations between competition and bribery.[5]

More troublesome would be if inaccuracies are systemic. For example, respondents in countries where corruption is more severely punished would be more likely to underreport bribery. But to the extent that such misreporting occurs countrywide then this type of inaccuracy can be captured by country dummies. The inclusion of industry controls can also capture differences in reporting among industries. An even more severe concern would arise if the degree of competition

causes a false report. If respondents assume that fierce competitors engage in bribery then they will report an inflated size of unofficial payments from their competitors regardless of whether or not they actually observe competitors paying bribes. Such responses would create a positive association between bribery and market competition even if market competition does not cause corruption. Unfortunately, we find no way to formally address this concern since we cannot distinguish competition's effect on actual bribery *versus* competition's effect on the perception of bribery. AS also acknowledge such a problem but believe it is minimal in that they claim that most firms are sufficiently aware of their competitors' business practices so as to not blithely assume that the mere presence of competition causes bribery without other substantiating evidence.

To help justify use of BRIBE, consider country-level measures of the absence of corruption from the World Governance Indicators (WGI) and the Corruption Perceptions Index (CPI) from Transparency International. Both stem from experts' opinions on the prevalence of corruption within a country and have often been used in cross-country studies. [6] For each country in our data set, we calculated the average bribe across all firms within the country. We then found the correlation with their WGI and CPI counterparts. The correlation between our averages and the WGI scores is −0.60. The correlation between our averages and the CPI scores is −0.51. Both correlations are significant at the 1% level. These correlations suggest to us that the firms' responses, at least when aggregated at the country level, are associated with more commonly used corruption variables and so enjoy some degree of validity. Noise does not appear to completely dominate the signal nor do the aforementioned problems seem so severe that the firm-level responses become unusable in empirical analysis.

We also considered a second check and one performed by AS. We cannot examine if competition causes firms to misreport bribery for strategic reasons. However, we do know when firms choose not to respond. Obviously, choosing not to respond and choosing to misreport are not the same but the two outcomes might not be entirely distinct either as the same characteristics that cause some firms to misreport could cause others to not report. Question 40 from BEEPS III serves as the foundation for our variable BRIBE. We created a dummy variable that equals one if a firm provides a numerical response to question 40 and equals zero otherwise. We then regressed this dummy against the measure of competition (denoted as LOC) we will employ below along with all exogenous variables using a probit methodology. The coefficient upon LOC was not significant (p-value of 0.63) suggesting no strong evidence that market competition is associated with whether or not to answer question 40.

Obviously, such checks are not proof that BRIBE is a valid measure of corruption but we do find them supportive.

The average firm in the sample pays just over 1% of their sales in informal payments. Slovenia averages the lowest bribe payment at only 0.17% of sales whereas firms in Azerbaijan pay almost 2.5%. These extremes generalize to country groupings. Firms in former Soviet countries pay over 1.2% in bribes whereas firms in former Yugoslav countries pay only 0.5% on average. Firms in the remaining countries in Eastern Europe pay 1%.

(b) *Market competition measures*

BEEPS III asks firms to report the number of competitors in both the national and local markets (although any response greater than "99 competitors" is assigned the value 99).

We focus on the local market for two reasons. One, a national competitor is usually also a local one and so the set of national competitors is generally a subset of local ones. The correlation between the two is 0.70. Second, many firms reported that they did not compete in the national market. Our sample size would be cut in half if we primarily considered national competitors instead of local ones. However, we will consider the number of national competitors along with other measures of competition when conducting robustness checks. [7]

An advantage of using the number of competitors is the cardinality of the measure, thereby easing its interpretation. However, it is not perfect. The number of competitors does not indicate how intensely firms compete with one another. An intense struggle for market share could also drive some firms out of business, thereby decreasing the number of competitors and implying that a higher value for the number of competitors does not necessarily signal more competition. Moreover, a large firm facing nine small competitors might face less competition than a firm facing nine firms similar in size to itself. If entry costs are low, then firms might still be constrained by potential competitors even if they are not currently realized. Because of these potential drawbacks, we also consider other measures for robustness checks.

Ades and Di Tella (1999) consider the import to GDP ratio. An advantage is that that import competition is less likely to be driven by the extent of domestic corruption. They argue that bureaucrats are less likely to enact (or set) trade policy. They also doubt that legislators and other government officials that set such policies coordinate with the bureaucrats that would be demanding bribes. We acknowledge, however, that domestic corruption could still hold some influence as global suppliers could be less willing to send their products into economies where corruption is rampant if these suppliers bear the costs of this corruption. Nevertheless, we consider the variable IMPORTS which is an ordinal variable denoting the extent to which a firm reports competitive pressure from imports. Other measures of competition from foreign sources will consider to what extent foreign firms influence the firm's decisions to innovate (INNOVRFOR) or lower production costs (COSTFOR). An advantage of these variables is that they somewhat address the intensity of competition since they measure to what extent pressure from competitors influences firm decisions. We will also consider domestic pressure to innovate (INNOVDOM) or reduce costs (COSTDOM). Disadvantages with these variables are that they are ordinal, complicating inferences regarding their changes. We will consider the extent of unfair business practices (as reported by the firm) coming from the firm's competitors (ANTIFAIR). Another ordinal variable is PRICERISE which comes from a question asking a firm what would happen to its sales if it raised prices by 10%. Finally, we will consider the natural log of the margin of the sales price to the operating cost (MARGIN), also denoted as a markup. Presumably, larger profit margins are associated with greater monopoly power and so less competition. However, Stiglitz (1989) and Rosenthal (1980) discuss possibilities where greater competition could lead to greater markups, creating a degree of ambiguity as to what an increase in this measure actually signifies.

Table 1 shows that these measures are capturing different aspects of competition as the correlations among them are well below one. [8] The measure most weakly associated with the others is MARGIN, perhaps because of the potential for greater competition to sometimes increase markups.

Table 1. *Correlations across competitive measures*

	NAT	MARGIN	IMPORTS	PRICERISE	ANTIFAIR	INNOVDOM	INNOVFOR	COSTDOM	COSTFOR
LOC	0.714	−0.009	0.094	0.159	0.124	0.256	0.047	0.235	0.055
NAT		−0.003	0.097	0.149	0.112	0.247	0.010	0.239	0.018
MARGIN			0.003	−0.118	−0.001	−0.014	0.005	−0.010	−0.004
IMPORTS				0.153	0.182	0.230	0.419	0.213	0.407
PRICERISE					0.136	0.220	0.117	0.207	0.127
ANTIFAIR						0.297	0.156	0.291	0.169
INNOVDOM							0.268	0.242	0.242
INNOVFOR								0.257	0.835
COSTDOM									0.341

LOC denotes the natural log of one plus the number of local competitors. NAT denotes the natural log of one plus the number of national competitors. MARGIN denotes the natural log of the profit margin. IMPORTS denotes to what extent imports compete with the firm. PRICERISE denotes what would happen to firm sales should the firm raise its price by 10%. ANTIFAIR denotes to what extent the firm's competitors take anti-competitive trade practices. INNOVDOM denotes to what extent domestic competition is a factor in the firm's decisions to innovate. INNOVFOR is similar but considers competition from foreign firms. COSTDOM denotes to what extent domestic competition is a factor in the firm's decisions to find ways to cut production costs. COSTFOR is similar but considers competition from foreign firms.

(c) *Empirical model*

Our baseline empirical model is:

$$\text{BRIBE}_{jki} = \delta_i + \alpha * \text{SALES}_{jki} + \beta * \text{COMP}_{jki} + \sigma * X_{jki} + \varepsilon_{jki} \quad (4)$$

where j denotes the firm, k denotes the industry, and i denotes the country. Country-level fixed effects denoted by δ_i capture countrywide determinants of corruption. These factors might include countries' rule of law and legal systems, regulations of economic activities, and other socio-economic characteristics. Treisman (2000) considers these and other variables in his cross-country study of the determinants of corruption. To the extent that such countrywide factors provide the most important reasons as to why experiences differ across firms, then their inclusion is likely necessary to uncover within-country associations between market competition and bribery. Such dummies could also capture countrywide factors that cause firms to misreport bribe payments. The variable SALES denotes j's sales in industry k and so controls for industry-level effects. Industry factors could also be important as even within the same country regulatory agencies could differ across industries but still be common for all firms within that industry. COMP_{jki} is the measure of competition. We primarily use the natural log of the number of local competitors, LOC, to measure competition but robustness checks will examine to what extent results are robust across alternatives.

X_{jki} denotes a set control variables comprising firm characteristics. We consider the firm's age (AGE) as longer surviving firms could have established networks with government officials. GOVSHARE and FORSHARE consider the share of government and foreign ownership of the firm. Firms with large government shares or large foreign shares could face different bribe environments. Another control variable is EXPORT, the percentage of a firm's output that is either directly or indirectly exported. Firms that export products on global markets could also differ in important ways from ones that mainly sell their output domestically. Exporting firms might also be less affected by domestic competition. Ideally, we would also like to include a measure of the firm's ability to pay. Unfortunately, we do not have data that closely matches this characteristic. We do not have data on firm profits. Instead, we use a cruder measure, namely the size of the firm (SIZE) as measured by the number of employees. We presume that larger companies are more able to pay larger amounts of bribes. On the other hand, larger firms might have also developed political connections that allow them to avoid paying bribes in which case SIZE would become a measure of a firm's refusal power.

Other characteristics measure the firm's bargaining power when facing corrupt officials or its ties to the government. We use the percentage of firm's total sales to government or government agencies (SALESGOV) as a proxy for a firm's reliance on government contracts. TAX provides another characteristic of the association between firm and government as it denotes the percentage of total sales that the firm reports for tax purposes. A small value would denote that the firm inherently hides much of its operation from the government and so could show a more antagonistic dynamic between the two. Moreover, its inclusion can also help control for firms' potential to misreport bribe payments. To the extent that misreporting of bribes is associated with misreporting of taxable revenue, then the inclusion of TAX can help control for the degree of misreporting. The variable HONEST denotes the opportunity for a firm to go to an honest official for correct treatment if another official demands a bribe. The survey respondent can answer with one (never) through six (always) integer values as to how likely this opportunity for honest treatment arises. CAPITAL takes the value one if the firm is located in the capital and zero otherwise. Firms located in the capital could find ways to influence government officials other than through bribery. Conversely, firms might move to the capital to better bribe officials and so the sign on capital is unclear.

For many of our variables we take natural logs to lessen the influence of outliers. We also add one to these responses before taking natural logs so as to not lose the observations reporting "zero" for one of these responses. We apply this transformation to: BRIBE, LOC, TIME, TAX, AGE, and SALESGOV.

Because many firms report not paying any bribes, bribery data is censored and so we estimate (4) with a tobit specification.[9] A second problem when estimating (1) is the potential endogeneity of competition. As found in the models cited in Sections 1 and 2, bureaucrats could restrict the number of firms thereby allowing some firms to receive rents in order to extract those rents by demanding bribes. By itself, such a result should create a negative association between corruption and competition. Another possibility is that agents choose not to establish firms where corruption is prevalent. This outcome would also create a negative association between the two. The presence of either case would negatively bias the coefficient on the competition measure in (1). As we will show, we find that

the association between competition and corruption is positive. Therefore, even if such biases exist they do not overturn the general conclusion from our paper that competition increases corruption.

An alternative possibility goes in the other direction. If bureaucrats understand that greater competition increases bribe payments, then they might try to encourage greater competition. We find it more likely that bureaucrats could limit competition by denying permits rather than force individuals to open firms and participate in markets. Still, perhaps these officials could lower prices for permits to start businesses in order to obtain greater bribe amounts in the future.

Omitted variable bias could also arise. Perhaps some third factor is positively associated with both competition and corruption. For example, a larger country could both support a larger number of firms and could be more ethnically heterogeneous. [10] Mauro (1995) argues that ethnic diversity influences the level of corruption. However, to the extent that such omitted factors prevail across the entire country they will be captured by the country dummies. The industry share variables will implicitly capture latent industry-level characteristics common to firms within an industry. Nevertheless, perhaps firm-specific or sub-sector specific, omitted characteristics influence both competition and corruption.

One way to mitigate endogeneity concerns is to employ different types of competitive measures as we have described above. Since different measures presumably capture different aspects of competition, some are less likely to be affected by the extent of corruption.

Nevertheless, we acknowledge that endogeneity concerns remain and so we instrument for our measure of competition. We consider three instruments. The first variable, SUPINC, takes on integer values 1–4 and stems from a question about the firm's main supplier. If this supplier raised its price by 10%, to what extent would the firm continue to buy from this supplier? A one indicates that the firm would purchase the same quantity of supplies and a four indicates that the firm would entirely buy from another supplier. If a firm faces strong competition, then such a price increase would be less likely to be passed to consumers and so a firm would have greater incentive to search for a new main supplier. A second question asks firms to rate the level of importance of several sources in attracting customers. These sources include: family and friends, government agencies, trade shows, chambers of commerce, former employees, and current suppliers and customers. Such sources should be more important when competitive pressures are great. NEWCUST is the sum of these responses. Higher values imply that regardless of the source, using such resources to find customers is of greater importance to the firm. [11] We assume that firms facing stronger competition have then stronger incentive to find new customers. Since both NEWCUST and SUPINC capture associations between the firm and its customers and suppliers, it should otherwise not be associated with the bureaucrats demanding bribes and so can serve as instruments for competition. The final instrument is a dummy variable indicating whether or not the firm is a member of a trade association, suggesting that other firms within the industry exist and so are possible competitors (ASSOC). In the first stage regressions (available upon request), the instruments are highly correlated with the respective measures of competition we utilize below. In no first-stage regression does more than one instrument fail to obtain at least a 10% level of significance.

For all specifications we conduct overidentification tests, examining the appropriateness of these instruments. Results of these tests are reported in the relevant tables.

4. RESULTS

Results are given in Table 2. Column 1 presents the baseline model. The coefficient upon LOC is 0.81 and is significant at the 1% level. Its size suggests that a one standard deviation increase in LOC (1.16) raises BRIBE by 0.94 units which equals 1.4 standard deviations, a sizeable impact.

For the other coefficients, evidence arises that foreign firms pay greater bribes whereas no strong association arises between government ownership and bribes. Firms that export also pay larger bribes, perhaps because they more often deal with customs officials. Not surprisingly, firms that report the potential to seek out honest officials report fewer bribes. Firms that are willing to declare a larger percentage of their revenue to tax authorities pay smaller bribes. Larger firms pay more, perhaps because they have a greater ability to pay. However, older firms pay less possibly because they have found other ways to influence government officials. Firms that more greatly rely on government establishments for their sales also report greater bribes. Firms located in the capital report lower bribes, again possibly because they have other ways to influence government. The null hypothesis that the country dummies are equal is easily rejected at the 1% level, suggesting at least level differences in bribe payments across countries. Finally, the overidentification test fails to reject the null hypothesis that the exclusion restrictions are valid.

Column 2 estimates (1) taking LOC to be exogenous. Although statistically significant, the coefficient upon LOC greatly falls in magnitude. If greater bribe payments reduce competition, then this reverse causality would bias the coefficient upon LOC downward if one did not address the endogeneity of LOC. Columns 3, 4, and 5 again instrument for LOC but remove the country dummies or the sectoral shares. To the extent that corruption or market competition differs at the country or industry level, the inclusion of these control variables could hinder finding associations with firm-level data. The coefficient estimates upon LOC remain robust to the removal of these controls and their magnitudes are roughly equal, suggesting that countrywide or industry characteristics do not greatly influence the association between market competition and corruption. Such a result reinforces our confidence that our use of BRIBE is appropriate for our application. Although the extent of misreporting could differ across countries, it does not seem to be systemically related to how competition associates with corruption.

The final column of Table 2 considers a different estimation methodology, fractional regression originally proposed by Papke and Wooldridge (1996) and further considered in Ramalho, Ramalho, and Murteira (2009). Since bribes cannot take negative values, one could argue that no censoring arises as assumed in a tobit model. Instead, values are constrained to lie within the unit interval as firms pay somewhere between 0% and 100% of their revenues as bribes. In our application, only the lower bound is binding as the highest reported bribe is 50% of sales. Since the data from the survey reports bribes as percentages, we create FRACBRIBE by dividing the bribe percentage by 100 and so FRACBRIBE takes on values between 0 and ½ in our sample. The coefficient upon LOC is 0.0473, just significant at the 5% level, again suggesting a positive association between competition and corruption. [12]

Panel B of Table 2 replaces the bribery variable used above with one specifically related to government contracts. This bribe is measured as a percentage of the value of the government contract that firms hope to obtain. An advantage of this variable is that the purpose of the bribe becomes more clear. We once again find a positive association between market

Table 2. *Empirical results*

	(1) IV-Tobit	(2) Tobit	(3) IV-Tobit	(4) IV-Tobit	(5) IV-Tobit	(6) Frac. Reg.
	Panel A: Total Bribes					
LOC	0.806***	0.059**	0.768***	0.830***	0.761***	0.0473*
	(0.231)	(0.019)	(0.227)	(0.217)	(0.210)	(0.0245)
GOVSHARE	−0.001	−0.005***	−0.001	−0.001	−0.001	−0.0034**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.0015)
FORSHARE	0.003**	−0.0002	0.003**	0.002*	0.003**	−0.0005
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.0012)
HONEST	−0.095***	−0.092***	−0.119***	−0.096***	−0.120***	−0.1061***
	(0.017)	(0.015)	(0.018)	(0.017)	(0.018)	(0.0197)
EXPORT	0.067***	0.030*	0.019	0.071***	0.018	−0.0033
	(0.024)	(0.017)	(0.024)	(0.026)	(0.024)	(0.0235)
TAX	−0.797***	−0.871***	−0.936***	−0.792***	−0.935***	−0.6366***
	(0.078)	(0.064)	(0.077)	(0.078)	(0.077)	(0.0590)
SIZE	0.050*	−0.002	0.130***	0.061**	0.134***	−0.0742***
	(0.027)	(0.017)	(0.031)	(0.025)	(0.028)	(0.0223)
SALESGOV	0.107***	0.070***	0.127***	0.115***	0.131***	0.0830***
	(0.020)	(0.014)	(0.022)	(0.018)	(0.019)	(0.0177)
AGE	−0.083**	−0.105***	−0.242***	−0.083**	−0.243***	−0.1242***
	(0.041)	(0.035)	(0.040)	(0.041)	(0.040)	(0.0472)
CAPITAL	−0.191*	0.112**	−0.081	−0.212**	−0.086	0.1934***
	(0.110)	(0.050)	(0.083)	(0.105)	(0.078)	(0.0628)
Constant	1.434**	3.559***	2.730***	1.216	2.569***	−1.6352***
	(0.711)	(0.332)	(0.677)	(0.699)	(0.660)	(0.3391)
Country dummies	Yes	Yes	No	Yes	No	Yes
Industry shares	Yes	Yes	Yes	No	No	Yes
# obs.	5399	5998	5399	5399	5399	5998
P-Value	0.155	Not app.	0.198	0.185	0.209	Not app.
	Panel B: Bribes for Government Contracts					
LOC	3.220***	0.176***	3.229***	3.236***	3.275***	0.1152**
	(1.086)	(0.037)	(1.192)	(1.056)	(1.192)	(0.0293)
# obs.	5177	5710	5177	5177	5177	5497
P-Value	0.392	Not app.	0.090	0.508	0.135	Not app.

Standard errors are in parentheses. IV-Tobit estimates obtained via a two-step estimation methodology. ***,**, and * denote significance at the 1%, 5%, and 10% levels, respectively. Instruments for LOC include ASSOC, SUPINC, and NEWCUST. *P*-Value denotes the *p*-value from a chi-square test taking as the null that the model is not overidentified.

competition and bribery. This finding supports Beck and Maher (1986) who find that bribes for contracts behave similarly as bids for those contracts. Both increase with the number of agents wanting to obtain the contract.

Table 3 considers a series of robustness checks, replacing LOC with the other measures of competition listed above. For all of these measures except MARGIN, associations between competition and bribery remain positive and significant. The coefficient upon MARGIN is negative which is congruent with the other measures since higher margins suggest lower competitive pressures, but the sign is not significant. However, in some cases the overidentification test suggests that the models are not correctly specified which also tempers results somewhat. Nevertheless, the finding that market competition increases bribery is generally consistent across alternative measures of competition, measures that are not always strongly correlated with one another.

Use of BEEPS surveys from other years is limited due to the nonexistence of precise data for the number of competitors. An exception is market share from the 2004 survey, another measure of competition.[13] It asks firms to report the firm's market share in local and national markets, respectively. Presumably, a greater market share denotes less competition although, once again, the measure is not perfect. A firm reporting a 20% market share facing a single competitor with an 80% share differs from a case where a firm also has a 20% share but faces numerous smaller competitors. We again take natural logs to reduce the influence of outliers and denote these two measures as LOCSHARE and NATSHARE. Higher values imply less competition for the firm because it serves a greater share of the market. The last two rows of Table 3 show results with these variables. Coefficients are negative and so again suggest that greater competition is associated with larger bribe amounts.

As mentioned in the previous section, the degree of bribery differs across the countries within the sample. Firms in Slovenia pay an average of only 0.17% of their revenues in bribes whereas firms in Azerbaijan pay 2.76% of their revenues as bribes. To the extent that only averages differ across countries, then the inclusion of the country dummies suffices to account for such differences. However, might associations between corruption and competition also differ, suggesting that the coefficient upon LOC should not be constrained across all countries in the sample? Consider a three-way split of the sample. Group 1 contains former Yugoslav countries. Group 2 contains the countries of the former Soviet Union. The final group contains the remaining countries: Albania, Bulgaria, Czech Republic, Hungary, Poland, Romania, and Slovakia.

For each group, the specification presented in column 1 of Table 2 was applied and the results are given in Panel A of

Table 3. *Robustness checks using different measures of market competition*

	Coefficient	Standard Error	*P*-Value	# observations
NAT	0.587	(0.358)	0.296	3004
MARGIN	−0.041	(0.765)	0.0004	4957
PRICERISE	0.142***	(0.059)	0.0001	5383
IMPORTS	0.457***	(0.142)	0.064	5325
ANTIFAIR	0.747***	(0.188)	0.944	5227
INNOVDOM	0.516***	(0.139)	0.151	5357
INNOVFOR	0.489***	(0.137)	0.420	5201
COSTDOM	0.509***	(0.136)	0.303	5297
COSTFOR	0.419***	(0.120)	0.352	5155
LOCSHARE	−0.991***	(0.215)	0.836	2140
NATSHARE	−0.951***	(0.326)	0.141	1003

Standard errors are in parentheses. IV-Tobit estimates obtained via a two-step estimation methodology. ***,**, and * denote significance at the 1%, 5%, and 10% levels, respectively. Instruments for LOC include ASSOC, SUP, and CUST. *P*-Value denotes the *p*-value from a chi-square test taking as the null that the model is not overidentified. NAT denotes the natural log of one plus the number of national competitors. MARGIN denotes the natural log of the profit margin. PRICERISE denotes what would happen to firm sales should the firm raise its price by 10%. IMPORTS denotes to what extent imports compete with the firm. ANTIFAIR denotes to what extent the firm's competitors take anti-competitive trade practices. INNOVDOM denotes to what extent domestic competition is a factor in the firm's decisions to innovate. INNOVFOR is similar but considers competition from foreign firms. COSTDOM denotes to what extent domestic competition is a factor in the firm's decisions to find ways to cut production costs. COSTFOR is similar but considers competition from foreign firms. LOC (NAT) SHARE denotes the firm's share of local (national) market sales.

Table 4. In all cases, the coefficient upon LOC is positive and statistically significant, at least at the 10% level. One can also see that the coefficient estimates remain large although standard errors are also high. We interpret these results to suggest that the previous findings between market competition and corruption are not stemming from a particular set of countries. [14]

One can also split the sample into goods-producing *versus* service-producing firms. Service sector firms could face different types of regulations thereby influencing the association between competition and corruption. Such a split could be especially relevant when interpreting results from AS since they restrict their sample to manufacturing firms and one could wonder whether service sector firms create a similar association between LOC and BRIBE. Another reason to consider such a split is that measuring the quality or even the quantity of output is more difficult in service sectors. If such characteristics matter for how bribes are set, then the association between competition and bribes could differ for service sectors, especially if service sectors have higher degrees of competition. This could result in a biased coefficient upon the competition measure (although purely level effects upon bribery would be captured by the sector shares).

Panel B again repeats the specification from column 1 of Table 2 but includes a SERVICE*LOC interactive term where SERVICE = 1 for firms that obtain over half of their sales in service sectors. The coefficient upon LOC hardly changes whereas the coefficient upon the interactive term is nearly zero, suggesting that the association between competition and corruption is stable between goods and service providers. One possible reason for this outcome is that goods providers and service providers barely differ in regard to either the number

Table 4. *Results for subsamples*

Panel A: Differences across Country Groups

	Former Yugoslavia	Former USSR	Other
Coefficient upon LOC	1.454*	0.579**	0.812*
	(0.787)	(0.272)	(0.448)
Number of Obs.	670	2901	1828

Panel B: Services versus Goods (Estimates and Summary Statistics)

Dep. Var. is BRIBE	Estimate	Standard error	# of goods firms
LOC	0.795**	(0.327)	2635
Service*LOC	0.042	(0.904)	

LOC	Mean	Standard deviation
Goods sector firms	2.08	1.17
Service sector firms	2.18	1.15

BRIBE	Mean	Standard deviation
Goods Sector Firms	0.37	0.68
Service sector firms	0.33	0.63

Panel C: Services versus Manufacturing (Construction and Mining Firms Removed)

Dep. Var. is BRIBE	Estimate	Standard error	# of goods firms
LOC	1.081**	(0.457)	2012
Service*LOC	−0.136	(0.957)	

Standard errors are in parentheses. IV-Tobit estimates obtained via a two-step estimation methodology. ** and * denote significance at the 5% and 10% levels, respectively.

of local competitors they face or the amount of bribes that they pay. Both the respective standard deviations and means are similar as also shown in panel B of Table 4.[15] Panel C removes construction and mining firms and so creates a more refined comparison between manufacturing firms and service sector firms. As before, the coefficient upon the interactive term is small, once more suggesting that the association between competition and corruption does not greatly differ across sectors.

Tables 5 and 6 consider a different issue and one discussed at the end of Section 2. Suppose a firm reports that obtaining licenses or permits presents a considerable obstacle. In such cases, does competition matter more or less? Do competitive pressures to bribe increase when firms face severe regulatory obstacles or do these obstacles weaken such associations because firms have incentive to bribe regardless of the number of competitors they face? We consider five obstacles: obtaining permits/licenses, dealing with tax officials, dealing with customs officials, dealing with labor regulations, and dealing with the judiciary. For each of these, a firm rates the obstacle on a scale of one to four where higher values denote greater obstacles. The correlations across these five obstacles (shown in Table 5) fall between 0.23 and 0.39, positive but not so high as to be capturing identical impediments.

Table 5. *Correlations across obstacle types*

	Q54j	Q54k	Q54l	Q54p
Q54i	0.2305	0.3180	0.3509	0.2656
Q54j	1			
Q54k	0.3491	1		
Q54l	0.2885	0.3763	1	
Q54p	0.2810	0.2836	0.3182	1

Q54i: Obtaining licenses and permits.
Q54j: Dealing with tax officials.
Q54k: Dealing with customs officials.
Q54l: Dealing with labor regulations.
Q54p: Dealing with the Judiciary.

The first columns of Table 6 show that the coefficient upon LOC retains its magnitude and remains statistically significant when each of these obstacles is included as a control variable. However, the latter columns are more interesting. For each obstacle, the sample is split into two subsamples. One subsample only considers those observations reporting values of 3 or 4 for a particular obstacle, indicating that the firm sees this obstacle as onerous. The other subsample consists of those firms reporting a 1 or 2, indicating that the obstacle is less of an impediment. In four of the five cases, the coefficient upon LOC is greater for the less onerous obstacle. In three cases, the coefficient is over twice as large when obstacles are less burdensome, indicating that the association between competition and bribery is greater when firms report fewer obstacles from government institutions. The one exception concerns the judiciary and even there the coefficients are of similar magnitude, 0.52 *versus* 0.59. These results suggest a somewhat perverse result, namely that market competition could have the biggest effect upon cost-reducing corruption where government obstacles that could spur cost-reducing corruption are *less* onerous. In other words, market competition could have the biggest influence on corruption in those countries or sectors that are the least regulated.

The paper that this examination most resembles is AS and so it is important to compare our findings to theirs. We both find a positive association between market competition and bribery. They focus on manufacturing firms whereas we consider a wider sample of firms, including firms from service sectors. We both employ tobit methodologies instrumenting for market competition but our specifications also differ. We include more control variables in our specification. Our instruments also differ. They use the U.S. capital–labor ratio at the

Table 6. *Market competition and regulatory obstacles of doing business*

Obstacle	Coefficients on:		Coefficient on LOC when:	
	LOC	Obstacle	Obstacle $\leqslant 2$	Obstacle > 2
Obtaining permits/licenses	0.743***	0.063***	1.212***	0.462**
	(0.234)	(0.017)	(0.425)	(0.262)
# of observations	5399		2504	2895
P-Value	0.185		0.849	0.051
Dealing with tax officials	0.788***	0.020**	0.834***	0.366
	(0.231)	(0.008)	(0.291)	(0.298)
# of observations	5399		3855	1544
P-Value	0.206		0.866	0.210
Dealing with customs officials	0.739***	0.046***	0.949***	0.319
	(0.231)	(0.012)	(0.355)	(0.260)
# of observations	5399		3670	1729
P-Value	0.284		0.502	0.288
Dealing with labor regulations	0.746***	0.059***	0.707***	0.634
	(0.233)	(0.016)	(0.253)	(0.592)
# of observations	5399		4036	1363
P-Value	0.246		0.281	0.708
Dealing with the judiciary	0.794***	0.040***	0.518	0.588**
	(0.230)	(0.009)	(0.319)	(0.255)
# of observations	5399		3597	1802
P-Value	0.275		0.214	0.952

Standard errors are in parentheses. IV-Tobit estimates obtained via a two-step estimation methodology. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. Instruments for LOC include ASSOC, SUP, and CUST. *P*-Value denotes the *p*-value from a chi-square test taking as the null that the model is not overidentified.

subsector level to instrument for competition, arguing that such ratios should be similar across countries and reflect fixed costs that could affect competition while U.S. capital–labor ratios should be unaffected by corruption in distant countries. Despite these important differences in specification, our results largely coincide although they are more robust in our paper. Market competition appears to increase bribery.

Nevertheless, some important differences arise. AS argue that their findings suggest that corruption is cost-reducing. They claim that survey questions asking firms how much they pay in informal payments "to get things done" suggest that firms are paying for shortcuts to accomplish some task. One might then infer that competitive pressures intensify when regulatory obstacles become more severe. Instead, we find that the association between competition and corruption is greatest when such obstacles are smaller. When regulatory or other obstacles become sufficiently great, firms have incentive to pay bribes to circumvent these obstacles regardless of how much competition they face.

5. CONCLUSION

In this paper we investigate the link between private market competition and bribery using the BEEPS 2005 dataset for 26 countries. Given that many firms report no bribes and the potential for market competition to be endogenous, we employ a tobit estimation methodology, instrumenting for competition. We found that as the number of competitors increases the amount of bribes paid tends to increase as well and that the magnitudes are relatively large. Results were robust to using other measures of market competition. Many of the theoretical studies cited in sections one and two report nuanced effects from competition to corruption. Competition could cause greater corruption in some instances and less than others. Our findings are more straightforward. Competition is generally associated with greater corruption.

However, we find that competition is more strongly associated with corruption where the opportunity for these short cuts is diminished. Our result makes sense to us in that such impediments are likely to lead to more bribery regardless of the degree of market competition as firms look for ways to avoid such obstacles. A policy implication is that reducing such obstacles could have diminished impacts upon bribery where market competition is high as such competition could continue to spur bribe payments in the future. The direct effect of removing obstacles so as to lower corruption could be somewhat offset by an indirect effect of making corruption more sensitive to competitive pressures. More generally, our results suggest that the degree of influence that market competition has upon bribery depends upon the degree of obstacles firms face. This finding could be of particular relevance since market reforms often come in packages. Reforms could both attempt to lower regulations while encouraging more private enterprise.

As for a more general policy implication, we do not blithely suggest constraining market competition. For one, costs of restraining market competition would also arise, especially if some firms gained monopoly power. This paper has made no attempt to measure such costs. Furthermore, the enactment and enforcement of new policies could create even more corruption as firms jockey for position to best exploit such policy changes. Without considering any of the costs of limiting competition, we do not wish to proffer any such recommendations. Nevertheless, our results can still help policymakers identify the marginal impacts upon bribery of increasing competition. Such knowledge could be especially important in countries transitioning to more market-based economies like the countries of our sample.

A question that our paper leaves unanswered is to what extent bribes are initiated by a government official or the firm. Do officials extort firms or do firms actively seek to pay off officials to cut corners? Such questions we hope to address in future work.

NOTES

1. The control of corruption score from the World Bank's World Governance Indicators is centered at zero (so that zero is the population mean). The average WGI score for the countries in our sample is −0.31, suggesting that corruption is more widespread in these countries relative to the global average.

2. Duvanova (2014), Miller (2006), and Safavian, Graham, and Gonzalez-Vega (2001) also examine corruption in post-communist countries.

3. Berg, Jiang, and Lin (2012) consider how competition affects the frequency of bribes to telephone authorities for service. However, their measure of competition is on the number of telecommunication providers, not on the number of firms potentially paying a bribe as in our study. They find that the frequency of bribes to telecommunication operators falls with the number of operators. A similar result comes from Clarke and Xu (2004) who report that bribes from firms for utility service decrease as the number of providers increases.

4. For more details, see http://www.ebrd.com/pages/research/analysis/surveys/beeps.shtml. Reinikka and Svensson (2006) provide a more general discussion regarding the use of micro-studies to examine corruption.

5. Admittedly, respondents thinking about intentionally misreporting bribe activity could follow sophisticated strategies. A respondent from a firm that bribes might not only be choosing between a strategy of honestly reporting bribe activity *versus* falsely underreporting such activity but could possibly even be following a mixed strategy between the two. But as stated in the text, the potential for the use of such strategies to bias findings differently from what is described in the text depends upon to what extent such strategies depend upon the degree of competition.

6. See Razafindrakoto and Roubaud (2010) for an examination of how experts' opinions regarding the extent of corruption differ from micro-level surveys.

7. AS (2013) also use the number of competitors although their data sometimes consist of only coded intervals of competitors in which case they use the midpoint. Obviously, use of such data provides for greater measurement error and could explain why they more often fail to find significant associations than we do as shown below.

8. A common measure of competition is the Herfindahl–Hirschman Index which calculates a sum of squares of the ratios of firm sales to total sales across all firms in the industry. We do not employ such a measure here since for each industry we only have a sample of firms and not the total, preventing this calculation.

9. We also explored using censored quantile regression from Chernozhukov and Hong (2002). However, estimation proved difficult given the country fixed effects in the model as the model usually failed to converge.

10. Mauro (1995) uses a measure of ethnic heterogeneity to instrument for corruption in a growth model. However, Ades and Di Tella (1999) assume that country size does not directly associate with corruption in their estimation strategy.

11. Responses are not zero sum. That is, weighting "family" more heavily as a source of new customers does not require some other source to be weighted less heavily. If it was zero sum, NEWCUST should have little variance. Although the values for the individual components could differ across firms, their sums should not. Instead, its coefficient of variation is over 0.34.

12. We employ a one-part regression model with a logistic link function. See Ramalho *et al.* (2009) for further details.

13. The 2004 survey also considers a different set of countries: Germany, Greece, Portugal, South Korea, and Vietnam. Therefore, we are also jointly examining the robustness of our finding for a different set of countries. We do not primarily focus on the 2004 survey because it does not provide information regarding the number of competitors.

14. We also conducted regressions examining each of the 26 countries individually. Unfortunately, the power behind the hypothesis testing was extremely low. For example, 7 of the 26 coefficients upon LOC exceeded a value of one in magnitude, considerably higher than the estimate of 0.8 in column 1 of Table 2. But of these seven, only two were statistically significant due to high standard errors.

15. One could also consider differences in size between service and goods sector firms. In our sample, service sector firms have a mean of 74 employees whereas goods sector firms average 128 employees. We do not consider this difference of 54 to be large. It is roughly 1/7 of a standard deviation in the number of employees across the entire sample.

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APPENDIX

The following Tables describe the variables and present summary statistics.

Table 7. *Variable definitions*

Variable	Question Number from BEEPS 2005	Descriptions
BRIBE*	Q40	"On average, what percent of total annual sales do firm's like yours typically pay in unofficial payments/gifts to public officials?"
GOVBRIBE*	Q42	Percentage of contract value that firms like yours typically make in informal payments to secure the contract
Competition measures		
NAT*	Q12ca	"Please give me the exact number of your competitors in the national market" (natural logarithm)
LOC*	Q13ca	"Please give me the exact number of your competitors in the local market" (natural logarithm)
MARGIN*	Q14	Percentage of how much sale price exceeds the operating cost in the main product line in the domestic market (natural logarithm
IMPORTS	Q10	Importance of imports. 1 – Not important, 2 – Slightly, 3 – Fairly, 4 – Very, 5 – Extremely, 6 – Goods cannot be imported. Note: Our variable replaces "6" with "1" since the two responses are equivalent for our purposes
PRICERISE	Q11	What would happen if your firm raised your price by 10% but your competition kept prices the same? 1 – Customers would buy in same quantities, 2 – Slightly lower quantities, 3 – much lower quantities, 4 – Customers would buy from competitors
ANTIFAIR	Q54t	How problematic are anticompetitive practices by competitors, 1–4 with higher values denoting a greater obstacle
INNOVDOM	Q63a	Importance of domestic competitors in firms decision to design new products, 1–4 with higher values denoting greater importance
INNOVFOR	Q63b	Importance of foreign competitors in firms decision to design new products, 1–4 with higher values denoting greater importance
COSTDOM	Q64a	Importance of domestic competitors in firms decision to reduce costs, 1–4 with higher values denoting greater importance
COSTFOR	Q64b	Importance of foreign competitors in firms decision to reduce costs, 1–4 with higher values denoting greater importance
LOCSHARE*	Q12C in BEEPS 2004	Share of firm's sales in main product line in local market
NATSHARE*	Q12B in BEEPS 2004	Share of firm's sales in main product line in the national market
Firm characteristics		
SALESGOV*	Q9a + Q9b	"What percentage of your domestic sales are to": – Government or government agencies (excluding state-owned enterprises) – State-owned or controlled enterprises
ASSOC	Q36a	=1 if the firm is a member of trade association or lobby group, = 0 otherwise
TIME*	Q35a	Percentage of senior management time spent per year in dealing with government (natural logarithm)
TAX*	Q43a	Percentage of sales that similar firms report to tax authorities (natural logarithm)
SIZE*	Q66a	The number of permanent, full-time employees the firms currently has (natural logarithm)
EXPORT*	Q7a + Q7b	"What percentages of your firm's sales are, exported directly, exported indirectly through a distributor?"
HONEST	35c	How often can one go to another official when a government agent acts against the rules: 1 = Never, 2 = Seldom, 3 = Sometimes, 4 = Frequently, 5 = Usually, 6 = Always
AGE	S1a	AGE = natural log of 2005 – S1a
FORSHARE*	S5b	Share of company owned by foreign entities
GOVSHARE*	S5c	Share of company owned by government
CAPITAL	CITY	CAPITAL = 1 if CITY = 1, = 0 otherwise
NEWCUST	Q21a–g	How important are the following to finding new customers? Seven sources are listed and firms rate each on a scale of 1–5 with higher values denoting greater importance. NEWCUST sums these responses across the seven sources
SUPINC	Q19	What would happen if your main supplier raised the price by 10%? 1 – Buy in same quantities, 2 – Slightly lower quantities, 3 – much lower quantities, 4 – Buy from other suppliers instead
$SALES_k$ where $k = 1–7$	Q2a–h	Share of sales to one of seven sectors: mining, construction, manufacturing, transport, wholesale and retail, business services, hotels and restaurants, and other
Obstacle	Q54i, Q54j, Q54k, Q54l, Q54p	Measured on a 1–4 integer scale with greater values denoting greater obstacles. Obstacles: obtaining licenses and permits, dealing with tax officials, dealing with customs officials, dealing with labor regulations, and dealing with the judiciary

* Denotes a variable transformed into its natural logarithm.

Table 8. *Summary statistics*

Variable	Mean	Standard deviation
BRIBE	0.381	0.677
LOC	2.090	1.165
NAT	2.573	1.288
PRICERISE	2.535	1.126
IMPORTS	2.609	1.390
INNOVDOM	2.886	1.026
INNOVFOR	2.085	1.154
COSTDOM	2.829	1.062
COSTFOR	1.056	1.147
ANTIFAIR	2.303	1.114
MARGIN	3.012	0.552
LOCSALES	2.631	1.051
NATSALES	0.575	1.052
AGE	2.405	0.739
CAPITAL	0.314	0.464
HONEST	2.965	1.515
FORSHARE	9.054	26.424
GOVSHARE	8.602	27.020
EXPORTS	0.803	1.507
ASSOC	0.372	0.483
TIME	1.597	1.270
TAX	4.462	0.308
SIZE	3.026	1.657
SALESGOV	1.057	1.592
SUPINC	2.755	1.223
NEWCUST	17.313	6.055