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Privatization, Competition and Corruption: How Characteristics of Bribe Takers and Payers Affect Bribe Payments to Utilities

George R.G. Clarke and Lixin Colin Xu

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George R.G. Clarke and Lixin Colin Xu, *The World Bank*

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Summary

Many recent studies have looked at the macroeconomic, cultural and institutional determinants of corruption at the cross-national level. This study complements these existing cross-country studies by focusing on firm-level evidence of microeconomic factors affecting bribes paid in a single sector of the economy. Using enterprise-level data on bribes paid to utilities in 21 transition economies in Eastern Europe and Central Asia, we examine how characteristics of the utilities taking bribes and the firms paying bribes affect the equilibrium level of corruption in the sector. Bribe takers (utility employees) are more likely to take bribes in countries with greater constraints on utility capacity, lower levels of competition in the utility sector, and where utilities are state-owned. Bribe payers (enterprises) are more likely to pay bribes when they are more profitable, have greater overdue payment to utilities, and are *de novo* private firms. A thorny issue in the empirical literature on corruption is how to distinguish between the "endogenous harassment" and "speed money" theories of corruption. The former receives stronger support from some of the results than the latter.

Keywords: Corruption, bribes, ownership, competition and privatization

JEL: K4, L1, L9

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Address for correspondence:

George Clarke
The World Bank
1818 H Street NW
MSN MC3-300
Washington DC 20433
USA
Phone: (202) 473-7454
Fax: (202) 522-1155
E-mail: gclarke@worldbank.org

I. INTRODUCTION

Since the pioneering papers on corruption and rent seeking in the sixties and seventies (Becker, 1968, Becker and Stigler, 1974, Krueger, 1974, Leff, 1964, Rose-Ackerman, 1978), many studies have looked at the determinants and consequences of corruption.[1] While some authors have seen bribes either as "grease money" that lubricates the squeaky wheels of rigid bureaucracy and commerce (Huntington, 1968, Leff, 1964) or as a substitute price mechanism that restores optimal allocation in the market (Lui, 1985, Olson, 2000), most have viewed corruption less positively by emphasizing its distortionary effect on economic decisions. For example, corruption might direct talent to occupations with large opportunities for rent seeking (Baumol, 1990, Murphy et al., 1991, Svensson, 2003), might bias bureaucrats towards purchases on which it is easier to collect bribes (Shleifer and Vishny, 1993), or might affect income distribution adversely (Rose-Ackerman, 1978). Consistent with the less flattering view of corruption, recent empirical studies have found that corruption hampers growth and reduces investment and income (Mauro, 1995), increases inequality (Li et al., 2000), increases the size of the unofficial economy (Friedman et al., 2000, Murphy et al., 1993), and is associated with lower levels of human capital, urbanization, financial depth and foreign trade (Li, et al., 2000).[2]

In addition to the literature on the effect of corruption on economic outcomes, a large supplementary literature has appeared on the determinants of corruption. Although some results vary between studies, these studies have found that corruption is lower in countries that are more open to foreign trade; countries with protestant traditions and that were formerly British colonies; countries with longer exposure to democracy; countries that are more democratic; countries with greater political stability and greater freedom of the press; and countries with parliamentary systems (see, for example, Ades and Di Tella, 1999, Knack and Azfar, 2000, Kunicova, 2001, Lederman et al., 2001, Treisman, 2000, Wei, 2000). Most of these earlier

[1] Bardhan (1997) and Rose-Ackerman (1978) provide excellent reviews of issues.

[2] See also Bardhan (1997) and Myrdal (1968). Other studies of corruption include Alam (1990), Ades and Di Tella (1997), Bliss and Di Tella (1997), De Long and Shleifer (1993), Fisman (2001), Johnson, et al. (1988), Johnson *et* al. (1997), Li (1999), and Mookherjee and Png (1995).

studies have used cross-country subjective indices and have focused on how macroeconomic, cultural and institutional factors affect the overall level of corruption.

Although this paper fits squarely into the existing literature on the determinants of corruption, it complements it in several ways. First, rather than using subjective survey data, this paper uses data on the bribes that enterprise managers report paying – a measure that does not suffer from some of the problems associated with subjective measures. More importantly, rather than focusing on the overall level of corruption in a country, the paper looks at firm-level data on bribes paid to a single sector of the economy – infrastructure. This allows us to focus on characteristics of the utility enterprises that receive bribes as well as characteristics of enterprises that pay bribes along with characteristics of the institutional and macroeconomic environment.

For infrastructure enterprises receiving bribes, we look at whether the equilibrium bribe payment is affected by capacity, competition and privatization in infrastructure – factors that might affect either the internal incentives of the utility companies or their ability to demand bribes. On the other side of the equation, we also look at how ownership of the bribe-paying enterprise and the nature of the enterprises' relationship with the utility affect the equilibrium bribe payment. Finally, as in Svensson (2003), we look at whether the enterprises' ability- or willingness-to-pay appears to affect the equilibrium bribe payment.

The empirical results are largely consistent with the conceptual framework presented in the next section of the paper. We find that the bribe payments are lower in countries where infrastructure is better developed, suggesting that excess demand is an important determinant of corruption. The extent of competition in the telecommunications sector, measured by the number of cellular operators in the country, also appears to reduce the equilibrium level of bribes. After controlling for capacity and competition, we also find that bribes are lower in countries where the utility companies have been privatized. One potential explanation for this final result is that private owners might have a greater incentive than public managers to impose stiff penalties upon employees taking bribes, reducing bribe payments.

Characteristics of the enterprise offering the bribe also affect payments. For example, enterprises that are more profitable appear to pay higher bribes - a result that is consistent with both the queuing (Lui, 1985) and the endogenous harassment (Myrdal, 1968) theories of

corruption and with the empirical results in Svensson (2003) for total bribes paid by enterprises in Uganda.[3] Also firms with higher overdue payments to utilities appear to pay higher bribes. This is consistent with the endogenous harassment theory that these firms have a weaker bargaining position vis-à-vis the employees of the utility company; yet is inconsistent with the "speed money" theory. Finally, we find strong support for the complementarity of the overall level of corruption in a country and bribes in the utility sector.

II. CONCEPTUAL FRAMEWORK

In this section, we discuss factors that might affect the likelihood that an enterprise pays bribes to utility employees. We first examine characteristics of bribe takers (i.e., utility companies) such as service capacity, ownership and competition. We then shift to bribe payers (enterprises in this analysis), looking at financial performance, relative bargaining position versus utility companies, and the length of the enterprise's relationship with utility companies.

II.1. Characteristics of Bribe Takers

If there is **excess demand** for utility service – for example if there is a price ceiling or if limits on public investment have historically limited system expansion – there will be rents associated with access.[4] Consequently, if utility employees have discretion over who gets connected or has broken down connections repaired, they will be able to demand side payments in return for reduced wait periods. Since enterprises will be more willing to pay bribes when excess demand is higher, we expect bribes to utilities to be more common when this is the case.

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[3] Svensson (2003) finds that enterprises that are more profitable and that have greater difficulty reallocating their capital to alternate activities pay higher bribes. Our paper complements Svensson's (2003) in a number of ways. First, while he focuses on how ability-to-pay affects bribe payments — an issue we also examine — we focus on the roles of ownership and competition. Second, his paper does not examine the characteristics of bribe takers. Third, while his data set consists of roughly 200 firms from a single country, ours has roughly 2000 firms in 21 transition economies, allowing us to also examine features of the country-level institutional environment. Finally, we focus on the corruption among utility employees, while Svensson (2003) focuses on bureaucrats.

[4] In practice, utility service has been rationed in many developing and transition economies. The waiting list ratio (the average waiting list over the number of main lines) was 0.17 for the 17 countries in our sample for which data were available in 1998 (authors' calculation based on the ITU data). In addition, see footnote 17.

Since **utility privatization** is often associated with an increase in investment and a large expansion of capacity, it should reduce bribe payments by reducing capacity constraints.[5] However, it also might affect how management deals with corrupt employees. When a company is privatized, the private owners become residual claimants on the income of the company, giving them an incentive to reduce corruption among employees (Olson, 2000, Chapter 6). In contrast, since it is often unclear who the residual claimants are under public ownership (e.g., whether the Treasury, political leaders, or the utility itself is the residual claimant), there might be less pressure on management to reduce corruption under public ownership. Although, in theory, profits accrue to the general public under public ownership, an individual would receive only 1/Nth (where N is the number of citizens) of the benefit of her monitoring but would pay the entire cost (Olson, 2000). Consequently, she would have a strong incentive to free ride off the efforts of others.

Other aspects of public ownership might also encourage corruption. In general, principal-agent problems between owners and managers might be worse in public enterprises. In particular, it is often difficult to tie managers' salaries to profits under civil service pay schemes or to reward public managers with stock or stock options.[6] Under these circumstances, and especially if side-payments from corrupt employees are possible, managers might not be willing to exert much effort to reduce corruption. Finally, in countries where inflation or pay freezes have eroded salaries in the civil service and public utility, threats to fire corrupt employees will be less effective. These factors, combined with greater monitoring by private owners relative to public owners, will mean that privatization should reduce corruption even if it fails to reduce excess demand.

Competition in the utility sector should also reduce corruption. Increased competition should increase the total supply of infrastructure services (relative to supply under a monopoly),

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[5] See, for example, recent studies of the effect of privatization on the telecommunications sector (Li and Xu, 2001, Ros, 1999, Wallsten, 2001).

[6] Laffont and Tirole (1991) note that because managers of public enterprises do not own stock or stock options and are not subject to corporate takeovers that could cost them their jobs, they typically have less reason to adopt a long-term perspective focusing on productive efficiency. Even if contractual arrangements linking the managers' wages to profitability are politically feasible, it would be difficult to find credible third parties that could force the government to honor its contractual obligations in weak institutional environments (Shirley and Xu, 1998).

because monopolists have incentives to restrict output. More importantly, when there are multiple service providers, utility customers can respond to bribe demands by switching providers. Anticipating this, utility employees might be less likely to ask for bribes or to ask for lower bribes when competition is greater (Ades and Di Tella, 1999, Rose-Ackerman, 1978, Shleifer and Vishny, 1993). The effect of competition will depend crucially upon whether users' threats to change utility companies are credible. This suggests that the number of cellular operators should provide a better measure of competition in the telecommunications sector than the number of fixed-line operators. Even when there are multiple fixed-line operators, local monopoly provision of service is likely – in contrast, cellular operators often compete locally with fixed line operators (see Li and Xu, 2001).[7] We thus expect corruption to be less common in countries with greater competition, as measured by competition from cellular operators.

II.2. Characteristics of Bribe Givers

So far we have focused on the bribe taker, the utility companies. However, characteristics of bribe payers, the firms demanding utility service, might also affect bribes. The simplest theory about the behavior of utility customers is the "speed money" or efficiency theory of bribes (Barzel, 1974, Huntington, 1968, Leff, 1964, Lui, 1985). Under this hypothesis, firms that benefit more from utility service will be more likely to offer bribes for reduced wait periods for connection or repairs. Consequently, utility service would be allocated according to the value that different enterprises place on service, with bribes acting as an efficient price discrimination mechanism. Although the benefit that an individual firm gains from utility services is unobservable, it is reasonable to assume that more **profitable** firms will benefit more from utility service and consequently, would be more likely to pay bribes.[8]

The endogenous harassment theory, suggested in Myrdal (1968) and further elaborated in Kaufmann and Wei (1999), also suggests that profitability should be correlated with bribe payments. Under this hypothesis, utility employees use observable information such as industry,

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[7] Li and Xu (2001) find empirical evidence that cellular competition is more important than the fixed-line competition in explaining the improvement in performance in the telecom sector.

[8] This can be justified, for example, by the plausible assumption of complementarity of managerial ability or monopoly rents with utility service.

size, or profitability to guess enterprises' willingness-to-pay for service and endogenously offer incentive-compatible bribes that depend on these characteristics. Although the basic ingredient in both the speed money and the endogenous harassment hypotheses is that willingness-to-pay bribes increases with profitability, utility employees need more information under the endogenous harassment hypothesis. In the speed money hypothesis the enterprise paying the bribe decides how much it is willing to pay according to its cost of waiting. In contrast, the endogenous harassment hypothesis requires utility employees to discriminate between enterprises and, therefore, requires them to have information on firm characteristics, such as profitability, that affect willingness-to-pay.

A second implication of the endogenous harassment theory is that willingness-to-pay bribes can be affected by the enterprise's **overdue payments to the utility company** – something many enterprises in Eastern Europe and Central Asia have.[9] In bilateral bargaining between the utility employee and the enterprise, enterprises with significant overdue payments have worse fallback positions, and, hence, weaker bargaining power, making it easier for the utility employee to extract bribes. Since utility employees will generally be able to observe enterprises' overdue payments to utilities, enterprises with overdue payments should generally be more likely to pay bribes and to pay higher bribes than other enterprises. In contrast, the speed money hypothesis does not make the same prediction. In fact, since enterprises with overdue payments will often have cash flow problems that reduce their ability to bribe, we might expect to find a negative correlation between overdue payments (of all types) and bribes under this hypothesis. Alternatively, if other variables (e.g., profitability) control for the prevalence of cash flow problems sufficiently, we might expect to find no correlation between the two under the speed money hypothesis.

Although the speed money and the endogenous harassment hypotheses make different predictions regarding the relationship between bribes and overdue payments to utilities, they make similar predictions regarding the relationship between bribes and **overdue payments to workers**. Under the speed money hypothesis, to the extent that overdue payments to workers signal cash flow problems, we might expect enterprises with large overdue payments to workers to have lower ability to pay bribes. However, as noted previously, if other variables control for this adequately in

[9] In the World Business Environment Survey (WBES), 33 percent of enterprises in the transition economies reported having overdue payments to utilities.

the empirical analysis, we might find no relationship between the two. Under the endogenous harassment hypothesis there is a second reason why we might find no relationship between bribes and overdue payments to workers. Since bribes are only affected by factors that are observable to the bribe taker (i.e., the utility employee) and given that overdue payments to workers will be harder for utility employees to observe than overdue payments to utilities, it is less likely that they will affect bribe payments. In summary, the speed money hypothesis predicts either no relationship or a negative relationship between bribes and both types of overdue payments, while the endogenous harassment hypothesis predicts a positive relationship between bribes and overdue payments to *utilities*, but no (or a negative) relationship between bribes and overdue payments to *workers*.

The relationship between the enterprise paying the bribe and the utility receiving the bribe might also affect bribe payments. We conjecture that ***de novo* private enterprise** might pay higher bribes than other enterprises. First, if *de novo* private firms are more profitable than other enterprises (and to the extent that other variables fail to control for this), we would expect them to be more likely to pay bribes.[10] Similarly, we would expect state-owned enterprises to be less likely to pay bribes. Second, de novo private enterprises might be more vulnerable to bribe demands because they tend to have less political influence (e.g., with judges and local politicians) than managers of established, especially state-owned, enterprises. Consequently, managers of *de novo* enterprises might be less able to resist bribe demands than other managers, while managers of state-owned enterprises might be better able to resist bribe demands. A final reason why *de novo* enterprises might be more likely to pay bribes is that when it is unclear whether the relationship between the utility employee and the *de novo* company will turn into a long-term one, utility employees might behave like "roving bandits", extracting as much from the *de novo* enterprise as quickly as possible (Olson, 2000). When the relationship becomes consolidated over time, utility employees might become "stationary bandits", internalizing the costs imposed by current bribe taking, and in so doing, reducing bribe demands (Olson, 2000). However, because individual utility employees are but one of the many beneficiaries of lower bribes, it is possible that this channel will have only a minor impact – the typical stationary bandit in Olson's (2000) exposition has monopoly

power to collect taxes or bribes within a region and so completely internalizes the cost of bribe-taking. To summarize, we expect *de novo* private firms to be more likely to pay bribes and to pay higher bribes than other types of firms.

Firm growth might also affect bribe payments by signaling strong firm performance – especially since investment is often financed through retained earnings – and thus might be correlated with increased bribes. However, other factors might work in the opposite direction, making the relationship between bribe payment and firm growth ambiguous. If utility employees behave like 'stationary bandits', they might be less likely to demand bribes or demand lower bribes to encourage rapid firm growth and increase the potential for future bribes. Yet, as argued earlier, utility employees are unlikely to take the adverse effects of current bribes on future firm growth into account since they will generally be only minor beneficiaries of future firm growth. Table 1 summarizes our hypotheses on the determinants of bribes.

III. EMPIRICAL ESTIMATION

III.1 Data

The main source of data used in this paper is the World Business Environment Survey (WBES), a cross-sectional survey of industrial and service enterprises conducted in mid-1999 by the World Bank and several other agencies, including the European Bank for Reconstruction and Development (EBRD) in the Transition economies. The WBES's main purpose is to identify constraints on enterprise performance and growth in developing and transition economies. The survey, therefore, has many questions on how taxation, regulation, the performance of the financial sector, the institutional environment and corruption affect business operations. In contrast, it includes little information on enterprise characteristics. In particular, although some information on assets, sales, broad sector of operations, ownership, employees, and enterprise growth was collected, this data was often only collected in categorical form. Detailed balance sheet information and profit and loss statements were not collected.

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[10] Megginson and Netter (2001) and Shirley and Walsh (2001) discuss why private enterprises might perform better than state-owned enterprises and present evidence that supports these hypotheses. In addition, a recent meta-

Although the WBES was conducted in many countries throughout the world, and some effort was made to ensure cross-country comparability, the degree of detail varies greatly between regions. For example, although data was collected on actual sales, fixed assets, and debts in some regions (e.g., in Africa), only categorical data on the same information was collected in others (e.g., in the transition economies in this paper). For the purpose of this study, the most important differences between the surveys were that questions on profitability (margins) and overdue payments to utilities and the questions that allow us to calculate the amount of bribes paid to utilities were asked only in the transition economies. Consequently, we focus on this region. The sample includes about 2000 enterprises from 21 transition economies.[11]

The enterprise level data from the WBES is supplemented with data from a variety of other sources. In addition to characteristics of the enterprise paying the bribe, the analysis also includes characteristics of the utilities, the enterprises receiving the bribe payments. In the electricity sector, we focus on the distribution utilities, since these are the enterprises that will generally interface with the (mostly small) enterprises in the WBES sample. However, since the WBES does not provide information on the enterprises' locations within the country, and because electricity distribution is often handled on a local or regional basis, it is generally easier to observe privatization in the telecommunications sector than in the power sector.[12] Consequently, for the most part, we focus on the telecommunications sector since there are readily available measures of competition and privatization. By the late 1990s, cellular services provided significant competition for fixed line services in most of the countries included in this analysis. The information on the privatization of telecommunications operators was provided by the World Bank Telecommunications Department; and information on the privatization of electricity distribution was obtained from Bacon (1999). Information on number of fixed lines come from International Telecommunications Union (2001), while the number of cellular

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analysis of studies of enterprise performance in the transition economies found that private enterprises appear to generally perform better than state-owned enterprises (see Djankov and Murrell, 2000).

[11] The countries in the sample for transition economies are: Albania, Armenia, Azerbaijan, Belarus, Bulgaria, Croatia, the Czech Republic, Estonia, Georgia, Hungary, Kazakhstan, the Kyrgyz Republic, Lithuania, Moldova, Poland, Romania, Russia, Slovenia, the Slovak Republic, Ukraine, and Uzbekistan.

[12] Bacon (1999) provides information on whether any privatization of electricity distribution had occurred by 1999, but did not provide information on the extent of privatization.

companies operating in each country was calculated using information from EMC (2000) and *Telecoms and Wireless Reports*: *Eastern Europe/Commonwealth of Independent State* by Pyramid Research. Macroeconomic and political data used to control for factors that might affect the overall level of corruption are taken from a variety of sources including World Bank (2002), Beck, et al. (2001), and Freedom House (2000). Table 2 and Table 3 provide sources, brief descriptions and summary statistics for the main variables used in this analysis.

III.2 Empirical Specification

The dependent variable in this study is a dummy variable indicating that the enterprise manager reported that the enterprise had to make unofficial payment to get connected or maintain connection to electricity or telephones.[13] To encourage honest responses to questions about bribery, and to allow enterprise managers to avoid implicating themselves when answering questions about frequency and level of bribe payments, the WBES asked about bribes paid by 'firms like yours' rather than about the manager's own firm. In the empirical analysis, we assume that the manager was answering the question for a firm similar to the manager's own enterprise in terms of the independent variables.

In the analysis, it is assumed that the probability that enterprise *i* pays bribes (B_{ij}) to telecommunications and electricity utilities in country *j* is a function of enterprise characteristics (x_{ij}), characteristics of the utilities (u_j), country-level characteristics (z_j) and a normally distributed unobserved error term (ε_{ij}).

$$\text{Prob}\left(B_{ij} > 0\right) = \Phi(\alpha + \beta_1 x_{ij} + \beta_2 u_j + \beta_3 z_j)$$

We estimate the model using standard maximum likelihood estimation. One practical concern is that error terms might be correlated for enterprises within a single country (e.g., if there are omitted country-level characteristics that affect bribes for all enterprises within a country). If this were the case, this could cause us to underestimate standard errors on the

[13] The question refers specifically to power and telecommunications, but does not separate between the two.

coefficients and lead to problems with inference, especially for country-level variables.[14] We deal with this problem in two ways in the empirical analysis. First, we present quasi maximum-likelihood estimates of standard errors allowing for arbitrary correlation patterns between enterprises' error terms within countries (i.e., we present Huber-White standard errors allowing for clustering within countries). Second, in the sensitivity analysis, we present results from a cross-country regression (i.e., with only one observation for each country) of the percentage of enterprises that report paying bribes on country-level characteristics.

The measure of corruption used in this study has some advantages over the subjective indices of corruption used in previous studies. One problem with subjective indices is the question of what benchmarks respondents use for rating the extent of corruption. For example, some respondents might compare corruption in a country to corruption under a previous regime, others might compare it with neighboring countries, while others might even compare it with their own personal ideals. If different respondents use different benchmarks, subjective indices might suffer from large noise-to-signal ratios.[15] Moreover, there might be systematic errors due to cognitive problems, social desirability of answers, non-attitudes, wrong attitudes, and soft attitudes (Bertrand and Mullainathan, 2001, Sudman et al., 1996, Tanur, 1992). If these systematic errors are correlated with enterprise (or country level) characteristics, and it is difficult to obtain instruments that are correlated with the explanatory variables but not the systematic errors, results using the indices as dependent variables will be biased. Consequently, some authors have suggested that although subjective indices might be useful as explanatory variables (although they will still suffer from attenuation bias and when correlated with other

[14] For example, Moulton (1986) concludes that OLS standard errors often have substantial downward bias when disturbance terms are correlated within groups (i.e., countries). Bertrand, et al. (2001) and Deaton (1997) discuss this issue in detail.

[15] Some studies have found evidence consistent with this. For example, Oldenberg (1987) describes the land consolidation program in villages in U.P. in Northern India, suggesting that there may be discrepancies between personal assessment about corruption frequency and its actual incidence (Bardhan, 1997). Measurement error might be especially problematic when studies include fixed country effects (see Bertrand and Mullainathan, 2001).

explanatory variables, inconsistency), they are less likely to be effective as dependent variables (Bertrand and Mullainathan, 2001).[16]

As noted previously, in addition to characteristics of the utility taking the bribe and the enterprise paying the bribe, the regression also includes country-level variables to control for the environment in which the enterprise and utility operate. Since the incentives of an individual to be corrupt depend on how many other people are corrupt (Andvig, 1991), either because the moral cost of corruption is lower or because limited law enforcement resources mean that the likelihood of being detected is lower in more corrupt societies, bribes in the *utility sector* might tend to be higher in countries where *other forms of corruption* are more common. In other words, factors that raise the general level of corruption in a country might also increase bribe taking in the utility sector even if they have little direct effect on the incentives of either the enterprise paying the bribe or the utility receiving the bribe.

As previously discussed, there is a large literature that discusses factors that might affect the *overall* level of corruption in a given country. First, several authors have argued that the rents might be lower in more competitive economies and, therefore, that corruption might also be lower in these countries (Ades and Di Tella, 1999, Rose-Ackerman, 1978, Shleifer and Vishny, 1993). Consistent with this, Ades and De Tella (1999) find that corruption is higher when domestic firms are sheltered from foreign competition by natural or policy induced barriers to trade. To control for this, our base regression includes measures of the extent of competition and the existence of rents similar to those used in previous studies – the ratio of imports to GDP (to measure competition) and the ratio of mineral, fuel and metal exports to total exports (to measure rents). Second, corruption tends to be lower in countries with political institutions that highlight political accountability and give voice to voters. For instance, past studies have found that corruption is lower in countries with longer exposure to democracy (Treisman, 2000) or in countries that are more democratic (Lederman, et al., 2001). Third, corruption should be lower

[16] One of the most comprehensive studies of the cross-national determinants of corruption is Treisman (2000), who is keenly aware of the limitations of subjective measures. He offers three justifications for the use of these indices: (1) the Transparency International Ratings are highly correlated among themselves, (2) they are also highly correlated among themselves across years, and (3) in a footnote, "a third reason, of course, is that there *are* no objective data on the extent of corruption."

in countries that are growing more rapidly. For example, Baumol (1990) and Murphy, et al. (1991) suggest that occupational choice is affected by the way in which talents are rewarded. When growth is faster, talent will tend to flow to productive instead of the rent-seeking sectors and, therefore, we might expect corruption to be lower in countries that are growing faster. In addition to these variables, we test the robustness of the main results to many other country-level variables, including a subjective measure of the overall level of corruption (i.e., corruption outside of the utility sector).

III.3 Econometric Results

The results from the main model specification, which includes variables to test the main hypotheses listed above (see Table 1) along with additional country and enterprise-level controls, are presented in column (1) of Table 4. In the sensitivity analysis, we test the robustness of the main results to the inclusion of additional country-level variables suggested elsewhere in the literature on the determinants of corruption and to the inclusion of country fixed effects.

Ownership of Utilities. Consistent with hypothesis that bribes are less common in countries with privately owned utilities, the coefficients on the dummy variables indicating that the fixed line telecommunications and electricity distribution companies are privately owned are negative and statistically significant (see Table 4). Since we control for the effects of competition and capacity constraints, the ownership variables should proxy for the direct effect of utility ownership. The point estimates of the coefficients suggests that utility privatization has a large impact – privatization of the fixed-line telecommunication and electricity distribution companies reduces the probability that the 'average' enterprise would pay bribes to utility companies by 15.1 percentage points and 12.4 percentage points respectively (see Table 5).

Capacity and Competition. Consistent with the hypothesis that enterprises are less likely to pay bribes in countries where capacity is less constrained, enterprises in countries with better developed telecommunications systems appear less likely to pay bribes than enterprises in

countries with less developed systems after controlling for per capita income (see Table 4).[17] The coefficient on fixed lines per capita is negative and statistically significant throughout most of the analysis. Increasing the number of fixed lines by one percent decreases the probability that the average enterprise will pay bribes to utility companies by about 1.2 percent (see elasticities in Table 6).

Consistent with the hypothesis that competition reduces the ability of utility employees to demand bribes, the coefficient on the number of cellular companies is statistically significant and negative (see Table 4). Increasing the number of cellular companies by one (from two to three cellular companies) on average reduces the probability that an enterprise will pay bribes to obtain or maintain utility service by 5.1 percentage points.

Enterprise Performance. More profitable enterprises were more likely to pay bribes to utilities than less profitable enterprises (see Table 4). This is consistent with both the endogenous harassment and speed money theories of corruption, and with Svensson's (2003) results for enterprises in Uganda. A one percent increase in margin raises the probability that enterprises report paying bribes to utilities by about 0.2 percent (see Table 6). Although the coefficient on sales growth is positive, it is statistically insignificant in many model specifications including the base specification (see Table 4). This suggests that utility employees act like "roving bandits" and do not consider inter-temporal schedules for rent extraction.

Ownership for Enterprise Paying Bribe. The base regression (see Table 4) includes several dummy variables to control for the ownership of the bribe payer. Most of the coefficients on the dummy variables indicating ownership, including the coefficient on foreign-owned and insider-owned (i.e., manager and employee-owned) enterprises are statistically insignificant, suggesting that these enterprises are no more likely to pay bribes to utilities than domestically owned privatized enterprises (the default category). In contrast, the coefficient on the dummy variables indicating that the enterprise is a domestically owned *de novo* enterprise (i.e., a newly established private enterprise) is statistically significant and positive, suggesting

[17] Although the waiting period might be seem to be a more appropriate measure of excess demand, waiting period is often poorly measured and can be a poor proxy for the extent of excess demand if long waits deter people from bothering to request service. In addition, we suffer from a significant loss of sample when waiting period is used.

that *de novo* enterprises are more likely to pay bribes than privatized or state-owned enterprises.[18] The effect appears to be large in quantitative terms – the probability that *de novo* private enterprises will pay bribes to utilities is nearly 10 percentage points higher than the probability that other enterprises will (see Table 5). This is consistent with our hypothesis that *de novo* private firms are more likely to pay bribes either because they are more profitable and therefore have higher willingness to pay, or because they have less political power and therefore are more vulnerable to bribe threats, or because utility employees, who behave as roving bandits, see them as more risky.

Overdue Payments to Utilities. The negative and statistically significant coefficient on the index variable indicating overdue payments to utilities (where higher values of the index mean lower overdue payments) implies that enterprises without overdue payments to utilities reported that they were less likely to pay bribes to utilities than enterprises with overdue payments (see Table 4). In contrast, the coefficient on overdue payments to workers is statistically insignificant and positive. The coefficient on overdue payments to utilities suggests that an average enterprise with modest overdue payments would be 3 percentage points more likely to pay bribes than a similar enterprise with no overdue payments (see Table 5). Recalling that the endogenous harassment theory implies a positive relationship between bribes and overdue utility payments, while the "speed money" theory implies a negative relationship or no relationship, the evidence is consistent with the endogenous harassment theory but not the "speed money" theory. These findings suggest that bribe extraction is more likely when the firm is vulnerable to threats by the utility employees.

[18] This pattern is consistent with the pattern observed for total bribes to government officials (see European Bank for Reconstruction and Development, 1999).

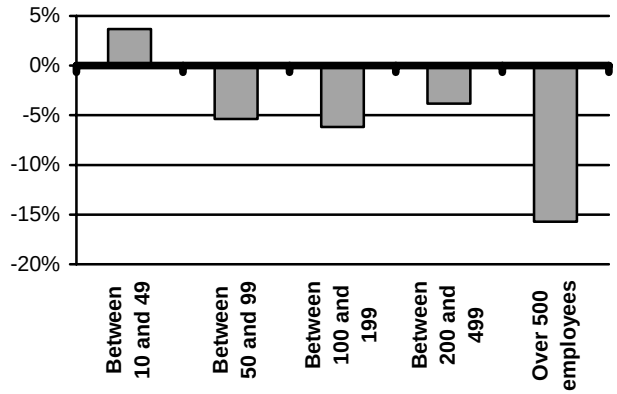

Figure 1: Difference in probability that enterprises of difference sizes pay bribes to utilities relative to enterprises with under 10 employees.

Data Source: The World Business Environment Survey (WBES) ©2000 The World Bank Group.
Note: Based upon coefficients from column (1) of Table 4. Omitted category is enterprises with less than 10 employees. Probabilities are calculated based at means of all other variables.

Enterprise Size. European Bank for Reconstruction and Development (1999) finds that small enterprises in Eastern Europe and Central Asia generally paid higher total bribes (i.e., to all sources not just utilities) than large enterprises. Consistent with this, and even after controlling for other factors, we find that large enterprises were more likely to pay bribes than small enterprises (see Figure 1). Enterprises with over 500 employees were about 15 percentage points less likely to pay bribes to utilities than enterprises with fewer than 10 employees (see Figure 1).[19] As noted previously, we only have categorical data on enterprise size, not actual number of employees (or actual sales). We use employees to measure of enterprise size, since it is more easily comparable across countries. However, the main results are robust to the inclusion of categorical variables based upon enterprise sales, assets and debt (see, for example, column 3 of Table 8).[20]

Macroeconomic and Political Controls. Since the overall level of corruption in a given country might affect the level of bribes paid to utilities, the analysis also includes some macroeconomic and political variables that might affect corruption in other areas. To avoid problems associated with reverse causation, the macroeconomic and political controls are lagged at least one year. Given the relatively modest number of countries in this analysis, it is possible

[19] The null hypothesis that enterprises of different sizes are equally likely to pay bribes can be rejected at conventional significance levels. The null hypothesis can be rejected at less than a 1 percent significance level (χ^2 (5) = 31.49, Prob.> χ^2 is 0.00).

[20] Enterprises are put into eleven categories for each of sales, assets and debt. The coefficients of interest, other than the one on overdue payments to utilities, remain significant when these additional dummies are included.

to include only a small number of the many variables suggested in the literature in the base regression. However, many additional macroeconomic and political variables – most of which have statistically insignificant effects on bribes paid to utilities in this sample – are included in the sensitivity analysis (see Table 8 and Table 9). The coefficients on the control variables included in the base regression are generally statistically significant with signs consistent with theory and previous analyses. Enterprise are less likely to pay bribes to utilities in countries with higher levels of democracy; that are more open to imports; where exports of natural resources are less important and where growth is faster. After controlling for these variables, the coefficient on (the log of) per capita GDP is not statistically significant at conventional levels.[21]

Although most control variables are available for the entire sample, exports of minerals, metals and fuel was not available for either Ukraine or Uzbekistan. However, the coefficients of interest, other than the coefficient on the number of cellular companies, remain significant when we replace this variable with a variable indicating per capita oil reserves in the country (see column 2 of Table 8), which is available for the entire sample. The pairwise correlation between oil reserves and mineral, fuel and metal exports is very high (0.9) for the 19 countries for which both variables are available. Consistent with the previous results, the coefficient on per capita oil reserves is positive and statistically significant, providing more evidence that corruption is higher in countries where economic rents are more important.

Robustness Checks: Magnitude of Bribes. In addition to the analysis that uses a dummy variable indicating that the enterprise paid bribes to utilities as the dependent variable, we also estimated similar regressions using the percent of revenues (in interval form such as 5 - 10%) that the enterprise pays in bribes to utilities. Although there are concerns associated with this part of the analysis related to the quality of the dependent variable, which was constructed by combining information from several questions, and the difficulty of calculating standard errors, the results appear broadly consistent with results from the previous analysis (see column 1 of

[21] One concern is that some of the control variables might be endogenous. In particular, Ades and Di Tella (1999) suggest that if bureaucrats determine market structure, the level of corruption in any given country might affect the share of imports in GDP. Similarly, others have suggested that corruption might also affect growth (see, for example, Mauro, 1995). In practice, however, most of the main results are robust to the *exclusion* of either of these

Table 4). Appendix 1 discusses the results from this part of the analysis, the construction of the dependent variable, and other issues related to the estimation.

Robustness Checks: Country-Level Regressions. As an additional check for robustness – and in particular as an additional check whether correlated errors between enterprises within countries has led us to underestimate standard errors in the enterprise-level analysis – we also present results from cross-country regressions using the percentage of enterprises reporting paying bribes to utilities as the dependent variable (see Table 7). Since this sharply reduces sample size, it is not surprising that significance levels tend to be lower in this part of the analysis. However, several of the main results are robust to even this change. First, utility privatization still appears to be associated with a reduction in corruption within the sector. The percentage of firms reported paying bribes to utilities was 11 percent lower in countries where the fixed line telecommunications provider had been privatized, and about 15 percent lower in countries where electricity distribution is privatized, although the coefficient on the dummy variable indicating that electricity distribution is privatized becomes statistically insignificant at conventional 5 and 10-percent levels.[22] The coefficient on capacity (per capita fixed lines) also remains statistically significant and negative, indicating that enterprises are less likely to pay bribes in countries where capacity is less constrained. In contrast, the coefficient on the number of cellular companies becomes statistically insignificant at conventional levels. These results are robust to substituting per capita oil reserves for fuel, mineral and metal exports (both proxies for the importance of natural resources in the economy and the potential for economic rents), which increases sample size by two countries.

Robustness Checks: Additional Country-Level Variables. Over the past decade, many studies have looked at country level variables that might affect the overall level of corruption. Although most of these determinants would not be expected to affect corruption in the utility sector *per se*, to the extent that they affect the overall level of the corruption in the country, they

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variables. The only exception is that the coefficient on the dummy indicating that electricity distribution is privatized becomes statistically insignificant when the share of imports to GDP is excluded.

[22] Although the statistically insignificant coefficient on the dummy indicating privatization of electricity distribution might suggest that electricity privatization is less important than telecommunications privatization, it is important to note that the local nature of electricity distribution might mean that electricity privatization is measured poorly.

might have an indirect effect on corruption in the utility sector. If these omitted characteristics are correlated with the other country-level variables, this could lead to omitted variable bias. Given the relatively modest number of countries in the sample (see footnote 11) and the large literature on the potential determinants of corruption, it would be impossible to simultaneously include all possible regressors in a single regression, especially since many are unavailable for some countries in the sample. However, to check robustness, we add many of the variables suggested in the literature – including regional dummies, inflation, alternative measures of the political and institutional environment, factors that might affect natural openness, measures of the extent of taxation and government spending, measures of the extent of decentralization and a measure of the overall level of corruption – to the base regression (i.e., column 1 of Table 4). In addition, we also include a subjective measure of corruption in the regression as an additional robustness check.[23]

For the most part, the coefficients on the additional variables are statistically insignificant and they have little impact on the main results (see Table 8 and Table 9). The coefficients on margin, the *de novo* dummy, the dummy indicating privatization of the fixed line telecommunications operator, and the number of fixed lines remain significant at a 5 percent level or lower throughout the sensitivity analysis. The coefficients on the remaining variables (the number of cellular companies, the dummy variable indicating that electricity distribution has been privatized, the dummy variable indicating that the largest shareholder is the government and the variable indicating the extent of overdue payment to utilities) have the same sign as in the base analysis and are statistically significant in most specifications.

Although the small sample of countries and the measure of bribes to only utilities mean that this sample is not well suited to looking at the impact of macroeconomic or political factors on overall corruption, one of the statistically significant results is of interest. The negative and statistically significant coefficient on the variable indicating the extent of privatization

[23] Some variables suggested in the literature are omitted from the sensitivity analysis because there is insufficient variation (e.g., no countries in the sample were former British colonies), while others are omitted because there is insufficient data available for the countries in the sample (e.g., measures of ethno-linguistic fractionalization). Although the subjective corruption index is potentially endogenous (i.e., corruption in the utility sector might be reflected in the measure of corruption), it does not appear to have a significant impact on the main results.

throughout the entire economy suggests that corruption is generally lower in countries that have privatized more (i.e., with higher scores on the EBRD's index of privatization). Although this might seem inconsistent with previous results that suggest that state-owned enterprises might be less likely to pay bribes than other enterprises (i.e., the coefficient on the dummy variables indicating state-ownership is statistically significant in many model specifications), this is not necessarily the case. If privatization increases competition for all enterprises in the economy (i.e., for all enterprises including those that remain state-owned), it might be correlated with lower levels of corruption for all enterprises facing this increased competition. That is, by increasing competition and decreasing rents throughout the economy, privatization might lower bribes for both privatized and state-owned enterprises even if individual privatized enterprises pay higher bribes than similar state-owned enterprises. This interpretation is consistent with results from previous studies (see, e.g., Ades and Di Tella, 1999) that suggest that openness to imports, which might also increase competition, is correlated with lower corruption.

Robustness Checks: Country and Country-Sector Fixed Effects. Although the base regression contained country-level variables to try to control for systematic differences between countries in the region, it is possible that they might not adequately control for systematic differences between countries. To check the robustness of the enterprise-level results while controlling for cross-country differences more completely, we add country and country-sector dummies (i.e., dummies for each of the seven sectors for each of 21 countries – 147 dummies in all) to the base regression. Since the country-level variables are collinear with these dummy variables, country level variables have to be dropped from this part of the analysis. For the most part, the main enterprise-level results are robust to the inclusion of the fixed effects. The coefficients on margin and the dummy variable indicating that the enterprise is a *de novo* private enterprise remain positive and statistically significant at a 5 percent level. The coefficient on variable indicating that the enterprise has overdue payments to utilities remains negative and statistically significant when country dummies are added, although its significance level falls slightly below conventional significance levels when country-sector dummies are added.

One difference is that two of the other controls become statistically significant once the additional dummies are added to the regression. The positive coefficient on sales growth suggests that faster growing enterprises are more likely to pay bribes to utility companies than

slower-growing enterprises. This is again consistent with our earlier discussion that utility employees act more like "roving bandits" than "stationary bandits" and are more concerned with short-term rent extractions. The magnitude of the effect however is very small: a one percent change in sales growth at the sample mean increases the probability that enterprise will pay a bribe by less than 0.02 percent. The negative coefficient on the dummy variable indicating that largest shareholder is the government suggests that state-owned enterprises are less likely to pay bribes than other enterprises – the probability that a state-owned enterprise will pay bribes to utilities is nearly 10 percentage points less than similar enterprises. This might be because state-owned enterprises are poorly performing, because managers of state-owned firms have greater political power and are therefore more able to resist demands for bribes form utility employees, or because managers of state-owned enterprises personally benefit less from profit increases due to getting utility connections and therefore are less willing to offer bribes.

IV. CONCLUSION

Rather than discussing the political, macroeconomic and cultural factors that affect the overall level of corruption (see, for example, Ades and Di Tella, 1999, Fisman and Gatti, 2002, Kunicova, 2001, Lederman, et al., 2001, Treisman, 2000), this paper primarily focuses on how characteristics of firms paying and receiving bribes affect the equilibrium level of bribes in the utility sector. Our conceptual framework suggests that characteristics of bribe takers (i.e., the rents available for extraction in the utility sector, the extent of competition in the sector and the penalty functions faced by utility employees) and bribe payers (i.e., the firm's willingness to pay bribes, the leverage that bribe takers have over the bribe payers, and the length of the payers relationship with the takers) should both be important. Further, the multiple-equilibria nature of corruption (Bardhan, 1997) means that bribe payments in the utility sector should be higher in countries where the overall level of corruption is higher.

The empirical evidence from a survey of around 2000 enterprises in 21 countries in Eastern Europe and Central Asia is remarkably consistent with the conceptual framework. We find strong evidence that bribes paid to utilities are lower in countries with greater capacity and competition in the utility sector and where utilities has been privatized. On the side of bribe payers, enterprises that are more profitable, enterprises that have greater overdue payments to utilities and *de novo* private firms appear to pay higher bribes. Macroeconomic and political

factors that contribute to higher corruption at the national level also appear to increase bribes in the utility sector. The main results are highly robust to the inclusion of additional country-level variables that might affect both privatization policies at the national level and the overall level of corruption in the country. Further, the results are also robust to directly controlling for the overall level of the corruption in the country.

The results from this study suggest that countries can reduce corruption in the utility sector through market-friendly policies such as utility privatization and increased competition in the utility sector. In addition to reducing corruption by easing capacity constraints, privatization might improve internal incentives to reduce corruption while competition might reduce the utilities' ability to demand bribes from enterprises using their services. Steps to reduce corruption in the utility sector might also have beneficial side effects on the overall level of corruption, due to the multiple equilibria nature of corruption.

This result on the corruption-reducing effect of privatization might appear contrary to findings in Glaeser (2001), which suggest that the wave of utility nationalization in the early 20th century was intended to reduce corruption. Glaeser (2001) suggests that private firms relying significantly on the government as buyer or seller have strong incentives to bribe government officials. In contrast, public firms have much weaker incentives because managers face the risk associated with corruption but fail to reap the benefits. While these arguments, and the empirical results in the paper might appear to run counter to our findings and hypotheses, this is not the case. Most notably, this study looks at petty corruption (i.e., *utility employees* taking bribes from customers), finding that utility privatization is associated with *utility employees* receiving lower bribes from utility customers. In contrast, Glaeser (2001) discusses grand corruption (i.e., *government bureaucrats or politicians* taking bribes from utility managers*),* finding that privatization is associated with utility companies paying higher bribes to government officials.[24] Both approaches postulate that stronger profit incentives for private utility companies affects corruption. In our case, the stronger incentives lead utility managers to crackdown on employee diversion of company money; in Glaeser's (2001) case, they lead to attempts by company managers to bribe government officials to receive better business deals. If both results are

correct, privatization leads to an interesting tradeoff that is unnoticed by the existing literature: privatization might increase grand corruption (i.e., bribe payments to government officials and bureaucrats by utility managers), but decrease petty corruption (i.e., bribe payments to utility employees by service-using firms). And if the tradeoff is true, anti-corruption policies should be focused on measures to guard against private companies' attempt to capture public officials.

[24] This terminology is used by Lovei and McKechnie (2000)

V. TABLES

Table 1: A Summary of the Hypotheses on the Determinants of Corruption

	Hypothesis
Characteristics of bribe takers (utility companies):	
Capacity Constraints	H1: When constraints on capacity are greater, connections will be more valuable and bribes will therefore be higher.
Utility privatization	H2: Privatization increases capacity and strengthens managerial incentives to monitor corruption of bribe employees, thus reducing bribes.
Competition in the utility sector	H3: Competition in the utility sector reduces bribes by raising utility capacity and allowing customers to shift to other providers when encountering demands for bribes.
Characteristics of bribe givers (enterprises)	
Firm profitability	H4: More profitable firms are more likely to pay bribes either because they have higher willingness to pay or because the service provider can endogenously extract more bribes.
Overdue payments to utilities	H5S: Under the 'speed money' hypothesis, overdue payments to utilities do not affect bribes after controlling for profitability and other factors that might affect willingness to pay. However, if the measures of firm profitability are not adequate controls for the firm's willingness to pay and companies with overdue payments have cash flow problems, overdue payments to utilities might be negatively correlated with bribes. H5E: Under the endogenous harassment hypothesis, overdue utility payments weaken the firm's bargaining position and increase the ability of utility employees to demand bribes.
Overdue payments to workers	H6: After controlling for profitability, overdue worker payment should not affect bribes because (i) they do not affect the bargaining position of the firm, (ii) they are difficult for utility employees to observe, and (iii) because they do not affect the firm's willingness to pay for utility service. If the measures of firm profitability are not adequate controls for the firm's willingness to pay and companies with overdue payments have cash flow problems, overdue payments to worker might be negatively correlated with bribes.
De Novo Private Enterprises	H7: *De novo* private firms pay more bribes because they are more profitable and therefore have higher willingness to pay; have less political influence, and the higher risk of bankruptcy makes the utility employee more likely to behave like a "roving bandit".
Firm growth	H8: If utility employees behave like 'stationary bandits', firm growth might reduce bribe payments. However, it is unlikely that utility employee could internalize the differential effects of current bribes and therefore unlikely that they will behave in this way. Further, if firm growth signals high willingness to pay bribes (after controlling for other factors), then fast growing firms might actually pay higher bribes than other enterprises. The relationship between bribes and firm growth is likely an ambiguous one.

Table 2: Means, Variances and Descriptions of Enterprise Level Variables.

Variable	***Description***	***Mean***	***Std. Dev.***
Extent of Overdue Payments to Workers	Index (1-4). Higher values mean less overdue payments.	3.429	0.941
Extent of Overdue Payments to Utilities	Index (1-4). Higher values mean less overdue payments.	3.429	0.928
Margin	Unit Sales Price less Operating Costs (as percent of operating costs)	16.508	15.643
Sales Growth	Real growth of sales over the previous three years	13.432	67.333
Ownership (omitted Category is privatized)			
Largest Shareholder – Other Private – De Novo	Dummy. Other Private implies that it is not owned either by foreign enterprises or individuals or by insiders. De Novo implies that it was not privatized (i.e., it was never state-owned).	0.488	0.500
Largest Shareholder – Foreign	Dummy.	0.034	0.182
Largest Shareholder – Insiders	Dummy. Insiders are workers and managers	0.153	0.360
Largest Shareholder – Government	Dummy	0.157	0.363
Size (omitted category is over 500 employees)			
Fewer than 9 employees	Dummy	0.265	0.441
Between 10 and 49 employees	Dummy	0.200	0.400
Between 50 and 99 employees	Dummy	0.160	0.367
Between 100 and 199 employees	Dummy	0.137	0.344
Between 200 and 499 employees	Dummy	0.154	0.361
Ownership (omitted category is 'other services')			
Sector -- Transportation	Dummy	0.061	0.240
Sector - Wholesale and Retail Trade	Dummy	0.269	0.443
Sector -- Manufacturing	Dummy	0.297	0.457
Sector -- Mining and Construction	Dummy	0.099	0.298
Sector -- Farming, fishing, forestry	Dummy	0.135	0.342
Region			
Region -- South East Europe	Dummy	0.164	0.371
Region -- Commonwealth of Independent States	Dummy	0.535	0.499
Region -- Central Europe and the Baltic States	Dummy	0.301	0.459

Data Source: The World Business Environment Survey (WBES) ©2000 The World Bank Group

Table 3: Summary Statistics and Sources for Macroeconomic and Political Variables

Variable	*Description*	*Source*	*Mean*	*Std. Dev.*
Number of Cellular Companies	Number	Authors' Calculations (see text).	2.815	1.543
Electricity Distribution Privatized	Dummy	Bacon (1999)	0.424	0.494
Country has Parliamentary System	Dummy	Beck, et al. (2001)	0.246	0.431
Democracy Index	Index (0-7). Avg. score on legislative and executive index of electoral competitiveness (IEC). High numbers mean greater level of democracy	Beck, et al. (2001)	6.760	0.539
EBRD Index for large-scale privatization	Index (1-4) -- Higher scores mean greater privatization	EBRD (1999)	3.041	0.676
Political Rights	Index (1-7) -- Higher scores mean greater democracy	Freedom House (2000)	3.184	1.804
Decentralization	Local and State Spending as share of total government spending	International Monetary Fund (2001)	0.326	0.115
Corporate Tax Index	Index (1-5). Higher scores mean corporate tax rates are higher	Heritage Foundation (1997)	3.079	0.651
Corruption (Overall)	Index (1-6). International Country Risk Guide Index of Corruption. Higher scores mean less corruption.	PRS Group (1999)	3.200	1.097
Number of Fixed Lines	Per 100 inhabitants	International Telecommunications Union (2001)	20.987	9.930
Fuel, Mineral and Metal Exports	As % of GDP	World Bank (2002)	24.075	22.494
Population	Natural Log	World Bank (2002)	16.414	1.384
Inflation	Average between 1996 and 1999	World Bank (2002)	36.939	67.545
Openness	Imports as percent of GDP	World Bank (2002)	46.675	17.913
Government Expenditures	As % of GDP	World Bank (2002)	16.900	5.115
GDP Growth.	Average between 1996 and 1999	World Bank (2002)	1.978	4.244
Per Capita GDP	000s of US $	World Bank (2002)	5.906	3.175
Fixed Line Telecommunications Operator Privatized	Dummy	World Bank Telecommunications Department	0.502	0.500
Country is Landlocked	Dummy	World Bank Global Development Network Growth Database	0.388	0.487
Oil Reserves	Million Barrels per Million Population	Economist Intelligence Unit Country Reports	103.5	228.9

Note: Data is for 1998, except where noted and for data from Beck, et al (2001) and Heritage Foundation (1997), which are from 1997 since data for 1998 were not available.

Table 4: Impact of enterprise and country characteristics on bribes to utilities.

Estimation Method	**Probit**			**Interval Regression**
Dependent Variable	**Dummy variable indicating that firm reported paying bribes to utility companies**			**Amount paid to utility companies**
Number of Observations (firms)	1780	2152	2038	1780
Sector Dummies [a]	Yes	Yes	Yes	Yes
Size of Enterprise Dummies [b]	Yes	Yes	Yes	Yes
Country or Country-Sector Dummies [c]	No	Country	Country-Sector	No
Enterprise Performance				
Margin	0.0081***	0.0068***	0.0080***	0.0133***
(Unit Price less Operating Costs as % of operating costs)	(5.50)	(4.17)	(5.48)	(3.82)
Sales growth over previous three years	0.0004	0.0008*	0.0010**	0.0000
(Percent)	(0.82)	(1.75)	(2.15)	(-0.02)
Enterprise Ownership *(privatized is omitted category)*				
Largest Shareholder – Other Private – *De Novo*	0.3461***	0.2046**	0.2384**	0.3414**
(Dummy)	(3.64)	(2.22)	(2.26)	(2.02)
Largest Shareholder – Foreign	0.0588	-0.1852	-0.1629	-0.1094
(Dummy)	(0.25)	(-0.81)	(-0.67)	(-0.30)
Largest Shareholder – Insiders (Managers or Employees)	0.1036	-0.0010	-0.0060	0.0433
(Dummy)	(0.82)	(-0.01)	(-0.05)	(0.21)
Largest Shareholder – Government	-0.2499	-0.3095**	-0.3005**	-0.3262
(Dummy)	(-1.54)	(-2.28)	(-2.09)	(-1.41)
Overdue Payments				
Overdue Payments to Utilities	-0.1131*	-0.0895*	-0.0882	-0.1742**
(Index – higher values mean less overdue payments)	(-1.73)	(-1.71)	(-1.48)	(-2.24)
Overdue Payments to Workers	0.0510	0.0456	0.0191	0.0822
(Index – higher values mean less overdue payments)	(0.79)	(0.85)	(0.35)	(1.01)
Utility Privatization				
Fixed Line Telecom Operator Privatized	-0.5217***			-0.7498***
(Dummy)	(-5.36)			(-4.57)
Electricity Distribution Privatized	-0.4593***			-0.3608*
(Dummy)	(-2.69)			(-1.73)
Capacity and Competition in Telecommunications Sector				
Fixed Lines	-0.0389***			-0.0518***
(Per 1000 people)	(-3.21)			(-3.70)
Cellular Companies	-0.1796**			-0.2450***
(Number)	(-2.49)			(-3.35)
Country and Macroeconomic Controls				
Natural Log of Per Capita GDP in 1998	0.2361			0.2079
(000s of US dollars)	(1.37)			(0.85)
Political Rights	-0.2454***			-0.3095***
(Index – Higher values mean greater democracy)	(-3.73)			(-4.48)
GDP growth	-0.0253*			-0.0602***
(Average between 1996 and 1998)	(-1.93)			(-3.48)
Openness	-0.0140***			-0.0163**
(Imports as share of GDP)	(-3.59)			(-2.58)
Fuel, Mineral and Metal Exports	0.0184***			0.0202***
(As share of total exports)	(2.92)			(4.01)
Pseudo R-Squared	0.13	0.14	0.17	---

Standard errors are Huber-White standard errors allowing firms' error terms within countries to be correlated (i.e., 'clustered' errors at the country level) for regressions in columns (1)-(3). T-statistics are in parentheses.

* Significant at 10% level. ** Significant at 5% level. *** Significant at 10 percent level.

[a] Regressions include 6 dummies for enterprise size based upon employment. The categories are: enterprises with fewer than 10 (full-time) employees; between 10 and 49 employees; between 50 and 99 employees; between 100 and 199 employees; between 200 and 499 employees and over 500 employees.

[b] Regressions include seven dummies based upon sector of operations. The categories are: manufacturing; agriculture; other industry; retail and wholesale trade; transportation; other services; and other.

Table 5: Effect of changes in discrete variables on the probability of paying bribes for an 'average' enterprise.

Variable	**Marginal Effect**
Utility privatization	
Fixed Line Telecom Operator Privatized	-15.1%
Electricity Distribution Privatized	-12.4%
Capacity in Telecommunications Sector	
Additional Cellular Companies [a]	5.1%
Overdue Payments	
Overdue Payments to Utilities [b]	3.2%
Overdue Payments to Workers [b]	-1.4%
Enterprise ownership	
Largest Shareholder – Other Private – *De Novo*	9.7%
Largest Shareholder – Foreign	1.7%
Largest Shareholder – Insiders (Managers or Employees)	3.0%
Largest Shareholder – Government	-6.5%
Country Controls	
Political Rights [c]	6.4%

Note: Coefficients are from Column 1 of Table 4 and changes are evaluated at the means of all other variables.
[a] An increase from 2 to 3 cellular companies. [b] An increase from 'no' to 'modest' arrears. [c] An decrease in freedom from 3 to 4 on the Freedom House 7-point scale.

Table 6: Marginal effect and elasticities on the probability of paying bribes for continuous variables for an 'average' enterprise.

	$\frac{d\Phi}{dx}$	Elasticity
Capacity in Telecommunications Sector		
Fixed Lines	-0.0109	-1.21
Enterprise Performance		
Margin	0.0023	0.18
Sales growth over previous three years	0.0001	0.01
Macroeconomic Controls		
Natural Log of Per Capita GDP in 1998	0.0661	0.55
Political Rights	-0.0687	-1.08
GDP growth	-0.0071	-0.07
Openness	-0.0039	-0.95
Fuel, Mineral and Metal Exports	0.0052	0.65

Note: Coefficients are from Column 1 of Table 4 and changes are evaluated at the means of all other variables.

Table 7: Impact of country characteristics on bribes to utilities from cross-country regressions

Estimation Method	**Ordinary Least Squares**	
Dependent Variable	**Percent of firms that pay bribes to utility companies**	
Number of Observations (countries)	18	21
Utility Privatization		
Fixed Line Telecom Operator Privatized	-0.1120*	-0.0981**
(Dummy)	(-2.07)	(-2.80)
Electricity Distribution Privatized	-0.1492	-0.1000
(Dummy)	(-1.51)	(-1.69)
Capacity and Competition		
Fixed Lines	-0.0123*	-0.0075*
(Per 1000 people)	(-2.15)	(-1.97)
Cellular Companies	-0.0211	0.0095
(Number)	(-0.60)	(0.65)
Country Controls		
Natural Log of Per Capita GDP in 1998	0.0822	-0.0112
(000s of US dollars)	(0.98)	(-0.24)
Political Rights	-0.0569**	-0.0462***
(Index – Higher values mean greater democracy)	(-2.61)	(-3.66)
GDP growth	-0.0066	-0.0093*
(Average between 1996 and 1998)	(-1.18)	(-1.88)
Openness	-0.0031	-0.0031**
(Imports as share of GDP)	(-1.68)	(-2.39)
Fuel, Mineral and Metal Exports	0.0042	
(As share of total exports)	(1.54)	
Per Capita Oil Reserves		0.0003***
(Barrels per capita)		(3.71)
R-Squared	0.75	0.82

Standard errors are Huber-White standard errors. T-statistics are in parentheses.
* Significant at 10% level. ** Significant at 5% level. *** Significant at 10 percent level.

Table 8: Coefficients on Main Variables when additional independent variables are included in regression (see Table 4, Column 1 for base regression).

	DEPENDENT VARIABLE IS DUMMY INDICATING BRIBES PAID TO UTILITIES						
Additional Independent Variable	**None**	**Oil Reserves [a]**	**Additional Size dummies (sales)**	**Region Dummies [a]**	**Average Inflation**	**Democracy Index**	**Parliamentary Dummy**
Number of Observations (firms)	1835	2214	1773	1835	1835	1835	1835
Coefficient on Additional Independent Variable	---	0.0011***	---	---	-0.0009	0.0626	0.1096
	---	(6.05)	---	---	(-1.21)	(0.48)	(0.74)
Coefficients on other variables of Interest							
Fixed Line Telecom Operator Privatized	-0.5197***	-0.4520***	-0.4959***	-0.4339***	-0.5748***	-0.5090***	-0.5123***
(Dummy)	(-5.32)	(-5.36)	(-4.59)	(-2.97)	(-5.00)	(-5.11)	(-5.19)
Electricity Distribution Privatized	-0.4495***	-0.2442***	-0.4401***	-0.2246	-0.4892***	-0.4305**	-0.4096**
(Dummy)	(-2.71)	(-2.69)	(-2.62)	(-1.01)	(-2.93)	(-2.43)	(-2.51)
Fixed Lines	-0.0377***	-0.0156**	-0.0396***	-0.0467***	-0.0319**	-0.0387***	-0.0313**
(Per 1000 people)	(-3.24)	(-1.97)	(-3.33)	(-3.25)	(-2.49)	(-3.22)	(-2.21)
Cellular Companies	-0.1664**	-0.0040	-0.1665**	-0.1852	-0.1871**	-0.1834*	-0.1467**
(Number)	(-2.37)	(-0.14)	(-2.34)	(-1.61)	(-2.33)	(-1.94)	(-2.30)
Margin	0.0080***	0.0073***	0.0078***	0.0079***	0.0078***	0.0079***	0.0079***
(Sales Price less Operating Costs as % of operating costs)	(4.67)	(3.72)	(4.40)	(4.79)	(4.66)	(4.67)	(4.64)
Largest Shareholder – Other Private -- De Novo	0.3329***	0.2176**	0.3240***	0.3308***	0.3443***	0.3318***	0.3332***
(Dummy)	(3.72)	(2.33)	(3.77)	(3.63)	(3.74)	(3.79)	(3.75)
Largest Shareholder – Government	-0.2670*	-0.2714**	-0.2793*	-0.2690*	-0.2589	-0.2632*	-0.2652*
(Dummy)	(-1.70)	(-2.20)	(-1.66)	(-1.71)	(-1.64)	(-1.66)	(-1.71)
Overdue Payments to Utilities	-0.1133*	-0.0930**	-0.0869	-0.1101*	-0.1084*	-0.1117*	-0.1116*
(Index – higher values mean less overdue payments)	(-1.79)	(-2.24)	(-1.46)	(-1.75)	(-1.73)	(-1.76)	(-1.78)

Standard errors are Huber-White standard errors allowing firms' error terms within countries to be correlated (i.e., 'clustered' errors at the country level). T-statistics are in parentheses.
* Significant at 10% level. ** Significant at 5% level. *** Significant at 10 percent level.
Note: Regressions include all variables included in Column 1 of Table 4 including sector and size dummies.
[a] Regional dummies are dummies for Central Europe, Southeastern Europe and the Commonwealth of Independent States. [b] Replaces exports of fuel, minerals and metals

Table 9: Coefficients on Main Variables when additional independent variables are included in regression (see Table 4, Column 1 for base regression).

	DEPENDENT VARIABLE IS DUMMY INDICATING BRIBES PAID TO UTILITIES						
Additional Independent Variable	**Landlocked Dummy**	**Population (Natural Log)**	**Decentralization**	**Corporate Tax Rate Index**	**Government Expenditures**	**Privatization Index**	**Overall Corruption**
Number of Observations	1835	1835	1664	1643	1835	1835	1745
Coefficient on Additional Independent Variable	-0.1027	0.1438	1.0845*	0.0242	-0.0066	-0.3152***	0.0613
	(-0.61)	(1.53)	(1.81)	(0.36)	(-0.46)	(-2.90)	(1.39)
Coefficients on other variables of Interest							
Fixed Line Telecom Operator Privatized	-0.4844***	-0.5731***	-0.4670***	-0.4928***	-0.5366***	-0.3658***	-0.5120***
(Dummy)	(-4.41)	(-4.57)	(-3.14)	(-4.01)	(-4.78)	(-3.99)	(-4.77)
Electricity Distribution Privatized	-0.4315**	-0.5136***	-0.3432**	-0.5381***	-0.4530***	-0.2859**	-0.6093***
(Dummy)	(-2.48)	(-2.99)	(-2.20)	(-4.87)	(-2.81)	(-2.09)	(-5.78)
Fixed Lines	-0.0386***	-0.0378***	-0.0401***	-0.0436***	-0.0371***	-0.0294***	-0.0442***
(Per 1000 people)	(-3.48)	(-3.04)	(-2.81)	(-5.29)	(-3.19)	(-2.80)	(-5.04)
Cellular Companies	-0.1789**	-0.2616**	-0.1467**	-0.1028*	-0.1521**	-0.1124**	-0.0539*
(Number)	(-2.10)	(-2.41)	(-2.51)	(-1.94)	(-2.01)	(-2.27)	(-1.73)
Margin	0.0079***	0.0080***	0.0085***	0.0074***	0.0080***	0.0080***	0.0077***
(Sales Price less Operating Costs as % of operating costs)	(4.72)	(4.73)	(5.20)	(4.19)	(4.85)	(4.54)	(4.72)
Largest Shareholder – Other Private -- De Novo	0.3351***	0.3151***	0.2655***	0.3172***	0.3277***	0.3046***	0.3101***
(Dummy)	(3.72)	(3.67)	(2.85)	(3.16)	(3.68)	(3.58)	(3.38)
Largest Shareholder – Government	-0.2598	-0.2895*	-0.4002***	-0.2476	-0.2709*	-0.2792*	-0.2808*
(Dummy)	(-1.65)	(-1.86)	(-3.08)	(-1.47)	(-1.73)	(-1.78)	(-1.75)
Overdue Payments to Utilities	-0.1124*	-0.1148*	-0.1196*	-0.1103	-0.1141*	-0.1158*	-0.1206*
(Index – higher values mean less overdue payments)	(-1.77)	(-1.81)	(-1.70)	(-1.61)	(-1.81)	(-1.79)	(-1.82)

Standard errors are Huber-White standard errors allowing firms' error terms within countries to be correlated (i.e., 'clustered' errors at the country level). T-statistics are in parentheses.
* Significant at 10% level. ** Significant at 5% level. *** Significant at 10 percent level.
Note: Regressions include all variables included in Column 1 of Table 4 including sector and size dummies.

APPENDIX 1: MAGNITUDE OF BRIBES

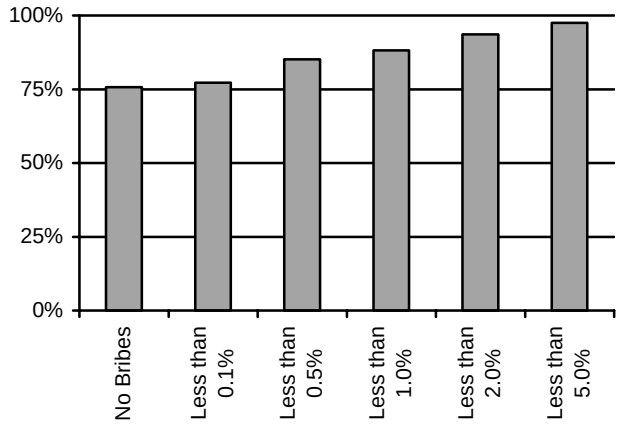

Figure 2: Upper Bounds of Bribe Payments to Utilities (as % of Revenues) in the Sample Countries.

Note: The categories are cumulative. Because each enterprise has unique upper and lower bounds, enterprises are classified by upper bounds. For example, an enterprise that reported paying between 0.1% of revenues and 1.9% of revenues in bribes to utilities would be counted only in the 'less than 2.0%' and 'less than 5.0%' percent categories (even if its actual payments – which are not observed – were only 0.2% of revenues).

The dependent variable in this part of the analysis is calculated using answers from two questions in the WBES – the percent of revenues paid per annum in 'unofficial' payments to public officials (including to the employees of electricity and telecommunications companies) and the share of those unofficial payments that were spent 'to get connected to and maintain public services (electricity and telephone)'. The enterprise manager's response to the first question about total unofficial payments was categorical (i.e., 0% of revenues; less than 1%; between 1 and 1.99%; between 2 and 9.99%; between 10 and 12%; between 13 and 25%; and over 25%), while the manager's response to the second question was any number between 0 and 100% (of total 'unofficial payments'). From this information, it is possible to calculate a range for the percent of revenues that each enterprise reported paying to electricity and telecommunications utilities.[25] About 75 percent of enterprises reported paying no bribes to public utilities (see Figure 2), while about 97.5 percent of enterprises reported an upper bound for bribes to utilities of less than 5.0 percent of revenues.[26]

[25] That is, the share to the utilities times the percentage of revenue as unofficial payment. Because the second response could take any value between 0 and 100%, the ranges are distinct for each enterprise.

[26] Note that although we know that an enterprise that reports an upper bound of less that 5 percent definitely paid less than five percent of revenues as bribes (ignoring reporting errors), it does not follow that those enterprises that reported an upper bound greater than 5 percent of revenues necessarily paid over 5 percent of revenues in bribes to utilities. For example, an enterprise that paid 2 percent of revenues in bribes could report lower and upper bounds of 1.2 and 6 percent (i.e., the actual level of bribes is between the two bounds). Only 0.3 percent of enterprises reported lower bounds greater than 5.0 percent of revenues (i.e., only 0.3 percent of enterprises reported ranges that were entirely above 5.0 percent of revenues) and no enterprises reported a lower bound greater than 8.0 percent of revenues.

As previously, it is assumed that bribes to telecommunications and electricity utilities by enterprise *i* in country *j* (B_{ij}) is a function of enterprise characteristics (x_{ij}), characteristics of the utilities (u_j), country-level characteristics (z_j) and an unobserved disturbance term (ε_{ij}). Since only upper and lower bounds on bribe payments, rather than actual amounts, are available, we estimate an interval regression. The contribution to the likelihood function for each enterprise is $\Pr\left(b_{ij}^{L} < B_{ij} < b_{ij}^{H}\right)$.[27] Assuming that the disturbance term is normally distributed, and denoting the standard normal distribution as Φ, the log-likelihood function, which can be maximized using standard maximum likelihood estimation, is:

$$L = \sum_{i,j} \log\left[\Phi\left(\frac{b_{ij}^{H} - \alpha - \beta_1 x_{ij} - \beta_2 u_j - \beta_3 z_j}{\sigma}\right) - \Phi\left(\frac{b_{ij}^{L} - \alpha - \beta_1 x_{ij} - \beta_2 u_j - \beta_3 z_j}{\sigma}\right)\right]$$

As before, it is plausible that correlation between enterprises within a single country might be correlated – perhaps due to omitted macroeconomic variables. Consequently, it would probably be appropriate to calculate Huber-White standard errors allowing for clustering. Unfortunately, when we do this the covariance matrix becomes non-invertible and, therefore, we present the usual (i.e., non-robust) standard errors in this section. Although this suggests interpretation of statistical significance should be done cautiously, it is important to note several points. First, the results in this section are generally consistent with results from the previous analysis, which allowed enterprises within countries to have correlated errors. Second, for the most part, using robust standard errors in the previous analysis does not appear to have had a large effect on results – non-robust t-statistics were, on average, only about 30 percent larger for country-level variables and 5 percent larger for enterprise-level variables in regressions similar to those in column (1) of Table 4. Finally, when we estimated a random-effects model, which allows errors to be correlated for enterprises within countries (i.e., a model that includes country-level random effects), the null hypothesis of no correlation could not be rejected in any of the specifications and the results were virtually identical in terms of coefficient size and statistical significance to the results presented in column 4 in Table 5.[28]

For the most part, the results from this analysis are similar to the results from the analysis of the effect on the likelihood that they will pay bribes. More profitable enterprises, enterprises with overdue payments to utilities, and de novo private enterprises generally pay higher bribes (as percent of revenue) than other enterprises.[29] Given that bribes to utilities appear to account for less that 1 percent of revenues for most enterprises (see Figure 2), the effect of these variables

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[27] The estimation takes truncation below, at 0% of revenues, into account (i.e., negative bribes are not observed).

[28] Note that this imposes additional restrictions in that error variances and correlation patterns have to be similar across countries. Further, it does not allow for arbitrary correlation patterns within countries (see Deaton, 1997).

[29] In addition to the previous explanations about why de novo enterprises might be more likely to pay bribes than other enterprises, there is an additional reason why they might pay ***higher*** bribes than other enterprises. Managers of *de novo* enterprises have less well developed relationships with the utility employees demanding bribes, utility employees might demand higher bribes to compensate them for the additional risk of taking bribes for performing favors for the entrepreneur (for example, for 'misreading' meters).

can be quite large. De novo private enterprises appear to pay approximately 0.34 percentage points more of revenues in bribes than similar privatized enterprises, enterprises with modest overdue payments to utilities pay approximately 0.17 percentage points more in bribes to utilities than similar enterprises with no overdue payments, and a one standard deviation increase in margin increases bribe payments to utilities by about 0.2 percentage points.

Enterprises also appear to pay lower bribes in countries with private telecommunications and electricity utilities and in countries with lesser constraints on capacity and greater competition in the telecommunications sector. The magnitude of the effect of these changes is also quite large. Based upon the coefficient estimates in column 4 of Table 4, enterprises in countries with private telecommunication and electricity distribution pay respectively about 0.75 percentage points and 0.36 percentage points less in bribes than similar enterprises in countries with state-owned utilities. Similarly, the addition of another cellular operator reduces bribe payments to utilities (as percent of revenues) by about 0.25 percentage points. Finally, increasing in the number of connections by one standard deviation reduces bribe payments by about 0.5 percentage points.

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