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Informal Payments to the Tax Collector in Transition Countries*

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Abstract

In this paper, I empirically examine survey data on the likelihood and frequency of firms' having to make informal payments or gifts to government officials in transition countries. The firm-level survey data are from the EBRD-World Bank Business Environment and Enterprise Performance Survey (BEEPS) for enterprises in transition economies of Europe and Central Asia, including Turkey. Characteristics of firms are used as explanatory variables along with country characteristics to control for the stage of economic development and current economic conditions at the time the survey data were collected. Probit and selection models of tax inspections, tax-compliance efforts, and firms' informal payments are estimated. The empirical evidence indicates that several specific corporate characteristics influence the likelihood of tax inspections, including employment and the location of the company. Both corporate and country characteristics determine the likelihood of tax officials' requests for informal payments. Importantly, tax-compliance costs significantly affect informal payments.

JEL Codes: H32, K42, P21

Keywords: Tax collection, informal payments, gifts, bribes, corruption, transition economy

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1. Introduction and Background

1.1 Introduction

A well-known problem for firms operating in transition countries is the expectation that informal payments or gifts should be given to government officials. In this paper, I empirically examine survey data that reveal the likelihood and frequency of firms' having to make such payments to tax officials. Enterprise-level data are taken from the 2009 round of the EBRD-World Bank Business Environment and Enterprise Performance Survey (BEEPS) of enterprises in transition economies of Europe and Central Asia, including Turkey. Characteristics of the firms are used as explanatory variables along with country details that are used to control for the stage of economic development and current economic conditions at the time the survey data were collected.

Using that data, I empirically model how characteristics of both the company and the country affect the likelihood that one will be subjected to a tax inspection, the number of tax inspections, and reported informal payments to tax collectors. Probit and selection models of tax inspections and firms' informal payments are estimated. The latter include measures of the staff time involved with tax compliance (measured in days of staff time). Based on the empirical findings, policy implications are drawn for reducing such informal payments to tax officials.

The evidence provided here indicates that businesses with larger employment and those located in bigger cities are more likely to be inspected. Furthermore, companies are shown to respond to higher staff-time costs associated with tax compliance by making informal payments to tax officials.

1.2 Related Literature

Several strands of the tax-evasion and economic-transition literature contain insights that are incorporated into the models of this paper. The tax-evasion literature, beginning with Allingham and Sandmo (1972), places emphasis on audit rates and penalty structures by the tax authority in the context of an income-tax regime. That basic approach was later incorporated into the optimal tax literature, as in Cremer (1990) and Kaplow (1990), where the emphasis is on designing an efficient tax mechanism given the presence of evasion and the necessity to expend resources to reduce that evasion.

In the context of less-developed and transition countries, the presence of both formal and informal market firms is important to consider as part of tax collection and enforcement. Furthermore, it is important to expand the context of taxation beyond the personal income tax to a broader tax-regime setting,

one in which there is a value-added tax and enterprise taxes. Fortin, Marceau, and Savard (1997) and Ruach (1991) provide modeling approaches in the broader context appropriate for developing countries. Tax inspections are a mechanism that may be linked to firms' input usage (e.g., labor/employment) or to the production of output. Previous, equally insightful studies of input access in the transition process have been informative in considering how to model tax inspections and informal-payments behavior by firms.

For an early overview of BEEPS data and its uses in research, see Hellman et al. (2000) and Hellman, Jones, and Kaufmann (2003). Issues of corruption, state capture of firms, and governance, in particular, have all been analyzed using BEEPS data. On the topic of tax bribes, Hellman et al. (2000) analyzed the first round of BEEPS data with respect to the frequency of companies reporting the payment of bribes and, conditional on that report, the percentage of their total revenues that were paid in bribes. That analysis showed that the percentage of enterprises reporting that they (ever) paid a bribe ranged from 45% in Slovenia and Belarus to 90% in Kyrgyzstan, 85% in Azerbaijan, and 80% in both Romania and Uzbekistan. Reported bribe amounts ranged from a low of 2% of total revenues in Croatia and 3% in Poland and Estonia to a high of 8% in Georgia, 7% in Armenia and Azerbaijan, and 6% in Kyrgyzstan, Moldova, Ukraine, and Uzbekistan. Tanzi and Tsibouris (2000) analyzed both the frequency and extent of unofficial payments to tax officials using other survey sources. They reported the percentage of businesses bribing frequently ranged from a low of 7.7% in Slovenia to a high of 59.3% in Azerbaijan. The average tax bribe ranged from a low of 2.1% of revenues in Croatia to a high of 8.1% in Georgia. Furthermore, Tanzi and Davoodi (2000) found that tax bribes as a share of annual revenue fall with the size of the enterprise. Joulfaian (2009) used early BEEPS data to estimate models of tax evasion.

Previous analysis of the BEEPS 2009 data in Anderson (2014) provides perspective on corporate perceptions of their informal payments to government officials vis-à-vis those of other firms in their industry. As for the frequency of demands for bribes, a survey question asked whether such incidents were frequent (frequent response) or common (frequent, usually, or always responses) in the respondent's industry; this question elicited mean positive response rates of 13% and 7%, respectively. Interestingly, it emerges that a given institution tends to perceive that its competitors are handing over more illicit payments to tax officials than it itself is.

By analyzing tax bribery and the general tax culture of transition economies, we have the potential to advance our understanding of the nature and manifestations of corruption, as in Shleifer and Vishny (1993), and the interactions between government officials and the private sector, as in Shleifer and

Vishny (1994). Understanding informal payments can also enhance our view of the so-called virtual economy that characterized the early phases of transition economies, as described in Gaddy and Ickes (1998a), Gaddy and Ickes (1998b), Gaddy and Ickes (1998c), Ericson and Ickes (1999), and Ericson (1991), Ericson (1999). Finally, this analysis can also inform policy assessment of reform efforts in transition economies, as in Tanzi and Tsibouris (2000).

Blanchard (1997) offers a useful theoretical discussion of the general issues surrounding restructuring and privatization in post-communist economies. He suggests that deep restructuring of state-owned firms has two essential elements: (1) necessary changes in the labor force employed by those enterprises, and (2) large capital expenditures needed for updating the equipment and technology. The first of these elements meets with resistance from the existing labor force, which fights for retention of the *status quo*. The second essential element means that state firms are unlikely to have the funds necessary for financing investment. For both reasons, these entities are unlikely to fully overhaul themselves to the degree required. Furthermore, Blanchard indicates that companies with outside ownership interests may be more effective in restructuring. Consequently, the empirical models include indicators of whether the firm is a state-owned enterprise, a privatized state-owned unit, a private business since its inception, or a joint venture with a foreign partner.

Havrylyshyn and Wolf (1999) analyze the growth performance of transition economies and identify three distinct country groups with similar growth patterns: Central Europe, the Baltics, and the CIS countries. They point out different initial conditions across these countries that have a bearing on their growth paths, but they maintain that the variation in their growth paths has more to do with diverse approaches to policy implementation during transition. They also identify as a key determinant of progress the degree of reform or market liberalization in a country. In subsequent analysis of transition experience, Havrylyshyn (2007) and Shleifer and Treisman (2014) show that the rapidly reforming countries outperformed the gradually reforming ones over time.

Several recent studies of resource access and bribery have examined the political-economic connections that are equally relevant to the present study. Fan, Lin, and Treisman (2000) prove that countries with more tiers of government or a greater number of local public employees have more frequent bribery. They find that when the revenue of local or central governments represents a larger share of GDP, bribery is less frequent. The general thrust of their evidence is that there is a danger in uncoordinated rent-seeking with more complex government systems. Faccio (2006) develops a measure of political

connections for companies across 47 countries, including both highly and less-developed ones, finding that politically connected firms represent nearly 8% of total global capitalization. Furthermore, she finds that political relationships between firms and politicians are heterogeneous across countries, being much more prevalent in some countries than in others. In the tax-collection context, this evidence may suggest that tax inspections and informal payments to tax collectors are influenced by political connections.

Carlin et al. (2007) have suggested that managers' responses to survey questions on the business environment in which they operate and the constraints they face in it measure the shadow cost of the constraints faced; they are not direct measures of the constraints. Consequently, they suggest use of a Lagrangian multiplier approach to analyze the shadow cost of input constraints. In transition countries, in particular, significant economic-reform efforts may also impact the prevalence of informal payments to government officials. Anderson (forthcoming) tests this proposition and finds empirical evidence that more advanced economic reforms reduce the incidence of informal payments.

It should be noted that various terms are used in the literature for the practice of making informal payments to government officials. Throughout this paper, the terms informal payments, gifts, and bribes are used interchangeably. The BEEPS questions consistently refer to "informal payments or gifts," and the practice of making such payments is considered in this paper to be a form of bribery or corruption, as in Rose-Ackerman (1999).

2. Model of Informal Payment

In this section, a model of informal payments required by the tax collector is presented. The basic approach taken in this model is that the informal payment may be required either in lump-sum form, in which case it has no efficiency effect, or in a form that is related to the use of one of the firm's inputs, in which case inefficiency is introduced. If the informal payment is related to the use of an input, the payment acts like a tax on that input.

Suppose we have a firm producing a product and operating with constant returns-to-scale production technology. The firm uses two inputs, x_1, and x_2, to produce output quantity q, with the production function $F(\underline{x}, q) = 0$. The firm's production technology is Cobb-Douglas with constant returns to scale:

$$q = Ax_1^{\alpha}x_2^{(1-\alpha)} \tag{1}$$

Output price is p and input prices are w_1 *and* w_2. The input cost function C is given by,

$$C = w_1 x_1 + w_2 x_2. \quad (2)$$

In addition to the usual cost of input acquisition, suppose that the tax inspector requires an informal payment, which may be either a lump-sum amount or a variable payment that depends on the quantity of a particular input. We can denote the informal payment (bribe) *B* as,

$$B = b_0 + b_1 x_1, \quad (3)$$

where b_0 is the lump-sum payment required, and $b_1 x_1$ is the variable payment that depends on the quantity of the first input, which is monitored by the tax official during tax inspections. The most obvious input that may be tracked by the tax official is employment. In that case, the informal payment required may depend on the size of the operation as measured by its number of employees.

In a competitive market context with no informal payments required, a profit-maximizing outfit will maximize output subject to the cost equation (2). The Lagrangian for this optimization problem is,

$$L = Ax_1^{\alpha} x_2^{(1-\alpha)} + \lambda[C - w_1 x_1 + w_2 x_2] \quad (4)$$

and the usual first-order necessary conditions are,

$$\frac{\partial L}{\partial x_1} = \alpha A x_1^{(\alpha-1)} x_2^{(1-\alpha)} - \lambda w_1 = 0 \quad (5)$$

$$\frac{\partial L}{\partial x_2} = (1-\alpha) A x_1^{\alpha} x_2^{-\alpha} - \lambda w_2 = 0 \quad (6)$$

$$\frac{\partial L}{\partial \lambda} = C - w_1 x_1 - w_2 x_2 = 0 \quad (7)$$

Equations (5) and (6) yield the traditional condition of the value of the marginal product of each input having to equal its price. Furthermore, the equations generate the condition,

$$\frac{\alpha A x_1^{(\alpha-1)} x_2^{(1-\alpha)}}{(1-\alpha) A x_1^{\alpha} x_2^{-\alpha}} = \frac{\alpha x_2}{(1-\alpha) x_1} = \frac{w_1}{w_2}, \quad (8)$$

which indicates that the rate of technical substitution (RTS) must equal the input price ratio.

Now, if we incorporate the informal payments to the tax official in the model, we have a second constraint and the Lagrangian becomes,

$$L = Ax_1^{\alpha} x_2^{(1-\alpha)} + \lambda\left[C - w_1 x_1 + w_2 x_2\right] + \mu\left[B - b_0 + b_1 x_1\right]. \quad (9)$$

Differentiating with respect to the two inputs and the two Lagrangian multipliers, λ and μ, yields the system of first-order necessary equations,

$$\frac{\partial L}{\partial x_1} = \alpha A x_1^{(\alpha-1)} x_2^{(1-\alpha)} - \lambda w_1 - \mu b_1 = 0 \tag{10}$$

$$\frac{\partial L}{\partial x_2} = (1-\alpha) A x_1^{\alpha} x_2^{-\alpha} - \lambda w_2 = 0 \tag{11}$$

$$\frac{\partial L}{\partial \lambda} = C - w_1 x_1 - w_2 x_2 = 0 \tag{12}$$

$$\frac{\partial L}{\partial \mu} = B - b_0 - b_1 x_1 = 0. \tag{13}$$

In this case, equations (10) and (11) yield the condition for the optimal input usage,

$$\frac{\alpha A x_1^{\alpha-1} x_2^{(1-\alpha)}}{(1-\alpha) A x_1^{\alpha} x_2^{-\alpha}} = \frac{\alpha x_2}{(1-\alpha) x_1} = \frac{\lambda w_1 + \mu b_1}{\lambda w_2} \neq \frac{w_1}{w_2} \tag{14}$$

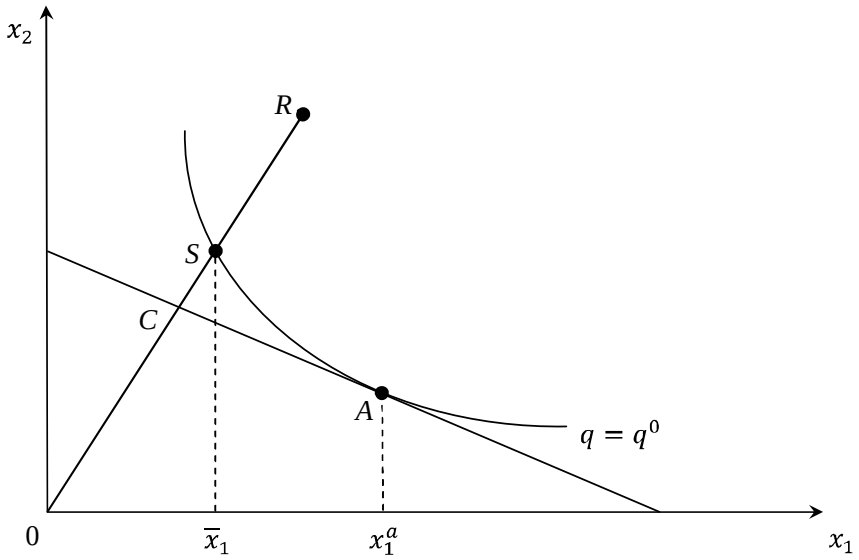
This condition clearly differs from equation (8) in that the RTS is not equal to the simple input price ratio. Rather, the RTS must equal an input price ratio that has been altered to include the two Lagrangian multipliers and the marginal informal payment. Consequently, the firm's RTS exceeds the ratio of input prices. This expression indicates that the rate at which the firm is technically able to substitute one input for another generally exceeds the rate at which it can economically substitute inputs when the informal-payment cost is included.

Two observations are important at this point. First, notice that the lump-sum portion of the informal payment, b_0, does not affect the optimality condition. While this term reduces the profit of the company, it does not alter the efficient input combination the management desires. Second, notice that the marginal informal payment, b_1, does enter equation (14) and has an impact on the optimal input combination of the firm. The marginal informal payment distorts the corporation's input decision. Efficiency requires that the firm operate using the combination of inputs where the ratios in equation (8) are equal. Due to the inequality in this expression, we know that there is an inefficient allocation of resources. The firm is diverted from pursuing the efficient allocation due to the informal payment required by the tax official when that payment is linked to input usage.

Next, we wish to examine the efficiency cost of a company altering its use of an input due to the informal payment required by the tax official. This is the situation that may arise if tax inspections or informal-payment requirements are linked to the firm's use of labor, for example. While there is no

explicit constraint, there is an implicit incentive to limit the employment of labor. In order to produce a fixed output quantity q^0, taking into account the constraint imposed on the input, the firm should operate at point S, illustrated in Figure 1. If the manufacturer were free to use any quantity of the input it wishes, it would operate at point A and use quantity x_1^{α}. But it is effectively input-constrained and chooses to use x_1 units due to the tax official's monitoring of that input usage and application of a marginal payment requirement. In order to produce q^0 units of output, the company must operate at point S, which brings inefficiency into the operation. The ratio 0S/0C, which exceeds unity, represents the economic inefficiency involved. Of course, it is also possible that the firm is operating with a technical inefficiency using the input quantities represented at point R. In that case, there is also a technical inefficiency, measured by the ratio 0R/0S. In the discussion that follows, we assume that the enterprise is operating in a technically efficient manner, so we focus only on the economic inefficiency imposed by limited access to the input.

Figure 1. Firm Inefficiency and Willingness To Pay To Relax Input Constraint



An index of overall efficiency can be computed, as described and illustrated in Cornes (1992), using the ratio 0C/0R, which is the product of the index of allocative efficiency 0C/0S and the index of technical efficiency 0S/0R:

$$\frac{0C}{0R} = \frac{0C}{0S}\frac{0S}{0R} \tag{15}$$

Another way to view this situation is to ask the question, "What would the firm be willing to pay in order to have the ability to operate most efficiently?" Clearly, the difference between operating at point S rather than at point A, or equivalently at point C, imposes a cost on the business that is captured in the index of allocative efficiency ratio 0C/0S. Therefore, the corporation would presumably be willing to pay a bribe to a government official to gain access to additional amounts of the constrained input and avoid the inefficiency.

This simple model of a manufacturer producing a product with a constraint on an input has several implications for testing. First, we recognize that the company will be more likely to report that it is subject to a constraint as the horizontal distance between points S and A in Figure 1 grows greater, which is the greater the difference denoted by $x_1^{\alpha} - \bar{x}_1$. If this difference is small, we would expect a firm to be less likely to make an informal payment. On the other hand, if this difference is large, the firm is more likely to be willing to make informal payments (bribes) to government officials to relax the input constraint and relieve the inefficiency being suffered.

Since the ratio 0S/0C represents the economic inefficiency inherent in the input constraint, it is an indicator of the likelihood that an organization will indicate that it is asked to make an informal payment. The larger the ratio 0S/0C, the more inefficient the firm is forced to be because of the input constraint (aside from any technical inefficiency). What determines this ratio? Two factors are important: (1) once again the difference $x_1^{\alpha} - \bar{x}_1$ is critical, as it measures the extent to which the input constraint is binding, and (2) the curvature of the isoquant $q = q^0$ is also a factor contributing to the distance between points C and S, and thereby a contributor to the inefficiency imposed on the firm with the input constraint.

The second of these factors depends on the elasticity of substitution between the constrained input and the non-constrained input. The greater the elasticity of substitution, the more relaxed is the curvature of the isoquant and the smaller is the inefficiency due to the input constraint. Firms that can easily substitute inputs will therefore be less likely to make informal payments. Furthermore, the difference $x_1^{\alpha} - \bar{x}_1$ may be affected by the extent to which prices have been liberalized in the country. That is reflected in the different slopes at points S and A in Figure 1, which reflect relative prices. Due to this factor, in countries where there has been more price liberalization, or greater overall economic reform, the distance $x_1^{\alpha} - \bar{x}_1$ may well be greater.

This model gives us several implications to test. First, companies that are inspected more frequently are more likely to make informal payments to tax officials because each inspection supplies the inspector with an opportunity to

request a payment or impose an implicit constraint on input use. Second, if tax inspections are linked to an enterprise's employment (labor-input usage), then those with greater employment will be more likely to report informal payments to tax officials. Third, in countries that have put through more far-reaching economic reforms, the difference between a firm's desired input use and the implicitly constrained input use may be greater, leading to greater inefficiency and a greater willingness on the part of the management to make an informal payment to relax the input constraint. Fourth, businesses with larger elasticities of substitution, whether due to technical factors or managerial skill, will be less likely to report making informal payments.

3. Data and Empirical Modeling Approach

3.1 Data

The primary data used in this study are from the 2009 round of the EBRD-World Bank Business Environment and Enterprise Performance Survey (BEEPS). These data are collected at the corporate level every three years and cover a broad range of topics related to the business environment and company performance.

BEEPS includes numerous questions on business-government relations. In addition, the data set is augmented with country-level data on economic conditions and measures of economic reforms. The country-level economic data are on GDP (PPP 2008), the GDP growth rate (%), the size of the agricultural sector of the economy (% of GDP), an indicator of whether the country is part of the Commonwealth of Independent States (CIS), the value-added tax rate (%), and the total tax rate applied to corporations (%).

Furthermore, an overall index of economic reform is supplied. This index is constructed from eight individual measures of reform produced by the EBRD: index of small-scale privatization, index of large-scale privatization, index of enterprise reform, index of price liberalization, index of foreign exchange and trade liberalization, index of competition policy, index of banking-sector reform, and index of infrastructure reform.

Enterprises in the following countries were surveyed: Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Macedonia, Georgia, Hungary, Kazakhstan, Kosovo, Kyrgyzstan, Latvia, Lithuania, Moldova, Mongolia, Montenegro, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Tajikistan, Turkey, Ukraine, and Uzbekistan. In the analysis that follows, however, enterprise survey responses are used for only 28 of the countries. The Czech Republic and Kosovo are omitted because the accompanying EBRD reform indices are not available for those countries.

3.2 Empirical Modeling Approach

A standard selection model is employed in the estimations to follow. The model is designed to account for the fact that there are both respondents and non-respondents in the BEEPS survey, and there is a selection process that determines who responds. The model accounts for the possibility that respondents are systematically different from non-respondents, and it controls for that contingency.

To begin, assume that we have a sample selection criterion defined by the equation,[1]

$$z^* = \gamma' w + \mu \tag{16}$$

and that the primary equation of interest is,

$$y = \beta' x + \varepsilon. \tag{17}$$

The sampling context in this model is one where y is only observed when z^* is strictly positive. Vectors of explanatory variables w and x are associated with parameter vectors γ and β, respectively. Error terms ε and μ are assumed to follow a bivariate normal distribution with zero means and correlation ρ.[2]

Following Theorem 21.4 of Greene (1990), we can summarize the standard selection model as having the following properties:

$$E[(y|y\ is\ observed) = E[(y|z^* > 0) \tag{18}$$

$$= E[(y|\mu > -\gamma' w)] \tag{19}$$

$$= \beta' x + E(\varepsilon|\mu > -\gamma' w) \tag{20}$$

$$= \beta' x + \rho\sigma_\varepsilon \lambda(\alpha_\mu) \tag{21}$$

where we define the parameter α_μ as,

$$\alpha_\mu = \frac{-\gamma' w}{\sigma_\mu} \tag{22}$$

and the inverse Mills ratio, denoted $\lambda(\alpha)$, is the ratio of the normal probability density function to the cumulative density function evaluated at $\gamma' w/\sigma_\mu$:[3]

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[1] Note that the symbol w here is a vector of explanatory variables, not input prices, as in equation (2).

[2] Note that the symbol μ is an error term in this model, not a Lagrangian multiplier, as in equation (9).

[3] Note that the symbol λ here is the inverse Mills ratio, not a Lagrangian multiplier, as in equations (4) and (9).

$$\lambda(\alpha) = \frac{\phi(\frac{\gamma' w}{\sigma_\mu})}{\Phi(\frac{\gamma' w}{\sigma_\mu})}. \quad (23)$$

Hence, we can write the expected value of *y*, conditional on its selection, as given by the expression,

$$E(y|z^* > 0) = \beta' x + \beta_\lambda \lambda(\alpha_\mu) + \upsilon. \quad (24)$$

This equation reveals that a simple regression of *y* on the vector of explanatory variables *x* would provide an inconsistent set of estimates of the β coefficients. The econometric problem here is essentially that of an omitted variable. Regression of *y* on the vector of explanatory variables *x* must also include the inverse Mills ratio λ in order to obtain consistent estimates. If we estimate that the parameter β_λ is positive (negative), we have an indication that unobserved factors that make participation more likely tend to be associated with larger (smaller) effects in the second (selection) equation. The error term in the selection equation and the primary equation are positively (negatively) correlated.

In what follows, we will use this modeling approach to explain business-survey responses on tax inspections, tax-compliance efforts, and informal payments to tax officials. In each case, we will report a probit model and a selection model explaining the dependent variable conditional on the selection criteria. Econometric estimation of this selection model reveals the firm and country characteristics that influence tax inspections and informal payments.

4. Empirical Estimation

4.1 Models of Tax Inspections and Informal Payments

Tax inspections are a routine part of business operations in transition countries. The theoretical model of corporate production indicated that impediments to input usage arising from the tax inspector's demands for bribes based on input usage can cause inefficiency that the company will seek to overcome by most likely making a payment in cash. In this section, empirical models are estimated to investigate how tax inspections may feed into increased informal payments to tax officials. Among the potential obstacles for an enterprise conducting business in a transition economy, the BEEPS survey includes questions on the number of tax inspections the business was subject to in the past year, the number of working days that corporate staff spent on procedures related to taxes, and the informal payments that were associated with those tax inspections. In particular, Question J.4 asks the respondent, "Over the last year, how many times was this establishment either inspected

by tax officials or required to meet with them?" A follow-up question (question J.5a) asks the respondent, "Over the last year, considering the overall process of filing and paying taxes, how many working days were spent by all staff members involved in the process?" Another question (question J.5) asks, "In any of these inspections or meetings, was a gift or payment expected or requested?" Companies' responses to these three questions are used in statistical modeling of tax inspections and informal payments in this section of the paper.

4.2 Models of Tax Inspections

Table 1 reports summary statistics for the variables used in the empirical analysis. Approximately 60% of the businesses in the BEEPS survey had tax inspections in the past year. The number of inspections (or meetings with tax officials) ranged from a minimum of one to a maximum of 2,003, with a mean number of inspections of 4.4. In other words, the typical number of inspections is about four, amounting to quarterly inspections, but some firms report an extraordinarily large number of inspections. About 6% of respondents indicate that informal payments were expected or requested, but the standard deviation for that dichotomous variable is 0.23, indicating a large variation in tax officials' requests or expectations. The number of working days allocated to paying taxes is about 54 days on average, but here again the variation is substantial. The minimum number of days reported is one, while the maximum is an incredible 6,000 days.

Table 2 reports estimation results for probit models of tax inspections. The first column reports estimated coefficients for Model 1, a probit equation identifying whether the firm was subject to any tax inspection in the past year. Among the first eight explanatory variables that control for characteristics of the countries in which corporations are operating, only two of the variables have a statistically discernible effect on tax inspections. The GDP growth rate of the country has a positive effect, indicating that in faster-growing countries, companies are more likely to be inspected. The other significant country characteristic is the private-sector share of GDP, which has a positive effect on tax inspections. The more highly privatized the economy, the more likely firms are to be inspected. Among the remaining explanatory variables that capture corporate characteristics, nine variables have discernible effects on tax inspections. Manufacturing operations, female-managed businesses, and limited partnerships are less likely to be inspected. However, those with international quality certifications, informal market competition, government subsidies, and stock-market listings have a greater probability of being inspected. The second column of Table 2 lists the marginal effects of each independent variable of the probit Model 1 for easier interpretation.

Table 1. Descriptive Statistics

Variable	Mean	Standard Deviation	Minimum	Maximum	Observations
Dependent Variables					
Tax inspection in the past year (0/1)	0.60	0.49	0	1	11,998
Number of tax inspections in the past year (#)	4.43	36.67	1	2,003	6,808
Informal payment expected or requested by tax official (0/1)	0.06	0.23	0	1	11,998
Working days of staff allocated to filing and paying taxes in the past year (#days)	53.76	189.17	1	6,000	9,278
Country characteristics					
GDP (PPP 2008)	10,886	5,809	1,761	27,182	11,728
Commonwealth of Independent States (CIS), (0/1)	0.40	0.49	0	1	11,998
Value-added tax rate (%)	18.4	2.8	10	25	11,998
Total tax rate applied to corporations (%)	43.0	17.8	10.6	95.6	11,998
GDP growth rate (%)	4.6	3.5	-4.6	10.8	11,728
Size of agricultural sector in country's economy (Ag value added as % of GDP)	9.1	6.1	0.0	29.8	11,445
Private-sector share of GDP (%)	68.0	9.3	30	80	11,479
EBRD index of small-scale privatization	3.9	0.37	2.3	4.3	11,479
EBRD index of large-scale privatization	3.2	0.54	1.7	4.0	11,479
EBRD index of enterprise reform	2.5	0.58	1.7	3.7	11,479
EBRD index of price liberalization	4.0	0.36	2.7	4.3	11,479
EBRD index of foreign exchange and trade liberalization	4.0	0.57	2.0	4.3	11,479
EBRD index of competition policy	2.4	0.50	1.7	3.7	11,479
EBRD index of banking-sector reform	3.0	0.54	1.7	4.0	11,479
EBRD index of infrastructure reform	2.6	0.57	1.3	3.7	11,479
Firm Characteristics					
Manufacturing-sector firm (0/1)	0.44	0.50	0	1	11,998
Manager's experience (years)	16.6	10.4	1	75	11,602
Manager female (0/1)	0.19	0.39	0	1	11,998
International quality certification (0/1)	0.26	0.44	0	1	11,998
Competes against unregistered or informal-market firms (0/1)	0.40	0.49	0	1	11,998
Subsidized by government (0/1)	0.09	0.28	0	1	11,998
Number of employees	127	1,076	1	100,000	11,880
State-owned enterprise (0/1)	0.01	0.11	0	1	11,998
Privatization of state-owned enterprise (0/1)	0.20	0.40	0	1	11,998
Originally private firm from startup (0/1)	0.74	0.44	0	1	11,998
Joint venture with a foreign partner (0/1)	0.02	0.14	0	1	11,998
Legal status: shareholding company with shares traded in stock market (0/1)	0.13	0.33	0	1	11,998
Legal status: shareholding company with shares traded privately, if traded at all (0/1)	0.59	0.49	0	1	11,998
Legal status: sole proprietorship (0/1)	0.15	0.36	0	1	11,998
Legal status: limited partnership (0/1)	0.03	0.17	0	1	11,998
Private domestic ownership share (%)	88.52	29.05	0	100	11,998
Location in capital city (0/1)	0.27	0.44	0	1	11,998
Location city size (1-5)	3.00	1.53	1	5	11,998

Table 2. Probit Models of Tax Inspections

Variable	Model 1 Probit estimates (standard error)	Model 1 Probit marginal effects (standard error)	Model 2 Selection model estimates (standard error)	Model 3 Selection model estimates (standard error)
Constant	-0.24 (0.61)	-0.90E-01 (0.23)	-0.22 (4.17)	51.79 (35.06)
GDP (PPP 2008)	-4.63E-06 (1.49E-05)	-0.18E-05 (0.57E-05)		-0.21E-03 (0.49E-03)
Commonwealth of Independent States (CIS) (0/1)	0.25E-01 (0.17)	0.96E-02 (0.66E-01)		-1.15 (5.30)
Value-added tax rate (%)	0.28E-01 (0.24E-01)	0.11E-01 (0.93E-02)		-0.83 (0.87)
Total tax rate applied to corporations (%)	-0.44E-02 (0.47E-02)	-0.17E-02 (0.18E-02)		0.18 (0.17)
GDP growth rate (%)	0.49E-01[b] (0.26E-01)	0.19E-01[c] (0.99E-02)		-1.66 (1.15)
Size of agricultural sector in country's economy (% of GDP)	0.12E-01 (0.14E-01)	0.46E-02 (0.52E-02)		-0.54 (0.49)
Private-sector share of GDP (%)	0.20E-01[a] (0.10E-01)	0.76E-02[c] (0.40E-02)		-0.55 (0.41)
EBRD overall reform index	-1.82 (1.50)	-0.69 (0.58)		54.26 (51.06)
Manufacturing sector (0/1)	-0.78E-01[a] (0.36E-01)	-0.30E-01[b] (0.14E-01)	1.30 (1.06)	3.49[c] (2.05)
Manager's experience (years)	-0.25E-02 (0.19E-02)	-0.97E-03 (0.72E-03)	-0.40E-01 (0.50E-01)	0.37E-01 (0.90E-01)
Manager female (0/1)	-0.70E-01[a] (0.25E-01)	-0.27E-01[a] (0.99E-02)	-0.88 (1.28)	1.49 (1.99)
International quality certification (0/1)	0.12[a] (0.40E-01)	0.47E-01[a] (0.15E-01)	0.59 (1.19)	-3.40 (2.38)
Competes against unregistered or informal-market firms (0/1)	0.79E-01[b] (0.35E-01)	0.30E-01[b] (0.14E-01)	0.51 (1.01)	-1.81 (2.23)
Subsidized by government (0/1)	0.12[a] (0.47E-01)	0.44E-01 (0.17E-01)	-0.39 (1.85)	-3.91 (3.37)
Number of employees	0.31E-03[b] (0.16E-03)	0.12E-03[b] (0.61E-04)	0.27E-02[a] (0.11E-02)	-0.19E-02 (0.27E-02)
State-owned enterprise (0/1)	0.74E-01 (0.10)	0.28E-01 (0.39E-01)	0.71 (5.46)	-2.27 (6.59)
Privatization of state-owned enterprise (0/1)	0.27E-01 (0.61E-01)	0.10E-01 (0.23E-01)	0.68 (3.04)	-0.54 (3.63)
Originally private firm from startup (0/1)	0.14E-01 (0.78E-01)	0.52E-02 (0.31E-01)	1.72 (2.89)	1.48 (3.80)
Joint venture with a foreign partner (0/1)	-0.21E-01 (0.10)	-0.81E-02 (0.40E-01)	-0.32 (4.52)	-0.25 (5.56)
Legal status: shareholding company with shares traded in stock market (0/1)	0.23[a] (0.96E-01)	0.87E-01[a] (0.35E-01)	-0.66 (2.24)	-7.76 (4.92)
Legal status: shareholding company with shares traded privately, if traded at all (0/1)	0.17[c] (0.10)	0.65E-01[c] (0.39E-01)	0.78 (1.73)	-4.22 (3.49)
Legal status: sole proprietorship (0/1)	0.40E-02 (0.12)	0.15E-02 (0.44E-01)	0.35 (2.11)	0.30 (4.27)
Legal status: limited partnership (0/1)	-0.16[c] (0.83E-01)	-0.61E-01[c] (0.33E-01)	1.02 (3.63)	6.87 (6.14)
Private domestic ownership share (%)	-0.57E-03 (0.74E-03)	-0.22E-03 (0.28E-03)	0.48E-02 (0.18E-01)	0.25E-01 (0.31E-01)
Location in capital city	-0.32E-01 (0.13)	-0.12E-01 (0.51E-01)	-3.84[a] (1.97)	-2.18 (5.07)
Location city size	-0.37E-01 (0.38E-01)	-0.14E-01 (0.15E-01)	1.12[a] (0.58)	2.01 (1.51)
Lambda			-0.61 (3.42)	-56.00[c] (32.45)
Chi squared, *p*-value	637.90, 0.00			
Log likelihood function	-6,714		-30,795	-30,784
Rho			-0.16E-01	-0.99
Sample size (*n*)	10,489		6,085	6,085

Notes: Superscripts [a,b,c] indicate statistical significance at the 1%, 5%, and 10% levels, respectively. E-*nn* indicates that the coefficient is to be multiplied by 10^{-nn}.

It is useful to consider the size of the probit-model coefficients and the marginal effects in order to gain insight into the magnitude of the effects. For example, the international quality certification effect pushes up the likelihood of tax inspection by about 5%, whereas the manufacturing-sector effect and the female-manager effect both reduce that probability by 3%. The employment coefficient indicates that an extra 100 employees will mean a 1% greater chance of being inspected. In general, the models point to the independent variables' having modest effects on the likelihood of inspection.

The third and fourth columns of results reported in Table 2 are for selection models of the number of tax inspections. A probit model of tax inspection and a selection model of the number of inspections are jointly estimated. Conditional on the business having at least one tax inspection, explained in Model 1, Selection Model 2 presents the total number of inspections. Selection Model 2 includes only corporate characteristics, not country characteristics, as explanatory variables. The only corporate characteristics that are discernible are the number of employees, which has a positive effect on the number of inspections, and the firm's location in the capital city (negative effect) or location city size (positive effect). When country characteristics are included in Model 3's selection estimation, no characteristics other than the manufacturing-sector dummy variable are statistically discernible. None of the included country characteristics matter in explaining tax inspections. In addition, their inclusion in the model causes other explanatory variables to lose significance. Furthermore, this selection model indicates that there is a notable selection bias, as the Inverse Mills Ratio (Lambda) is markedly different from zero, indicating that there is negative selection bias. Consequently, we know that unobserved factors making companies more likely to be targeted for tax inspections (in the first-stage probit equation) tend to be associated with smaller effects in the second-stage equation explaining the number of inspections.

For comparison, Table 3 reports the results of estimation for two OLS regression models of the number of inspections. Model 4 includes only corporate characteristics, while Model 5 also presents country characteristics. Estimated coefficients for Model 4 indicate that private manufacturers that were once state-owned, companies that have been private since their inception, and enterprises located in large cities are hit with more tax inspections. On the other hand, female-managed outfits, as well as those located in the capital city, are subjected to fewer tax inspections. When country characteristics are included in Model 5, the two that matter are CIS location, where businesses experience fewer inspections, and the agricultural intensity of the country's economy, which has a negative effect.

Table 3. Regression Models of Tax Inspections

Variable	Model 4 estimates (standard error)	Model 5 estimates (standard error)
Constant	-0.81 (1.59)	0.87 (4.29)
GDP (PPP 2008)		-0.36E-03[b] (0.17E-03)
Commonwealth of Independent States (CIS) (0/1)		0.55E-01 (0.87)
Value-added tax rate (%)		-0.24E-01 (0.85E-01)
Total tax rate applied to corporations (%)		0.28E-01 (0.31E-01)
GDP growth rate (%)		-0.90E-01 (0.64E-01)
Size of agricultural sector in country's economy (% of GDP)		-0.17[c] (0.99E-01)
Private-sector share of GDP (%)		-0.32E-01 (0.45)
EBRD overall reform index		6.30 (6.63)
Manufacturing sector (0/1)	1.19[c] (0.68)	1.27[b] (0.57)
Manager's experience (years)	-0.41E-01 (0.31E-01)	-0.40E-01 (0.31)
Manager female (0/1)	-0.97[b] (0.48)	-0.84[c] (0.51)
International quality certification (0/1)	0.82 (0.99)	0.78 (1.00)
Competes against unregistered or informal-market firms (0/1)	0.45 (1.13)	0.58 (1.33)
Subsidized by government (0/1)	-0.58 (0.88)	-0.19 (0.92)
Number of employees	0.27E-02 (0.19E-02)	0.28E-02 (0.20E-02)
State-owned enterprise (0/1)	0.82 (0.81)	0.50 (0.93)
Privatization of state-owned enterprise (0/1)	0.71[b] (0.33)	0.70 (0.40)
Originally private firm from startup (0/1)	1.74[a] (0.49)	1.95[b] (0.90)
Joint venture with a foreign partner (0/1)	-0.26 (0.64)	-0.26 (0.65)
Legal status: shareholding company with shares traded in stock market (0/1)	-0.66 (0.93)	-0.39 (1.01)
Legal status: shareholding company with shares traded privately, if traded at all (0/1)	0.63 (1.21)	1.12 (1.46)
Legal status: sole proprietorship (0/1)	0.47 (1.32)	0.31 (1.50)
Legal status: limited partnership (0/1)	0.79 (1.22)	1.17 (1.36)
Private domestic ownership share (%)	0.69E-02 (0.11E-01)	0.48E-02 (0.12E-01)
Location in capital city	-4.01[a] (1.03)	-3.78[a] (0.95)
Location city size	1.20[a] (0.23)	1.12[a] (0.20)
Log likelihood function	-33,295	-30,803
Sample size (*n*)	6,622	6,085

Notes: Superscripts [a,b,c] indicate statistical significance at the 1%, 5%, and 10% levels, respectively.
E-*nn* indicates that the coefficient is to be multiplied by 10^{-nn}.

4.3 Models of Informal Payments

Table 4 reports the results of estimation for informal payments to tax officials and effort levels in tax compliance. Model 1 is a probit model explaining whether a given firm reported having been approached for an under-the-table payment by an official during a tax inspection or meeting. Among the eight country characteristics in the model, all but one are statistically discernible. GDP, the VAT rate, and the size of the agricultural sector all have a negative effect on tax officials' requests for informal payments. CIS location, total tax rate applied to corporations, GDP growth rate, and the private-sector share of GDP all have positive effects on such payments. Among corporate characteristics in the model, three variables reduce the likelihood of informal payment requests, including the firm being a manufacturer, the manager's years of experience, and limited-partnership legal status. Four corporate characteristics increase the likelihood of being asked for an informal payment, namely competition with informal-market companies, being subsidized by the government, having the form of a joint venture with a foreign partner, and location city size. The second column of Table 4 provides the estimated marginal effects for Model 1.

A second probit model is estimated that incorporates two additional explanatory variables: the number of tax inspections and the days of effort expended in tax compliance. Estimates for Model 2 and its marginal effects are reported in the third and fourth columns of the table. Of the two additional variables in the model, only the days of tax-compliance effort is significant, with a positive sign. Thus, the more effort a firm reports expending in tax compliance, the more likely it is to be asked for an informal payment by tax officials.

4.4 Models of Tax-Compliance Effort

Table 5 reports estimates for two selection models where the number of days of effort in tax compliance is explained, conditional on a firm being asked for an informal payment (probit Model 2, reported in Table 4). In Model 1, five of the country characteristics have statistically discernible effects: GDP per capita (positive), CIS location (negative), VAT rate (positive), total tax rate on corporations (negative), and size of the agricultural sector (positive). Among corporate characteristics in the model, only competition with informal-market participants and location city size are significant, both with negative effects. Once again, Selection Model 1 reveals the existence of major selection bias. The coefficient for lambda (inverse Mills ratio) is negative, indicating negative selection bias.

Table 4. Probit Models of Informal Payments to Tax Officials

Variable	Model 1 Probit estimates (standard error)	Model 1 Probit marginal effects (standard error)	Model 2 Probit estimates (standard error)	Model 2 Probit marginal effects (standard error)
Constant	-2.54[a] (0.66)	-0.23[a] (0.56E-01)	-1.94[a] (0.77)	-0.30[a] (0.11)
GDP (PPP 2008)	-0.46E-04[b] (0.19E-04)	-0.42E-05[a] (0.16E-05)	-0.57E-04[a] (0.19E-04)	-0.89E-05[a] (0.28E-05)
Commonwealth of Independent States (CIS) (0/1)	0.39[b] (0.17)	0.37E-01[b] (0.16E-01)	0.45[a] (0.15)	0.71E-01[a] (0.23E-01)
Value-added tax rate (%)	-0.72E-01[a] (0.28E-01)	-0.65E-02[a] (0.24E-02)	-0.76E-01[a] (0.25E-01)	-0.12E-01[a] (0.38E-02)
Total tax rate applied to corporations (%)	0.13E-01[a] 0.49E-02)	0.11E-02[a] (0.41E-03)	0.12E-01[a] (0.44E-02)	0.19E-02[a] (0.65E-03)
GDP growth rate (%)	0.43E-01[b] (0.18E-01)	0.39E-02[a] (0.15E-02)	0.38E-01[b] (0.17E-01)	0.59E-02[b] (0.26E-02)
Size of agricultural sector in country's economy (% of GDP)	-0.26E-01[c] (0.15E-01)	-0.24E-02[c] (0.12E-02)	-0.34E-01[b] (0.14E-01)	-0.53E-02[a] (0.21E-02)
Private-sector share of GDP (%)	0.30E-01[a] (0.11E-01)	0.27E-02[a] (0.10E-02)	0.22E-01[b] (0.11E-01)	0.34E-02[b] (0.18E-02)
EBRD index of overall reform	-0.49 (1.37)	-0.44E-01 (0.12)	0.24 (1.25)	0.37E-01 (0.19)
Manufacturing sector (0/1)	-0.87E-01[b] (0.44E-01)	-0.77E-02[b] (0.40E-02)	-0.66E-01 (0.52E-01)	-0.10E-01 (0.82E-02)
Manager's experience (years)	-0.36E-02[c] (0.21E-02)	-0.32E-03[c] (0.19E-03)	-0.38E-02 (0.24E-02)	-0.59E-03 (0.38E-03)
Manager female (0/1)	-0.67E-01 (0.48E-01)	-0.58E-02 (0.41E-02)	-0.45E-01 (0.59E-01)	-0.69E-02 (0.90E-02)
International quality certification (0/1)	-0.25E-01 (0.47E-01)	-0.22E-02 (0.41E-02)	-0.33E-01 (0.63E-01)	-0.51E-02 (0.95E-02)
Competes against unregistered or informal-market firms (0/1)	0.25[a] (0.45E-01)	0.24E-01[a] (0.43E-02)	0.27[a] (0.52E-01)	0.43E-01[a] (0.88E-02)
Subsidized by government (0/1)	0.22[b] (0.10)	0.24E-01[b] (0.12E-01)	0.21[b] (0.11)	0.36E-01[c] (0.21E-01)
Number of employees	-0.27E-04 (0.43E-04)	-0.25E-05 (0.39E-05)	-0.25E-03[a] (0.87E-04)	-0.39E-04[a] (0.13E-04)
State-owned enterprise (0/1)	-0.12 (0.22)	-0.95E-02 (0.16E-01)	-0.13 (0.31)	-0.19E-01 (0.40E-1)
Privatization of state-owned enterprise (0/1)	0.18E-02 (0.10)	0.16E-03 (0.93E-02)	0.17E-02 (0.14)	0.27E-03 (0.22E-01)
Originally private firm from startup (0/1)	0.53E-01 (0.89E-01)	0.46E-02 (0.76E-02)	0.96E-01 (0.11)	0.15E-01 (0.17E-01)
Joint venture with a foreign partner (0/1)	0.36[a] (0.14)	0.43E-01[c] (0.23)	0.38[b] (0.17)	0.75E-01[c] (0.42E-01)
Legal status: shareholding company with shares traded in stock market (0/1)	-0.71E-01 (0.10)	-0.61E-02 (0.86E-02)	-0.23[c] (0.13)	-0.32E-01[b] (0.16E-01)
Legal status: shareholding company with shares traded privately, if traded at all (0/1)	0.44E-02 (0.90E-01)	0.40E-03 (0.80E-02)	-0.13 (0.94E-01)	-0.20E-01 (0.16E-01)
Legal status: sole proprietorship (0/1)	0.28E-01 (0.94E-01)	0.25E-02 ()0.87E-02	-0.48E-01 (0.94E-01)	-0.73E-02 (0.14E-01)
Legal status: limited partnership (0/1)	-0.36[b] (0.17)	-0.24E-01[a] (0.10E-03)	-0.43[c] (0.26)	-0.50E-01[b] (0.22E-01)
Private domestic ownership share (%)	-0.76E-03 (0.11E-02)	-0.68E-04 (0.10E-03)	-0.16E-02 (0.14E-02)	-0.24E-03 (0.21E-03)
Location in capital city	-0.16 (0.11)	-0.13E-01 (0.93E-02)	-0.22 (0.14)	-0.32E-01 (0.20E-01)
Location city size	0.11[a] (0.38)	0.98E-02[a] (0.37E-02)	0.15[a] (0.48E-01)	0.24E-01[a] (0.77E-02)
Number of tax inspections			0.15E-03 (0.41E-03)	0.23E-04 (0.64E-04)
Days of tax-compliance effort			0.31E-03[a] (0.74E-04)	0.48E-04[a] (0.11E-04)
Chi squared, *p*-value	574, 0.00		424, 0.00	
Log likelihood function	-2,131	-2,131	-1,611	-1,611
Sample size (*n*)	10,489	10,489	5,186	5,186

Notes: Superscripts [a,b,c] indicate statistical significance at the 1%, 5%, and 10% levels, respectively. E-*nn* indicates that the coefficient is to be multiplied by 10^{-nn}.

Table 5. Selection Model of Days of Tax-Compliance Effort

Variable	Model 1 estimates (standard error)	Model 2 estimates (standard error)
Constant	9175.91[b] (4427.44)	5611.30[c] (3231.84)
GDP (PPP 2008)	0.19[b] (0.81E-01)	-0.44E-01 (0.75E-01)
Commonwealth of Independent States (CIS) (0/1)	-1457.75[c] (888.41)	-1243.57[c] (760.22)
Value-added tax rate (%)	246.86[c] (134.38)	-200.46[b] (97.44)
Total tax rate applied to corporations (%)	-38.13[b] (18.77)	2.29 (15.91)
GDP growth rate (%)	-129.36 (87.35)	32.18 (62.78)
Size of agricultural sector in country's economy (% of GDP)	112.76[c] (61.21)	47.05 (48.63)
Private-sector share of GDP (%)	-67.20 (41.83)	-76.88[b] (38.86)
EBRD index of overall reform	-1025.62 (4701.65)	-978.06 (4485.29)
Manufacturing sector (0/1)	204.57 (237.96)	161.00 (218.83)
Manager's experience (years)	12.62 (11.43)	-82.99[a] (27.09)
Manager female (0/1)	144.82 (275.68)	103.30 (258.33)
International quality certification (0/1)	115.35 (266.25)	87.09 (250.15)
Competes against unregistered or informal-market firms (0/1)	-860.07[b] (364.21)	-731.12[a] (277.41)
Subsidized by government (0/1)	-635.52 (487.13)	0596.07 (439.64)
Number of employees	0.822 (0.57)	-1.74[b] (0.81)
State-owned enterprise (0/1)	499.30 (1379.14)	467.75 (1312.58)
Privatization of state-owned enterprise (0/1)	13.64 (628.47)	14.05 (596.95)
Originally private firm from startup (0/1)	-281.79 (540.68)	-226.49 (507.28)
Joint venture with a foreign partner (0/1)	-1121.18 (869.80)	-909.44 (776.64)
Legal status: shareholding company with shares traded in stock market (0/1)	737.41 (562.62)	656.31 (510.95)
Legal status: shareholding company with shares traded privately, if traded at all (0/1)	387.09 (430.53)	355.94 (402.33)
Legal status: sole proprietorship (0/1)	156.10 (430.35)	131.52 (405.15)
Legal status: limited partnership (0/1)	1356.98 (1193.87)	1222.33 (1108.15)
Private domestic ownership share (%)	5.11 (5.19)	-7.54 (5.93)
Location in capital city	773.35 (713.98)	788.57 (692.83)
Location city size	-513.68[c] (307.65)	-331.69 (243.20)
Number of tax inspections		2.25 (9.30)
Log likelihood function	-4,224	-3,179
Lambda	-4049.90[a] (1478.64)	3854.87[a] (1128.05)
F statistic, *p* value	604, 0.00	657, 0.00
Sample size (*n*)	583	583

Notes: Superscripts [a,b,c] indicate statistical significance at the 1%, 5%, and 10% levels, respectively. E-*nn* indicates that the coefficient is to be multiplied by 10^{-nn}.

Consequently, we know that unobserved factors that make businesses more likely to be solicited for bribes (in the first-stage probit equation) tend to be associated with smaller effects in the second-stage equation displaying the number of days of tax-compliance effort.

Selection Model 2 is identical to Model 1, with the addition of the number of tax inspections as an explanatory variable. The number of inspections is not statistically significant, however. Apparently, tax-compliance costs are independent of the number of tax inspections or meetings. It should be noted, however, that the addition of this independent variable in the selection model results in substantial coefficient-estimate changes for several other variables in the model. GDP per capita, which was positive and significantly different from zero in Model 1, turns negative and insignificant in Model 2. The VAT rate, which was positive and weakly significant in Model 1, turns negative and significant in Model 2. The private-sector share of GDP, managerial experience, and the number of employees, which were all insignificant in Model 1, are negative and significant in Model 2. Most interesting is the fact that the inverse Mills ratio (lambda), which is negative and significant in Model 1, turns positive and significant in Model 2.

These results would indicate a reversal in the direction of the sample-selection bias estimated in the models. The instability of these results indicates that they should be viewed with caution. Also note that the sample sizes in Models 1 and 2 estimations are much smaller (n = 583) than in the previous models.

5. Summary and Conclusions

This paper has examined the ways that tax inspections and tax officials' requests for informal payments have an impact on businesses operating in transition countries. Using 2009 corporate-level survey data collected by the EBRD and the World Bank, we modeled several aspects of the ways that tax inspections affect firms. The models estimated control for the sample selection involved, recognizing that companies reporting having been inspected may systematically differ from those that have not been inspected. In addition, selection bias for those reporting that a tax official has asked for a pay-off was controlled for. This analysis demonstrates that there are clearly identifiable ways that the tax-inspection process creates inefficiencies and fosters an environment in which bribery can flourish. The empirical models indicate that there are both country-specific and company-specific characteristics that systematically influence tax inspections, requests for informal payments to tax officials, and staff costs related to tax compliance.

The theoretical model of the corporation yields four testable hypotheses. Of these, the first three are testable given the data available. First, firms that are inspected more frequently are more likely to make informal payments to tax officials because each inspection allows the inspector an opportunity to request a payment or impose an implicit constraint on input use. Second, if tax inspections are linked to an organization's employment (labor-input usage), then those with greater employment will be more likely to report informal payments to tax officials. Third, in countries that have succeeded in bringing about more economic reforms than others, the difference between a company's desired input use and the implicitly constrained input use may be greater, leading to higher inefficiency and more of a willingness on the part of management to hand over cash in order to relax the input constraint.

The evidence provided in the models indicates that whether a firm is subject to a tax inspection depends, in part, on certain country characteristics, among them the GDP growth rate and the private-sector share of GDP, both of which boost the probability of a tax inspection. Corporate characteristics also matter, including whether the corporation is in manufacturing or has a female manager, both of which reduce the incidence of tax inspections. On the other hand, corporate characteristics that raise the probability of tax inspection include competition with informal-market firms, international quality certifications, and legal status as a shareholding company with shares traded publicly.

For the second hypothesis—if tax inspections are linked to a company's employment (labor-input usage), then those with greater employment will be more likely to report informal payments to tax officials—the evidence confirms our model's estimate. A key corporate characteristic that ups the estimated likelihood of tax inspection in the models presented in this paper is the number of employees, with larger firms having a greater chance of being inspected. It is just this type of input-based criteria for tax inspections that can turn into a disincentive for companies to hire additional workers, and it creates a potential inefficiency in a firm's operations that can also feed into its willingness to pay off a tax official.

The third hypothesis developed from the theoretical model—that greater overall economic reform may result in a rise in the willingness of businesses to pay bribes in order to relax input constraints—is apparently not true. The empirical results indicate that overall economic reforms have no impact on informal payments. Anderson (forthcoming) submits evidence that greater price-liberalization reform has a negative influence on firms' reported obstacles in doing business, but the present analysis indicates no relationship between overall economic reforms and informal payments to tax officials. This (negative) result may reflect the fact that money paid to tax officials, in particular,

has more to do with the specific institutional context in which tax inspections take place and reflects the tax-administration regime more than anything else.

In addition, the model estimates reported in this paper reveal that higher tax-compliance costs contribute to an increased likelihood of firms making informal payments to officials. The marginal effect of additional days of tax-compliance effort is shown to correlate with corporate reports of bribe requests from tax officials. Clearly, the tax-administration programs are placing bottlenecks in the tax-compliance process and using the resulting inefficiency to extract informal payments from companies. These results indicate that tax inspections and compliance costs are a serious impediment to economic development in transition countries. A corrupt tax-administration process creates an environment in which businesses report that they tend to make informal payments in order to get things done.

Policy recommendations for improving economic-development strategies in these countries should therefore first include reform of the tax-administration process. The evidence presented here indicates that the problem is not so much the number of tax inspections or meetings with tax officials, but rather the cost in staff time incurred by the firm in complying with tax laws and regulations. The greater that cost, the more likely the enterprise is to be asked for a bribe. Therefore, tax officials apparently impose costly compliance obstacles accompanied by subsequent opportunities to obviate those obstacles by way of informal payments. Whether those compliance obstacles are legitimate, given the country's tax laws, or not cannot be determined from the data used in this analysis. What is clear, however, is that as compliance cost rises, the likelihood that companies are asked for informal payments by tax collectors increases. Tax officials may simply be taking the opportunity the tax code gives them to extract payments from firms.

In any case, the policy solution is to make the tax code and its administration more transparent. By lowering compliance costs and removing tax officials' opportunities, informal payments can be reduced. Monitoring of tax officials’ interactions with taxpayers is also necessary. Once these policy issues are resolved, much of the incentive for bribery and corruption will also be removed, enabling the economy to operate more efficiently.

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