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Abstract

This paper reports the first empirical evidence that fiscal reform efforts in transition countries have positive effects. Using the EBRD BEEPS I and II data, reported in 1999 and 2002, rigorous econometric models are estimated showing that the share of bribes paid to tax collectors is reduced in countries with more extensive fiscal reforms. This effect controls for selection bias in the likelihood that firms are required to make unofficial payments to tax authorities. On the basis of this evidence, we now have some confidence in the success of fiscal reform efforts. In addition, we have insight regarding what forms of fiscal reform may be more successful as the share of revenues generated from direct taxes (both personal and corporate) has an impact on tax bribes.

JEL codes: C21, H25, O23, O52

Keywords: Fiscal reform, Bribery, Transition economies, Eastern Europe, Central Asia

1 Introduction and Background

Over the past fifteen years we have witnessed one of the largest economic experiments in history as many of the formerly socialist countries of Eastern Europe and Central Asia have undergone fundamental economic transformations. Moving away from central planning to market reliance in the allocation of resources in both factor and product markets, these countries have experienced wrenching transition processes as they have struggled to establish the institutions necessary to support greater market reliance. This has required fundamental changes in the role and institutions of the public sector, including changes in the tax system. Fiscal reform projects, often aided by technical assistance provided by the United States Agency for International Development (USAID) and the European Union (EU), have been carried on to varying degrees in most of the transition countries. These projects typically involve rewriting tax laws to make the tax systems more compatible with market economies, establishing modern treasury functions, and improving administration of the tax collection agency. With all of this effort, however, there is precious little hard empirical evidence that the fiscal reforms have made life easier for firms struggling to be successful in these transforming economies.

While fiscal reform projects have been conducted in transition countries since the early 1990s, the assessment of specific impacts has been lacking. The purpose of the research reported in this paper is to begin an assessment of the specific impacts of fiscal reform in transition countries. Fiscal reform projects have heretofore lacked micro-level testing of whether project accomplishments have made life better for businesses operating in their country. Other things being equal, we would expect that reform of the public sector should assist firms in conducting business.

Firm-level survey data collected by the European Bank for Reconstruction and Development (EBRD) and the World Bank is now available that enables researchers to analyze the potential impacts on firms. The Business Environment and Enterprise Performance Survey (BEEPS) was conducted in 1999 (BEEPS I) and repeated again in 2002 (BEEPS II). The surveys included approximately 3,000 firms in 20 transition countries in 1999 and 6,000 firms in 27 countries in 2002. Table 1 provides a

comprehensive list of the countries included in both surveys. This data has been useful to researchers who have analyzed the prevalence of corruption, the extent of state capture of firms during the transition process, and matters of governance. See, for example, Hellman, Jones, Kaufmann, and Schankerman [13], and Helman, Jones, and Kaufmann [12].

Hellman et al [13] analyzed the BEEPS I data on both the frequency of firms admitting to paying bribes and, conditional on that admission, the percentage of revenues paid in bribes. They report summary statistics for each country in the survey. The percentage of firms admitting to ever paying bribes spans the range from approximately 45% in Slovenia and Belarus, to a high of approximately 90% in Kyrgyzstan, 85% in Azerbaijan, and 80% in both Romania and Uzbekistan. Firms admitting to ever paying bribes then reported the percentage of revenues typically paid in bribes ranging from a low of approximately 2% in Croatia and 3% in Poland and Estonia, to a high of approximately 8% in Georgia, 7% in Armenia and Azerbaijan, and 6% in Kyrgyzstan, Moldova, Ukraine, and Uzbekistan.

Tanzi and Tsibouris [25] were among the first to report BEEPS I data in analysis of transition countries. In their comprehensive review of fiscal reform over the first decade of activity in transition countries, they analyzed both the frequency and extent of the so-called bribe tax, or the required unofficial payments taxpayers made to tax officials. They reported the percentage of firms in each of the transition countries bribing frequently or more often, and also reported the average bribe tax as a percentage of annual firm revenues. The percentage of firms bribing frequently or more often ranged from a low of 7.7 percent in Slovenia to a high of 59.3 percent in Azerbaijan. The average bribe tax as a percent of annual firm revenues ranged from a low of 2.1 percent in Croatia to a high of 8.1 percent in Georgia.

Neither the Hellman et al nor the Tanzi and Tsibouris analysis go beyond the simple reporting of descriptive statistics on the frequency of bribe paying and the amount of bribes paid, however. Kaufmann et al [15] do not go beyond descriptive analysis either. In what follows, we will estimate simultaneously equations to explain both the frequency of bribe paying and the amount of bribes paid.

Tanzi and Davoodi [26] also report analysis of BEEPS I data on bribes as they act as a regressive tax, with bribes paid (as a share of annual revenue) falling with the size of the enterprise. The original analysis of this data is from EBRD [8]. These and other initial uses of BEEPS I data are simple applications in which the survey data have been used to provide descriptions of the situations in transition countries. There has been very little analysis using the survey data to conduct rigorous statistical tests of refutable hypotheses.

The BEEPS data also makes it possible to begin, for the first time, analyzing whether how the considerable fiscal reform efforts exerted in transition countries have affected the business environment. Using the considerable variation in fiscal reform projects and their progress across transition countries we can augment the BEEPS data with country-specific data on fiscal reform efforts. Benchmark events in each country's fiscal reform can be used to approximately measure the advance of fiscal reform. For example, we can include variables that capture the presence of an accounting reform project, the presence of a fiscal reform project, the adoption of new budget rules, the establishment of local treasuries, the adoption of a destination-based valued added tax (VAT) or system of excise taxes, the adoption of a revised and comprehensive tax code, and other important fiscal reforms.

2 Transition and Taxes

Fiscal reform in transition countries has involved fundamental re-structuring of both the revenue and expenditure systems to facilitate the larger transition to market-oriented resource allocation in the economy. On the expenditure side, fiscal reform efforts have rationalized public sector responsibilities, introduced hard budgets and modern budgeting processes, and established treasury functions. On the revenue side, the focus of fiscal reform efforts has been on the development of a comprehensive tax code, the establishment of a destination-based consumption-type VAT, the implementation of a corporate income tax based on market-based net income, the widespread elimination of exemptions and preferences. For an overview of the typical fiscal reforms recommended and implemented in transition countries, see Lorie [17], Martinez-Vazquez and McNabb [19], [18], Summers and Baer [24], Stepanyan [23], and Tanzi and Zee [27].

Mitra and Stern [20] have analyzed the transition experience of CIS and CSB countries (Central and Eastern Europe and the Baltics) and compared their experiences to high-income OECD countries. They have identified opposing movements in key ratios often used to monitor fiscal reform. Both tax levels and the composition of tax revenue sources are considered in assessing progress in fiscal reform. Opposing effects arise, however, in two ways. First, there are opposing effects between the beginning of transition and the situation at the end of a decade of transition. Second, there are opposing effects in cross-section comparisons of transition countries after a decade of reform and highly developed industrial countries. For both reasons, Mitra and Stern suggest that there is a U-shaped temporal pattern of the share of tax revenues to GDP and the shares of major taxes in tax revenue.

In the cross-section comparison of transition countries, there are several factors to consider. There is a loss of revenue from traditional profit, turnover, and payroll taxes due to the non-competitive nature of state enterprises. Price liberalization, new hard budget constraints, and private competition combine to reduce the potential revenue generated by taxing these entities. Furthermore, the complexity of fiscal reform has involved a limited ability to quickly implement a broad-based low-rate tax structure that is effectively administered. The challenge has been that of instituting a new tax system that fosters compliance among new and restructured enterprises, before they are driven underground. For both of these reasons it has been difficult for transition governments that formerly operated with a preemptive claim on the output of enterprises and the associated income generated and earned. Under the centralized systems before transition, the government exercised its claim to resources before citizens had access to the remainder. With transition and a less centralized system, however, the government has a diminished role and is forced to collect revenue in order to support spending. Mitra and Stern identify several implications of this transition situation, including a reduction in the ratio of tax revenue to GDP (due to declining corporate income tax revenue), a reduction in the ratio of public expenditures to GDP (due to a macroeconomic need to reduce fiscal deficits to control inflation), a reduction in the importance of income taxes (due to the reduced corporate income tax revenue), a reduction in the importance of social insurance tax revenues in CIS countries, an increase in the share of individual

income taxes, and an increase in the importance of indirect taxes such as VAT and excises taxes (reflecting the decline in direct taxes). With fiscal reform we expect a rise in the ratio of tax revenue to GDP, an increase in the share of direct taxes in tax revenue, an increase in the share of revenue from personal income taxes, a reduction in the share of revenue from domestic forms of indirect taxation, and a reduction in the role of trade taxes.

Tanzi and Tsibouris [25] discuss the expectation that progress in fiscal reform should result in improved revenue performance. They caution, however, that many of the reforms were recently implemented and have not yet been fully felt. Some reforms are revenue-reducing (such as the elimination of export taxes and excess wage taxes). Furthermore, many tax policy reforms have been hindered by problems in tax administration. Concern over tax evasion has been a particularly vexing issue in many transition countries. In one study of tax evasion Anderson and Carasciuc [2] examined evidence from the Republic of Moldova and found quite predictable effects, with greater measured tax evasion in sectors of the economy where audit frequencies were lower and/or where the real value of fines and penalties were lower.

2.1 Reform Measures
2.1.1 Subjective Measures of Fiscal Reform

A number of analysts engaged in assessing the extent of fiscal reform during the first decade of transition. Consequently, we have available several indices of the extent of reforms. We may use these indices as measures of the breadth and depth of reforms in an attempt to determine whether reforms have had an impact on the business environment in which firms operate. Two sources of reform measurement are considered in what follows.

First, we use the subjective reform measures computed by Martinez-Vazquez and McNab [18]. They created two reform measures: a cumulative reform index (CRI) and an overall reform index (ORI). Their CRI measure is constructed using data from twenty-four transition countries over the period 1989-96.

They use six measures of the effectiveness of reform, including:

• Timing of tax reform—the period of time from the start of the transitional process of the implementation of a tax reform program that included a modern VAT.

• Preparation for tax reform—the average period of time allocated for preparation of legislation and preparation for implementation.

• Stability of the tax system—frequency of changes in the tax laws since the initial reform program.

• High tax rates—positive deviation of the maximum rates for the primary revenue sources from the average maximum rate for the primary revenue sources of all countries in transition.

• Prevalence of tax holidays—significance of tax holidays and special treatments.

• Complexity—number of enterprise profit tax brackets.

Using the scores from all six of these measures, Martinez-Vazquez and Mc-Nab construct a cumulative reform index CRI by summing each country's six scores. CRI scores range from a low of 3 to a high of 17, with a mean of 11.75. A low score indicates more advanced reform. The most advanced reform countries include Czech Republic, Estonia, Latvia, and Croatia. High intermediate reform countries include Slovak Republic, Hungary, Lithuania, Poland, Kazakhstan, and Slovenia. Low intermediate reform countries include Bulgaria, Kyrgyz Republic, Turkmenistan, Ukraine, Albania, Romania, Russian Federation, and Tajikistan. Slow reform countries include Georgia, Azerbaijan, Armenia, Uzbekistan, Moldova, and Belarus. Then, they construct an overall reform index ORI by assigning an index value from zero to 3 for countries in each of these groups. Here again, the lower the index score, the more advanced the reform.

Second, we use the subjective reform measure reported by Ebrill and Havrylyshyn [4] who conducted a study of fiscal reforms in CIS and Baltic countries for the IMF. Their TPR index of tax policy reform over the period 1992-98 measured the degree of policy reform using a scale from one, indicating very little appropriate market-oriented reform, to a score of 5, indicating a high degree of reform.

These three indices of tax policy reform are used in the models described below in order to assess whether the degree of fiscal reform has had a measurable impact. In addition, we use objective measures of the extent of reform, as described in the next section.

2.1.2 Objective Measures of Fiscal Reform

In addition to the subjective measures of fiscal reform described above, we use objective measures of reform in order to gain as broad a perspective as possible on the effects of reforms.

The primary objective measure of fiscal reform we use is the share of tax revenue generated by direct taxes, including personal and corporate income taxes. As explained in section two, this key ratio is an indicator of the extent of fiscal reform. In the initial stages of reform the ratio is relatively low as countries rely heavily on excises, customs duties and other forms of indirect taxation. As reform proceeds, however, the ratio rises. Hence, we use the share of revenues derived from direct taxes as an objective measure of tax reform. The direct tax measure used in the BEEPS I analysis is taken from Mitra and Stern [20], Table 2 reporting taxes on income, profits, and capital gains during the early years of transition as a percent of tax revenue. In the 2002 BEEPS II analysis use the Mitra and Stern Table 4 (average for 1999 and 2000) reported share of direct taxes as a percent of tax revenue.

A secondary objective measure of fiscal reform is a micro-level indicator. We use a dichotomous variable indicating that the firm uses international accounting standards as a measure of fiscal reform. This may be an indicator that there has been a successful accounting reform project in the country. Or, it may indicate that the firm is a subsidiary of a foreign-owned firm. In either case, we anticipate that is measure will also reveal whether firm-level reform is effective.

3 Methodology

The research reported in this paper is based on analysis of BEEPS data augmented with country-specific information, including data on fiscal reform projects and their accomplishments. We conduct rigorous econometric analysis of firmlevel data on responses to survey questions related to the public sector and its effects on the business environment. The typical survey question provides a vector y of firm responses to a question and the survey instrument provides a matrix x of observations of firm characteristics. In particular, we are interested in the size of the unofficial payments, or tax bribes, that firms are required to make and whether fiscal reform efforts affect these tax bribes. We will augment the survey data with country-specific economic data, described in a matrix z, and country-specific information on fiscal reform efforts, described in a matrix r. Hence, analysis of the tax bribe might involve estimation of a model explaining y, such as,

$$y = \beta 0x + \gamma 0z + \delta 0r + \varepsilon, \tag{1}$$

where the coefficient vectors β, γ, and δ are estimated. Estimates of the coefficients in the vector δ have the potential to inform analysis of the effects of fiscal reforms across transition countries. A simple regression of this type is unlikely to be very informative, however. The problem is that there is likely to be substantial selection bias. We only observe tax bribe information for those firms that report having to make such bribes. Those firms may be systematically different from other firms in the survey sample. Hence, we need to account for the likelihood that firms are asked to pay tax bribes as we also model the amount they report paying.

We have survey questions asking firms both the likelihood that the firm is asked to pay a bribe and the proportion of bribes the firm must pay that is associated with taxes. Consequently, we can estimate a two-equation system in which we control for sample selection and jointly estimate the likelihood of being asked to pay a bribe and the size of bribes paid to avoid taxes. In such a case, we will estimate standard sample selection models using either two-stage least squares or maximum likelihood methods. Another example arises from the fact that we have sufficient survey information to model the

interaction of bribery and taxation. Firms were asked in the BEEPS survey how frequently they are faced with demands for bribes. They were also asked what percent of revenues they typically paid per year in unofficial payments to public officials.

Furthermore, they were asked how much they paid in bribes across nine specific services, including: connection to public services, licenses, taxes, government contracts, customs, courts, health or fire inspections, influence legislation, and other services. Using this data, we can estimate a model that jointly explains the likelihood of being asked to pay bribes and the amount of bribes paid (focusing specifically on those bribes that are tax-related). Hence, we can gain accurate information on both the prevalence of bribe-taking by tax officials and the extent of bribe-taking, conditional on its prevalence. This type of model permits more insightful analysis of the effects of fiscal reform efforts than has been possible with aggregate data in the past. Analysis based on aggregate data does not permit estimation of careful distinctions between prevalence and extent. Using firm-level data and appropriate econometric methods, such distinctions can be made.

We will begin with the simplest selection model with a selection criterion. A model of firm behavior or experience y (in this application, being required to make unofficial payments to the tax authorities) is explained by a set of explanatory variables in the matrices x, z, and r. This model applies to all firms, but the observed data (on the level of bribes paid or the share of bribes paid to avoid taxes) are not drawn randomly from this population. Rather, we observe the firm and its data when another variable $z*$ crosses a specified threshold. If we were to treat the observed data as a random sample, instead of coming from the sub-population with particular properties, our estimation would be subject to serious bias. Instead, we use an auxiliary equation to model the selection process that generates $z*$. The combined equations and the error term assumptions are given as:

$$y = \beta_0 x + \gamma_0 z + \delta_0 r + \varepsilon \tag{2}$$

$$z* = \psi_0 v + u$$

$$\varepsilon, u \sim N[0, 0, \sigma^2_\varepsilon, \sigma^2_u, \rho]$$

where σ_ε, σ_u are the standard errors of the error terms and ρ is the correlation of the error terms, ε and u, in the two equations. The problem is that $z*$ is not directly observed, but a

variable z is observed with the property that z = 1 if z∗ > 0 and z = 0 if z∗ ≤ 0. Values of y and x in the first equation are observed only when z = 1.

If we simply estimated a model using least squares regression for the observed tax bribe data following the specification for y in equation (2) we would obtain inconsistent estimates of the parameter vectors β, γ, and δ. Ignoring z and r for the moment, we know that the expected value of y is given as,

$$E[y \mid y \text{ is observed}] = E[y \mid z\ast > 0] = \beta_0 x + \beta_\lambda \lambda(\alpha u), \qquad (3)$$

where

$$\alpha u = -\psi_0 v / \sigma u, \qquad (4)$$

$$\lambda(\alpha u) = \varphi(\psi_0 v / \sigma u) / \Phi(\psi_0 v / \sigma u)$$

Hence, a simple ordinary least squares regression of tax bribes y on a vector of explanatory variables x would have an omitted variable and our estimate of the β coefficient vector would be inconsistent as it lacks the second term in equation (3). If we compute the term λ(αu),the so-called inverse Mills ratio, and include it in the regression, we can obtain a consistent estimate of β. In the estimation results presented below, we use this two-step Heckman procedure and first estimate a probit model, z∗ = ψ_0 v +u, of firms being asked to pay tax bribes, then use that equation to estimate the selection equation for the amount of tax bribes reported, conditional on the firm being asked to pay tax bribes.

Another related research question that we do not address is the prevalence of paying taxes in in-kind or non-monetary means. This includes tax offsets and netting operations performed by the Ministry of Finance. See Anderson [1], Commander and Mumssen [3], Ickes and Ryterman [14], and Ledeneva [16] for discussions of this issue and the related issue of inter-firm arrears in transition economies. Since the BEEPS survey data includes firm responses to a specific question on the extent to which taxes are paid in such ways we could estimate a model that provides insight on the country conditions and government policies that make this practice more or less prevalent. This would permit the first firm-level analysis of these practices and the changing reliance on these practices by governments over time, but we leave this for future research.

4 Empirical Results

This study will provide the first rigorous statistical analysis of the impacts of fiscal reform efforts on the business environment in transition countries. By using firm-level micro data at two points in time, 1999 and 2002, we will be able to assess how fiscal reform projects and their accomplishments may be affecting the business environment in which individual firms are operating and experiencing the effects (or lack thereof) of reforms. Keeping in mind that the 1999 survey asked questions about conditions three years prior, we have a window on what firms experienced over the period from 1996 to 2003. With the combined variation across countries and over time we anticipate being able to identify some specific effects of fiscal reform efforts, as business firms have perceived them.

Such results will advance our knowledge of the nature and manifestations of corruption, as described in Schleifer and Vishny [21] and of the way politicians and firms behave, as described in Schleifer and Vishny [22]. Secondly, these results will inform our assessment of the so-called virtual economy that is prevalent in transition economies, as described in Gaddy and Ickes [9], [10], [11], Ericson and Ickes [7], and Ericson [6], [5]. Finally, these results will inform policy assessment of fiscal reform in transition economies, as in Tanzi and Tsibouris [25].

Consequently, we anticipate having the first direct evidence with which to assess the success or failure of the various fiscal reform efforts that have been attempted across a broad range of transition countries. To date, assessment of fiscal reform programs has been severely limited by a paucity of data related to their impacts. We anticipate that this study will be the first to rigorously provide insight on these important programs and their likely effects.

4.1 BEEPS I (1999) Model Estimates

We begin our analysis with a simple examination of the likelihood that firms says they are asked to make unofficial payments to tax officials. The initial pobit equation estimated uses three variants of firm answers to question 28 as the dependent variable:

Q28 yes indicates that firms responded affirmatively regardless of the frequency, Q28 always indicates firms responded that they always need to make unofficial payments, and Q28 never indicates that firms responded never having to make unofficial payments. Table 3 reports probit estimation of an initial model explaining the likelihood that firms are asked to make unofficial payments for tax purposes. Independent variables included in the model control for the level of economic activity in the country (GDP per capita), the rate of economic growth in the country (GDP growth rate), the importance of agriculture in the economy (agricultural value-added as a share of GDP), location in the CIS, firm use of international accounting standards, firm size measured by full-time and part-time employees, firm use of the internet, and direct taxes as a share of total tax revenue. The first column reports estimation of the Q28 yes model. Firms were more likely to report being asked to make unofficial payments for tax purposes in countries with lower GDP per capita, since the GDP per capita variable has a negative and significant estimated coefficient. Firms with larger full-time employment were also less likely to be asked to make unofficial payments, although those with larger part-time employment were more likely to be asked to pay bribes. Firms with access to the internet were less likely to be asked for bribes. Finally, the larger the share of tax revenue derived from direct taxes in the country where the firm is located, the less likely the firm is to be asked to pay bribes. Note that the probit estimation for the Q28 never model has identical estimated coefficients, with the exception of the sign, and identical standard errors. This is due to the fact that the Q28 never variable is simply one minus the Q28 yes variable.

The center column of results in Table 3 reports an estimation of a probit model explaining the likelihood that firms report always having to pay tax bribes. The GDP per capita variable is negative and significant indicating that in countries with higher GDP per capita firms are less likely to always be asked to pay tax bribes. The agricultural value-added variable is negative and marginally significant, indicating weak evidence that firms are less likely to be asked to always pay tax bribes in more heavily agricultural economies. The only other significant variable in the model is the full-time employment variable, which has a negative estimated coefficient. Firms with larger employment are less likely to always be asked to pay tax bribes.

While these probit models explaining the likelihood of firm responses regarding

tax bribes are insightful, they are not fully revealing of the important issues we wish to examine. We want to model both the likelihood of firms having to pay tax bribes and the size of the bribes paid. We also want to examine whether the extent of fiscal reform has a significant impact on tax bribes. To accomplish that purpose we must estimate a selection model. The selection probit equation uses the dependent dichotomous variable that firms report affirmatively on BEEPS I question 28. Independent variables in the probit selection model explain the likelihood that firms are asked to make unofficial payments. Hence, the independent variables measure the level of economic activity in the country and include GDP per capita, the GDP growth rate, agricultural value-added, a dichotomous variable for CIS countries, and the ratio of tax revenue to GDP. These variables are used to control for the overall level of economic activity and the state of the fiscal system in the country and their effects on the level of tax corruption.

Table 4 reports both the selection Probit regression model and the corrected tax bribe regression models using three different subjective measures of the extent of fiscal reform, the Martinez-Vazquez and McNab ORI and CRI measures and the Ebrill and Havrylyshyn TPR measure. All three of these models use a common probit estimation for the likelihood of firms being required to pay tax bribes. Then, in the second stage of the estimation procedure we estimate the corrected regression for the amount of tax bribes (as a percent of total annual bribes paid for all purposes), including the sample selection correction (inverse Mills ratio).

The estimated Probit model includes explanatory variables intended to control for the level of economic development (and correspondingly the extent of transition) and the rate of economic growth across the countries in the BEEPS I sample. All five variables and the constant term are significant, permitting us to reject the null hypotheses that the variables have no effect on the likelihood of being required to pay tax bribes. The first variable is the GDP per capita (measured in PPP terms). The estimated negative coefficient on this variable indicates that the higher GDP per capita, the less likely a firm in that country is to be required to pay tax bribes. The second variable in the model is the growth rate of GDP in the country. This variable has a positive estimated coefficient, indicating that a firm in a fast-growing country is more likely to be asked to pay a tax bribe. In addition to controls for the level of economic development and the growth rate,

the model includes three variables that capture other important conditions that affect the likelihood of firms being required to pay tax bribes. The agricultural value-added variable is included to distinguish between countries that are highly reliant on agricultural production and those that are less agricultural in their economic output. The estimated coefficient on this variable is positive, indicating that firms in more agricultural countries are more likely to be required to make unofficial payments to tax authorities. A dichotomous variable for countries in the Commonwealth of Independent States (CIS) of the former Soviet Union is also included, since their tax administration systems may be systematically different from those of countries outside the CIS. The estimated negative coefficient on this variable indicates that firms in CIS countries are less likely to be required to pay tax bribes, other things being equal. Finally, the Probit model includes a variable to control for the level of taxation across countries, the ratio of tax revenue to GDP. The estimated coefficient on this variable is negative, indicating that the higher the level of taxation, the lower the probability that a firm will have to pay tax bribes, other things being equal.

The second stage of the estimation process is to take the results of the Probit model and use those results to estimate the inverse Mills ratio (λ) and include it in the tax bribe equation to correct for sample selection bias. We estimate three variants of the corrected tax bribe equation, including three alternative measures of fiscal reform. In all three corrected regressions the fiscal reform measure is a significant determinant of the amount of tax bribes paid. The CRI and ORI measures both have estimated coefficients that are positive. Recalling that these reform measures are inversely related to the extent of reform, the positive coefficients indicate that tax bribes are smaller in countries with more extensive fiscal reform. The TPR measure of fiscal reform is directly related to the extent of reform, hence the negative estimated coefficient on that variable in Model 3 also indicates that tax bribes are smaller in countries with more extensive reform. All three subjective measures of fiscal reform are significant determinants of the tax bribes paid by firms in transition countries.

Table 5 provides estimates of the final selection model that includes both subjective and objective measures of fiscal reform, in two variants. Both 2SLS and maximum likelihood estimates are reported. The table reports the selection probit model

estimation in the upper panel and the corrected regression for the selected regime in the lower panel. The lower panel of the table provides model estimates for the corrected regression. Controlling for the likelihood of the firms being asked to make unofficial payments to tax officials, this equation explains the share of firms' gross receipts paid in unofficial tax payments. The first set of variables included in the model control for firm characteristics, including the number of both full time and casual employees, trade relationships with the state sector, and the use of the internet in the business. The full time employment size variable has a positive estimated coefficient in both estimates indicating that the larger the employment level of the firm the larger the share of gross receipts it pays in tax bribes. The number of casual employees has a negative, but not statistically significant effect on tax bribes. Trading with the state has the effect of lowering the unofficial tax payments made by firms. Use of the internet increases the size of unofficial tax payments, but the effect is not statistically discernible.

Fiscal reform measures included in the model include both subjective and objective measures of reform. An accounting reform variable is used to capture whether firms are using international accounting standards (Question 43 from the BEEPS I survey). This measure is included as an objective measure of firm-level reform. The estimated coefficient on this variable is negative in the 2SLS model, but positive in the MLE model. In neither case is the accounting standard variable statistically discernible, however. Apparently, the mere fact that the firm uses international accounting standards has no effect on the size of bribes paid. The model also includes a variable measuring the share of direct taxes (personal and corporate income taxes) relative to total taxes. This is another objective measure of fiscal reform. We expect that as fiscal reform advances direct forms of taxation (personal and corporate income taxes) replace indirect forms of taxation (excises, customs duties, and VAT). The estimated coefficient estimate on the direct tax share variable is negative and highly significant in both model estimations, indicating that the larger the share of direct taxes in the country the lower the share of firms' gross receipts paid in unofficial tax payments. As fiscal reform generates a greater share of tax revenue from direct taxes we see that the size of tax bribes is reduced. Finally, we include a subjective measure of reform using the Martinez-Vazquez and

McNab CRI reform measure (measuring cumulative reform in the country). The estimated coefficient on this variable is positive and significant in both estimated models. Recalling that the CRI index value is inversely related to the extent of reform, this estimated coefficient indicates that countries with more advanced reforms pay smaller amounts in tax bribes. Hence, we have evidence that the extent of fiscal reform, as measured by this subjective index of reform, has an impact on tax bribes paid by firms, after controlling for the likelihood that the firm is required to make such payments.

The estimated coefficient for λ, the inverse Mills ratio in the two-step model, is negative and highly significant, reflecting the presence of sample selection bias. Hence, we are justified in estimating a selection model rather than a simple regression explaining tax bribes. Without the inverse Mills ratio in the tax bribe model we would be overestimating the size of tax bribes. Controlling for the fact that we only observe tax bribes for firms reporting them, we obtain smaller estimated bribes. The estimated parameters σ and ρ in the MLE model reflect the standard error of the error term in the first equation and the correlation between the error terms of the two equations, respectively.

4.2 BEEPS II (2002) Model Estimates

We analyzed firm responses to the BEEPS II survey question 56, which asked, "Thinking now of unofficial payments/gifts that a firm like yours would make in a given year, could you please tell me how often they make payments/gifts for the following purposes." One purpose listed was, "To deal with taxes and tax collection." Firms responses were coded according to the following scale: Never (1), Seldom (2), Sometimes (3), Frequently (4), Usually (5), Always (6), and Don't know (7). Table 6 reports estimates of Probit models of firm responses to this question. Three dichotomous variables were created to capture firm responses. The Q56yes variable takes on the value one if the firm responded seldom or more frequent, and the value zero otherwise. The Q56always variable takes on the value one if the firm responded always, and the value zero otherwise. Finally, the Q56never variable takes on the value one if the firm responded never, and the value zero otherwise.

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Comparing the results reported in Table 6 it is clear that the level of GDP per capita has a significant effect, with higher GDP per capita reducing the likelihood that a firm reports paying tax bribes (Q56yes), reducing the likelihood that the firm always pays tax bribes (Q56always), and increasing the likelihood that the firm reports never paying tax bribes (Q55never). The growth rate of GDP has a negative effect on Q56yes and a positive effect on Q56never, although it has no discernible effect on Q56always. Apparently, the GDP growth rate is less important than the level of GDP in the economy. Agricultural value-added does not have a statistically discernible effect on firm responses. Firms in CIS countries, however, report different responses from firms in other countries. They are more likely to report paying tax bribes, more likely to report always paying tax bribes, and less likely to report never paying tax bribes. Firms using international accounting standards or using the internet in their business appear to face no different situation than other firms. Firm size clearly has an important impact on firm responses. The measure of firm size merely categorizes firms as small (2-49 full-time employees), medium (50-249 full time employees), or large (250 or more full-time employees). The firm size variable takes on the value one for small firms, two for medium size firms, and three for large firms. Considering the estimates for the firm size variable across the three models in Table 5 it is clear that larger firms are less likely to be asked to pay tax bribes and more likely to never pay tax bribes, other things being equal. Finally, we included an objective measure of fiscal reform with the direct taxes variable. The effect of a higher proportion of direct taxes in the country's fiscal structure is to reduce the likelihood that firms report paying tax bribes, reduce the likelihood that they report always paying tax bribes, and increase the likelihood that they report never paying tax bribes.

A selection model was also estimated using the BEEPS II data. In the first stage, we used firm responses to question 54, which asked if it is common for firms to make irregular "additional payments/gifts to get things done" with regard to taxes and other services. Firm responses were coded according to the scale described above, taking on values from one to seven. The next question, Question 55, then asked, "On average, what percent of total annual sales do firms like yours typically pay in unofficial payments/gifts

to public officials?" The estimation strategy is to use firm responses to Question 54 in the first stage Probit equation, with the dependent variable taking on the value one if the firm responds that it pays tax bribes seldom or more frequently. The second stage equation then explains the percent of annual sales paid in bribes, conditional on the firm reporting that it pays bribes. Table 6 reports both two-stage and maximum likelihood estimates of the selection model.

Considering the first-stage Probit model in the two-stage least squares estimation, it is apparent that the likelihood of reporting tax bribe payment is negatively related to GDP per capita the GDP growth rate, but positively related to location in the CIS and also positively related to the tax revenue to GDP ratio. Results are similar in the maximum likelihood model, although the tax revenue to GDP ratio is not significant in that model. The selection model estimates from the MLE estimation are quite similar to those of the 2SLS estimation. Firm size is negatively related to bribe size and international accounting is positively related to bribe size. In this case, the direct tax variable does not have a statistically discernible effect on tax bribes.

5 Summary and Conclusions

After nearly fifteen years of transition experience and extensive efforts at fiscal reform to support economic transition, there is precious little evidence on whether fiscal reform efforts have been successful. Given the difficult experience of many transition economies, including some where fiscal reforms have been prominent, it is not readily apparent that fiscal reform has been a success. To date, the measures of fiscal reform project success have been crude and inadequate, however. Counting the number of laws changed or the number of tax officials sent to seminars, as is often done in reporting protocols on fiscal reform projects for example, provides no reliable insight into whether those efforts have made it easier for firms to engage in market activities and support the transition to a market economy. The research reported in this paper is the first to use the extensive firm-level survey data collected by the World Bank and the European Bank for Reconstruction and Development to test the effects of varying degrees of fiscal reforms across transition countries. Using the BEEPS I and BEEPS II data sets, augmented with

both subjective and objective measures of fiscal reform, we test whether reforms have an impact on the likelihood that firms are asked to pay tax bribes and if so, whether reforms affect the size of those bribes.

Our empirical evidence based on the BEEPS I survey data indicates that fiscal reforms have been effective in reducing the amount of tax bribes paid by firms. Controlling for the country-specific factors that affect the likelihood that firms are required to make unofficial payments to tax officials, we find that the unofficial tax payments reported by firms accounts for a smaller share of total annual unofficial payments made by firms where fiscal reforms have been more extensive. In this way, we have the first solid evidence that fiscal reforms have produced practical and important effects at the firm level in transition countries. Our evidence based on the BEEPS II survey data also indicates that the share of tax revenues derived from direct taxes, both personal and corporate, reduces the likelihood of firms being required to pay tax bribes. While we do not have newer subjective indices of fiscal reform to include in the selection models estimated using the BEEPS II data, the evidence is that direct taxes have an impact on the likelihood of firms being required to pay tax bribes, if not on the amount of tax bribes paid.

One of the limitations present in this study is that the survey questions related to tax bribes and firm characteristics were changed between BEEPS I and BEEPS II. The inconsistent availability of firm characteristics and measures of tax bribes makes direct comparison between our estimates impossible. Nevertheless, the data provide important insight regarding tax bribes. Of course, the fact that firms pay less in tax bribes in countries where fiscal reforms have been more extensive does not mean that the firms pay less in overall bribes. Further research is needed to consider whether the reduction in tax bribes is accompanied by a change in other types of bribes and unofficial payments. It could be that a reduction in tax bribes is accompanied by an increase in other types of bribes.

Table 1: Transition Countries Represented in the BEEPS I and II Surveys

Albania	Georgia	Romania
Armenia	Hungary	Russia
Azerbaijan	Kazakhstan	Serbia and Montenegro
Belarus	Kyrgyzstan	Slovakia
Bosnia and Herzgovina	Latvia	Slovenia
Bulgaria	Lithuania	Tajikistan
Croatia	Macedonia	Turkey
Czech Republic	Moldova	Ukraine
Estonia	Poland	Uzbekistan

Table 2: Descriptive Statistics

BEEPS I (1999) Survey Data				
Variable	Mean	St. Error	Minimum	Maximum
Unofficial tax payments, Q28yes (0/1)	.44	.50	0.00	1.00
Tax bribes paid, Q29 (% of total annual bribes)	18.74	23.82	0.00	100.00
GDP per capita (PPP)	5950.31	3411.82	1290.87	14624.21
GDP growth rate (%)	2.65	5.53	-6.54	15.60
Agricultural value added (% of GDP)	14.45	10.44	4.18	39.53
CIS countries (0/1)	.45	.50	0.00	1.00
Full time employees (#)	3.91	1.66	1.00	7.00
Casual employees (#)	1.81	1.53	1.00	7.00
Trade with state sector (0/1)	.52	.50	0.00	1.00
Internet use (0/1)	.40	.51	0.00	1.00
Tax revenue as a share of GDP (%)	24.34	8.36	9.38	43.53
International accounting standards (0/1)	.36	.48	0.00	1.00
Direct tax share of total tax revenue (%)	30.28	7.58	11.00	49.80
ORI index of overall tax reform	1.65	.99	0.00	3.00
CRI index of cumulative tax reform	9.92	4.05	3.00	17.00
BEEPS II (2002) Survey Data				
Variable	Mean	St. Error	Minimum	Maximum
Unofficial tax payments, Q54yes (0/1)	.63	.48	0.00	1.00
Tax bribes paid, Q55 (% of gross receipts)	1.51	3.20	0.00	50.00
Tax bribes paid, Q56yes (0/1)	.46	.50	0.00	1.00
Tax bribes always paid, Q56always (0/1)	.32E-01	.18	0.00	1.00
Tax bribes never paid, Q56never (0/1)	.54	.50	0.00	1.00
GDP per capita (PPP)	7442.00	4275.48	980.59	18437.44
GDP growth rate (%)	5.25	2.81	-.17E-01	13.19
Agricultural value-added (% of GDP)	12.99	9.35	3.11	37.68
CIS (0/1)	.42	.49	0.00	1.00
Firm size (S,M,L)	1.45	.72	1.00	3.00
Trade with state sector (0/1)	.27	.44	0.00	1.00
Internet (0/1)	.51	.50	0.00	1.00
Tax revenue as a share of GDP (%)	15.67	3.43	7.62	22.76
Direct tax share of total tax revenue (%)	23.96	5.73	10.90	36.60

Table 3: BEEPS I Probit Estimation for Question 28 on Tax Bribes

	Q28 yes	Q28 always	Q28 never
Constant	1.4842[a]	-.5426	-1.4842[a]
	.2265	.6158	.2265
GDP per capita (PPP)	-.1025E-03[a]	-.1631E-03[a]	.1025E-03[a]
	.1463E-04	.5970E-04	.1463E-04
GDP growth rate	.1841E-02	.3368E-02	-.1841E-02
	.5129E-02	.1108E-01	.5129E-02
Agricultural value added	-.9148E-03	-.1323E-01[d]	.9148E-03
	.3620E-02	.1007E-01	.3620E-02
CIS	-.7216E-01	.1511E-01	.7216E-01
	.7817E-01	.2378	.7817E-01
International accounting standards	-.4262E-01	.1557	.4262E-01
	.5252	.1236	.5252
Internet	-.1990[a]	-.4690E-01	.1990[a]
	.5238E-01	.1280	.5238E-01
Full time employees	-.1319[a]	-.1333[a]	.1319[a]
	.1431E-01	.3854E-01	.1431E-01
Part time employees	.4649E-01[b]	-.1405E-01	-.4649E-01[b]
	.2241E-01	.5790E-01	.2241E-01
Direct taxes	-.5563E-02[c]	-.7576E-03	.5563E-02[c]
	.3249E-02	.8772E-02	.3249E-02

[a,b,c,d] indicate significance at the 1%, 5%, 10%, and 20% levels or less.
Standard errors are reported below coefficient estimates.
Note: E-nn means multiply by 10 to -nn power.

Table 4: Two-Stage Estimates of BEEPS I Tax Bribe Selection Models
with Alternative Fiscal Reform Measures

Selection Probit Equation			
Constant	.5830ᵃ		
	.1792		
GDP per capita (PPP)	-.4827E-04ᵃ		
	.1577E-04		
GDP growth rate	.8151E-02ᶜ		
	.5044E-02		
Agricultural value added	.7518E-02ᵇ		
	.3818E-02		
CIS	-.2122ᵃ		
	.8157E-01		
Tax revenue to GDP ratio	-.1922ᵃ		
	.4401E-02		
Corrected Tax Bribe Models			
	Model 1	Model 2	Model 3
Constant	45.2969ᵃ	46.8025ᵃ	99.3519ᵃ
	8.6945	8.6844	15.3703
Full time employees	1.1814ᵇ	1.2444ᵇ	.2206
	.5721	.5728	.9674
Casual employees	-.9198	-.9354	-.6148
	.8301	.8323	1.3087
Trade with state (0/1)	-4.7798ᵃ	-4.5967ᵃ	-5.0869ᶜ
	1.7346	1.7347	2.9600
Internet (0/1)	.7870	.9197	.7412
	1.9539	1.9559	3.2400
Int. Accounting (0/1)	.1482	.1419	2.9052
	1.8689	1.8769	3.1749
CRI	.7163ᵃ		
	.2721		
ORI		2.7215ᵇ	
		1.2097	
TPR			-5.5947ᵃ
			1.4614
Lambda (λ)	-32.0903ᵃ	-31.3146ᵃ	-59.8377ᵃ
	5.7962	6.1214	11.9163

a,b,c,d indicate significance at the 1%, 5%, 10%, and 20% levels or less.
Standard errors are reported below coefficient estimates.
Note: E-nn means multiply by 10 to -nn power.

Table 5: Estimates of BEEPS I Selection Models

Selection Probit equation		
	2SLS Estimation	MLE Estimation
	Coefficient	Coefficient
Constant	.5830ª	.4415ᵈ
	.1792	.3398
GDP per capita (PPP)	-.4827E-04ª	.9154E-05
	.1577E-04	.2734E-04
GDP growth rate	.8151E-02ᶜ	.3035E-01ª
	.5044E-02	.1040E-01
Agricultural value added	.7518E-02ᵇ	.2777E-01ª
	.3818E-02	.8032E-02
CIS	-.2122ª	.3524ᵇ
	.8157E-01	.1752
Tax revenue to GDP ratio	-.1922E-01ª	-.2568E-01ª
	.4406E-02	.9612E-02
Corrected Tax Bribe Regression		
Constant	51.7379ª	30.9208ª
	9.2814	7.4654
Full time employees	1.1094ᵇ	1.0304ᶜ
	.5718	.5905
Casual employees	-.9057	-.7693
	.8288	.9098
Trade with state (0/1)	-4.6422ª	-5.2413ª
	1.7326	1.7811
Internet (0/1)	.6480	1.7820
	1.9519	2.0852
Int. Accounting (0/1)	-.6148	.4187
	1.8979	1.8401
Direct taxes	-.3185ᵇ	-.3681ᵇ
	.1561	.1826
CRI index of cumulative tax reform	.8766ª	1.0472ª
	.2792	.3121
Lambda (λ)	-29.6035ª	
	5.7272	
Sigma (σ)		26.0601ª
		1.1614
Rho (ρ)		-.5644ª
		.9504E-01

a,b,c,d indicate significance at the 1%, 5%, 10%, and 20% levels or less.
Standard errors are reported below coefficient estimates.
Note: E-nn means multiply by 10 to -nn power.

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Table 6: BEEPS II Probit Estimation for Question 56 on Tax Bribes

	Q56 yes	Q56 always	Q56 never
Constant	.8566[a]	-1.5426[a]	-.8536[a]
	.1744	.4087	.1744
GDP per capita (PPP)	-.5933E-04[a]	-.4510E-04[d]	.5906E-04[a]
	.9931E-05	.2873E-04	.9927E-05
GDP growth rate	-.1213E-01[c]	.6463E-02	.1193E-01[d]
	.7522E-02	.1543E-01	.7520E-02
Agricultural value added	-.7182E-03	.5468E-02	.6770E-03
	.3686E-02	.8022E-02	.3685E-02
CIS	.3014[a]	.3868[a]	-.3012[a]
	.5075E-01	.1191	.5075E-01
International accounting standards	-.2222E-01	-.1150[c]	.2168E-01
	.2905E-01	.6254E-01	.2905E-01
Internet	.2352E-01	-.4893E-02	-.2229E-01
	.3975E-01	.7966E-01	.3974E-01
Firm size	-.1302[a]	-.6930E-01[d]	.1303[a]
	.2610E-01	.5447E-01	.2610E-01
Direct taxes	-.1742E-01[a]	-.1025E-01[d]	.1739E-01[a]
	.3668E-02	.6747E-02	.3668E-02

[a,b,c,d] indicate significance at the 1%, 5%, 10%, and 20% levels or less.
Standard errors are reported below coefficient estimates.
Note: E-nn means multiply by 10 to -nn power.

Table 7: Estimates of BEEPS II Selection Models

Selection Probit Equation		
	2SLS Estimation	MLE Estimation
Constant	.5286[b]	.5645[b]
	.2428	.2717
GDP per capita (PPP)	-.3121E-04[a]	-.3112E-04[a]
	.1168E-04	.1235E-04
GDP growth rate	-.1542E-01[d]	-.2333E-01[c]
	.1224	.1388E-01
Agricultural value-added	-.1576E-02	.6669E-03
	.6578E-02	.7790E-02
CIS	.2706[a]	.2859[a]
	.7373	.8608E-01
Tax revenue to GDP ratio	.3885E-02	.3065E-03
	.1238E-01	.1425E-01
Corrected Tax Bribe Regression		
Constant	4.756[a]	3.1605[a]
	.6547	.5504
Firm size	-.6564[a]	-.6407[a]
	.1213	.1532
Trade with state	.1269	.3038[c]
	.1896	.1875
Internet	-.1982E-01	-.2043
	.1734	.1852
International accounting	.2044[d]	.2232[c]
	.1320	.1322
Direct taxes	.1636E-01	.1567E-01
	.1712E-01	.1503E-01
Lambda (λ)	-3.5819[a]	
	.8177	
Sigma (σ)		3.7405[a]
		.7616E-01
Rho (ρ)		-.1854[d]
		.1462

[a],[b],[c],[d] indicate significance at the 1%, 5%, 10%, and 20% levels or less.
Standard errors are reported below coefficient estimates.
Note: E-nn means multiply by 10 to -nn power.

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