Informality and Regulations:
What Drives the Growth of Firms?

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This paper relies on rich firm-level data on transition economies to examine the role of informality as an important channel through which regulatory and other policy constraints affect firm growth. We find that firms reduce their formal operations with greater tax and regulatory burdens, but increase them with better enforcement quality. In terms of firm growth, we find a differential impact of regulatory burden and enforcement quality on formal and informal firm growth. In particular, we find that growth in formal firms is negatively affected by both tax and financing constraints, whereas these constraints are insignificant for growth in informal firms. Moreover, formal firm growth improves with better enforcement, while informal firm growth is constrained by organized crime, pointing to informal firms' inability to take full advantage of the legal and judicial systems. Finally, we find that an interaction term between a countrywide measure of the rule of law and formality is positive, suggesting that better rule of law improves formal firm growth. [JEL L25, O17, O43, P26, P37]

Understanding firm growth is at the heart of the development process, making it a much researched area in finance and economics. More recently, the nexus between firm growth, aggregate investment, and economic growth has been examined in the context of the broader business

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environment—the institutional, policy, and regulatory environment—in which firms operate. Studies have shown that inadequate enforcement of property rights, financial and legal constraints, and cumbersome regulations have adverse effects on firm growth and investment.

At the same time, there is considerable evidence that the same obstacles are also important determinants of informality (Dabla-Norris, Gradstein, and Inchauste, 2008). The theoretical underpinning for these results is related to the idea that in the absence of effective monitoring and compliance, firms respond to the increased burden of these constraints by moving into the informal sector. However, this decision affects the allocation of resources across firms' activities and can distort incentives for capital accumulation, competition, and innovation. This is because in order to avoid detection, firms may remain suboptimally small, adopt fewer productive technologies, use irregular procurement, and divert resources to mask their activities. Being outside the regulatory and tax umbrella, informal firms can afford to be less productive than their competitors in the formal sector. However, they may also be locked out of markets for finance, technology, and legal protection. Because informal firms are typically less productive or efficient, aggregate productivity and economic growth may suffer.[1]

Understanding how various policy constraints influence both informality and firm performance is important for informing government policies that shape the opportunities and incentives facing firms. The goal of this paper is to examine the role of informality as an important channel through which regulatory and other policy constraints affect firm growth. We first examine whether policy constraints influence a firm's decision to become informal. We then examine whether these policy constraints have a differential impact on firm growth for formal and informal firms. To this end, we develop a simple model in which firms can choose to operate informally, and both the extent of informality and firm growth are related to policy obstacles. In the model, the quality of the legal system manifests itself in enforcing better compliance with existing taxes and regulations. This framework generates several predictions. In particular, we obtain that tax, regulatory, and legal constraints are important determinants of informality. Moreover, the sensitivity of firm growth to these constraints is higher the greater the extent of formal activity undertaken by the firm.

We test these predictions using an integrated firm-level data set for 27 countries in Eastern Europe and Central Asia. Although there has been a measurable improvement in the investment climate in many Eastern European and Central Asian countries since the onset of transition, on average business obstacles are still much more severe than in mature market

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[1]Although there is evidence that informal firms are dynamic (Maloney, 2004), studies have found that informal firms tend to be less productive than formal firms. For instance, the ratio of labor productivity between formal and informal firms is 39 percent in Turkey and 46 percent in Brazil (De Paula and Scheinkman, 2006). Loayza (1996 and 2005); and Schneider and Klingmair (2003) find that higher informality is associated with lower growth.

economies (EBRD, 2005). High costs of business regulation, weak tax administration, a poor institutional framework, and weak property rights are frequently cited as major obstacles to doing business in many transition countries (World Bank, 2006). Moreover, there is considerable variation in the extent of informal activity across transition countries that is influenced by differences in legal, regulatory, financing, and other obstacles faced by firms.[2] This is an important concern for policymakers, because creating incentives for formalization is viewed as an important step to increase aggregate productivity.

Our results provide evidence that policy obstacles play a significant role not only in shaping firms' incentives to operate informally, but also in determining which firms grow. The regulatory burden, legal quality, and efficiency of the formal sector are important determinants of informality in these countries. Although several studies have separately found each of these obstacles to be determinants of informality, we find support for the relevance of all these constraints.[3] More important, we find these results hold for three alternative proxies for formality, including the percentages of sales, wage bill, and workforce that are reported to tax authorities. We find that firms reduce their formal operations when faced with a high regulatory burden, as measured both by a countrywide measure of the cost of registering property as well as by firms' perceptions of existing tax and financing constraints. However, firms increase their formal operations with better enforcement quality—measured by a countrywide measure of rule of law—as well as in accordance with firms' perception of the fairness of courts and with fewer constraints imposed by anticompetitive practices and corruption.

In terms of firm growth, our paper provides empirical evidence that formal firms grow at a slightly slower pace than their informal counterparts. What's novel about our paper is that we find a differential impact of regulatory burden, financing constraints, and enforcement quality on formal and informal firms. In particular, we find that growth in formal firms is negatively affected by both high tax rates and weaknesses in tax administration. We also find that formal firms are the ones most severely affected by financing obstacles. Finally, enforcement quality measured by the perception of fair and impartial courts leads to higher growth in formal firms, but it is insignificant in informal firms. In contrast, enforcement quality measured by the constraints posed by organized crime leads to lower growth in informal firms, but is insignificant for formal firms, possibly pointing to the inability of the former to take full advantage of legal and judicial systems.

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[2]See Johnson and others (2000). Schneider (2006), using macro data, notes that the size of the shadow economy increased between 1999 and 2003 and varies from 20 percent in the Czech Republic to 68 percent in Georgia.

[3]Dabla-Norris, Gradstein, and Inchauste (2008) also find support for the significance of all these constraints, using a firm-level data set for a large number of countries. However, they focus on hidden sales as the only measure of informality; this paper shows the relevance of these constraints for different proxies of informality.

When we look at countrywide institutions, we find that firm growth declines with weaker institutions, proxied by a composite index of political, financial, and economic risk. More specifically, we find that a higher regulatory burden, proxied by the cost of dealing with licenses, decreases firm growth. An interaction term between rule of law and the level of formal activity is positive and significant, suggesting that better enforcement improves formal firm growth.

Our paper builds on earlier studies arguing that differences in regulatory, legal, and financial systems can explain much of the difference across countries in firms' financial policies and performance. One aspect that has received much attention, both theoretically and empirically, relates to the importance of financial sector development and legal enforcement on firm size and growth (see Demirgüç-Kunt and Maksimovich, 1998; Rajan and Zingales, 1998; and Beck, Demirgüç-Kunt, and Maksimovich, 2005).[4] Johnson, McMillan, and Woodruff (2002), using firm-level data for five transition countries, show the importance of property rights protection over bank finance when it comes to a firm's decision to invest. Our paper differs from this work in that we examine the effect of all these policy obstacles on firms' incentives both to operate informally and to grow. In particular, we analyze how financial and legal constraints can have a differential impact on the growth of formal and informal firms.

Related literature has examined the effects of regulatory barriers— particularly those affecting the product and labor markets—on firm dynamics, in particular, firm entry and exit, firm size, and average firm-level and aggregate productivity (see Loayza, Oviedo, and Servén, 2004; Desai, Gompers, and Lerner, 2005; and references therein). The underlying idea is that regulations affect the level of productivity of existing firms, or have an impact on firms' incentives to innovate and introduce new products.[5] In our paper we posit that informality is one important transmission channel through which regulatory burden can affect resource allocation and firm performance.

Our paper is also related to a large and separate body of literature on the determinants of informality. The size of the informal sector has been found to be associated with the tax burden (for example, Cebula, 1997; and Giles and Tedds, 2002); regulatory costs (Loayza, Oviedo, and Servén, 2004; Auriol and Warlters, 2005) institutional quality and regulatory burden, in

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[4]The theoretical underpinning for these results is typically related to the idea that credit constraints may limit firms in their ability to fund investment projects. For instance, Beck, Demirgüç-Kunt, and Maksimovich (2005) find that financial underdevelopment and corruption has a greater effect on small firms, which are more likely to suffer from credit constraints than large firms.

[5]Klapper, Laeven, and Rajan (2004) use firm-level data from Western and Eastern Europe to show that anticompetitive regulations such as entry barriers lead to slower growth in established firms. Besley and Burgess (2004) find that pro-worker regulations across Indian states are associated with lower output, employment, investment, and productivity in manufacturing.

particular, of labor (Friedman and others, 2000; Johnson and others, 2000; Botero and others, 2004); and financial development (Straub, 2005). Dabla-Norris, Gradstein, and Inchauste (2008) find support for the significance of all these constraints using a firm-level data set for a large number of countries, but do not examine the relationship among policy constraints, informality, and firm growth. Therefore, even though much work has been separately conducted on how various constraints affect firm growth and informality, few studies examine the role of informality as an important channel through which regulatory and other policy constraints affect firm growth. In this paper we integrate the existing literature using a rich database that contains information on both aspects of firm performance.

I. Analytical Framework

The model is kept as simple as possible to generate empirically testable predictions. Consider a representative firm, operating for two periods in a competitive environment. Current income is normalized to 1, and we assume for simplicity that it faces credit constraints so that it cannot issue equity or borrow. The firm can operate fully in the formal sector or hide a fraction of activity (income, investment, or sales) by operating in the informal sector. In the formal sector, the firm's reported revenue is subject to a financial burden at rate T. This can be interpreted as the cost of complying with regulatory requirements, licensing fees, and taxation in the formal sector. These costs can be quite significant for developing and transition countries, as documented in Djankov and others (2002), who find that these costs constitute more than 50 percent of GDP per capita in more than a third of their sample countries.

To avoid the tax and regulatory burden, a firm can hide some fraction of its activities by carrying them out in the informal sector, but faces the prospect of a fine with some probability. For simplicity, we do not distinguish the role of the probability of being caught from the size of the fine and assume that the penalty function is quadratic in the income earned informally:

$$C(I) = aI^2/2, \tag{1}$$

where $a > 0$ can be interpreted as the quality of the legal system or the enforcement of regulation compliance. The stronger the legal system, the larger a is, and the higher the expected penalty for operating informally. The idea behind this functional form is that it is easy to divert a small amount of resources, but the marginal value of operating informally decreases as the level of informality increases. For example, it may be easier for the government and courts to observe larger firms operating informally (see Loayza, 1996).

Let r denote the rate of return on investment in the formal sector relative to that in the informal sector, where the latter is normalized to 1. In the

context of our model, r can be interpreted as the relative efficiency of the formal sector. This assumption captures the idea that if a firm diverts resources to the informal sector, it cannot use them in its main production process but must use them instead in another lower-productivity activity. This could be either because firms scale down the size of their operations to avoid being caught or because informal firms are unable to take full advantage of publicly provided goods, such as the legal and judicial system and the police.

The firm derives income, Y, from its operations in the formal and informal sectors. Let e denote the share of the firm's investment in formal operations, which results in an income of $e(1+r)$; the income of a firm after incurring the regulatory cost is then given by $F = e(1+r)(1-T)$. The share invested in the informal sector, I, equals $(1-e)$, which is also the resulting income as the return in the informal sector is normalized to zero. The total income of a firm and its future profits can be written as follows:

$$P = F + I = e(1+r)(1-T) + 1 - e. \tag{2}$$

Net income of a firm then equals

$$Y = P - C(I) = e(1+r)(1-T) + 1 - e - a(1-e)^2/2. \tag{3}$$

The government first sets policies, then the firm determines the extent of its informal activity.

Informality

We assume here that the regulatory cost and quality of enforcement are exogenously given and focus on a firm's decision to operate informally. Maximization of Equation (3) with respect to e yields the first-order condition

$$(1+r)(1-T) - 1 + a(1-e) < 0, \tag{4}$$

so that in equilibrium,

$e = 0$ if $T - r(1-T) > a$

$e = 1$ if $T - r(1-T) < 0$

$e = 1 - [T - r(1-T)]/a$ if $0 < T - r(1-T) < a.$ (5)

Note that the firm's share of investment in formal operations is decreasing in the tax and regulatory burden; that is, $de/dT = -(1+r)/a < 0$, increasing in the quality of enforcement, a, and in the efficiency of the formal sector, r. Thus, we have

Proposition 1 *The propensity to operate in the formal sector decreases in the tax and regulatory burden and increases in the quality of enforcement and in formal sector efficiency.*

The intuition behind this result is as follows. Firms weigh the benefits of being formal against the costs; thus, when the tax and regulatory burden decreases or enforcement increases, more firms choose to operate formally. Moreover because $d^2e/dT\,da = (1+r)/a^2 > 0$, weak enforcement quality increases the sensitivity of going informal with respect to the tax and regulatory burden.

Assuming for simplicity an internal solution, substitutions then yield

$$F = \{1 - [T - r(1 - T)]/a\}(1 + r)(1 - T),$$

$$I = [T - r(1 - T)]/a, \quad C(I) = [T - r(1 - T)]^2/2a, \tag{6}$$

so that future income—which stands for firm growth—can be written as

$$Y = \{1 - [T - r(1 - T)]/a\}(1 + r)(1 - T)$$

$$+ [T - r(1 - T)]/a - [T - r(1 - T)]^2/2a. \tag{7}$$

Differentiation of firm growth while employing the envelope theorem yields

$$dY/dT = -e(1 + r) < 0 \text{ and } d^2Y/dTde < 0. \tag{8}$$

This implies that firm growth is negatively affected by regulatory costs, and, more important, that the sensitivity of firm growth with respect to these costs is negatively related to the extent of formal activity undertaken by the firm. Moreover, differentiating Equation (6) with respect to the quality of enforcement, a, reveals that $dF/da > 0$ and $dI/da < 0$, implying that better quality of enforcement enhances the profitability of operating formally and decreases the profitability of operating informally.

Proposition 2 *Firm growth is negatively affected by the tax and regulatory burden, more so the larger the firm's activity in the formal sector. Stronger legal enforcement increases firm growth in the formal sector and decreases firm growth in the informal sector.*

This proposition—which is the main focus of the empirical study—argues that it is mainly firms that operate in the formal sector that are affected by burdensome taxes and regulations. Moreover, the quality of the legal system can have a differential impact on firm income and growth in the formal and informal sectors.

The government's revenues from regulations imposed are given by

$$R = Te(1 + r) = T\{1 - [T - r(1 - T)]/a\}(1 + r). \tag{9}$$

Differentiation of Equation (9) with respect to the regulatory burden yields

$$MR = \{1 - [2T - r(1 - 2T)]/a\}(1 + r). \tag{10}$$

Note that dMR/dT is declining in the regulatory burden T. Further, when the

regulatory burden is zero ($T = 0$), Equation (9) is positive, whereas when $T = 1$, it is negative, provided that a is not too large, which implies that the revenue function increases in the regulatory burden initially and decreases afterward. Moreover, differentiating equation (9) with respect to the quality of enforcement, a, reveals that $d^2MR/dT\,da > 0$, which implies that the sensitivity of tax revenues with respect to the regulatory costs increases with the quality of enforcement.

II. Data and Summary Statistics

We use the 2005 Business Environment and Enterprise Performance Surveys conducted by the World Bank and the European Bank for Reconstruction and Development. The data set consists of firm-level survey responses of more than 9,300 firms in 27 countries from transition countries in Eastern Europe and Central Asia.[6] The survey reports on firms' growth in sales and investment, their size, ownership history, age, industry, and other characteristics. In particular, the survey asks whether sales have increased, decreased, or remained unchanged over the past 36 months. It then follows up with the question, "What was the percentage change for your company, in real terms (that is, after allowing for inflation)?" This allows us to construct a continuous variable for real sales growth, which ranges from -98 to 300, with negative values representing a decline in sales (Figure 1).

The survey also has information about the propensity to operate formally. Specifically, the latter can be retrieved from answers to the following three questions:

- "Recognizing the difficulties many firms face in fully complying with taxes and regulations, what percentage of total *annual sales* would you estimate the typical firm in your area of business reports for tax purposes?"
- "Recognizing the difficulties many firms face in fully complying with labor regulations, what percentage of total *workforce* would you estimate the typical firm in your area of business reports for tax purposes?"
- "Recognizing the difficulties many firms face in fully complying with labor regulations, what percentage of the actual *wage bill* would you estimate the typical firm in your area of business reports for tax purposes?"

Arguably, these variables are only rough proxies for formality for two reasons. First, the questions are phrased in terms of typical behavior by firms in that sector, rather than the behavior of the firm in question, which may introduce a bias toward the average behavior of other firms in that environment. Although firms are understandably reluctant to reveal the

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[6]See Appendix I for the full list of countries. In order to avoid outliers, we restrict the sample to include only firms whose growth rate is less than 300 percent, although the results are not affected by this.

Figure 1. Distribution of Sales Growth[1]
(In percent)
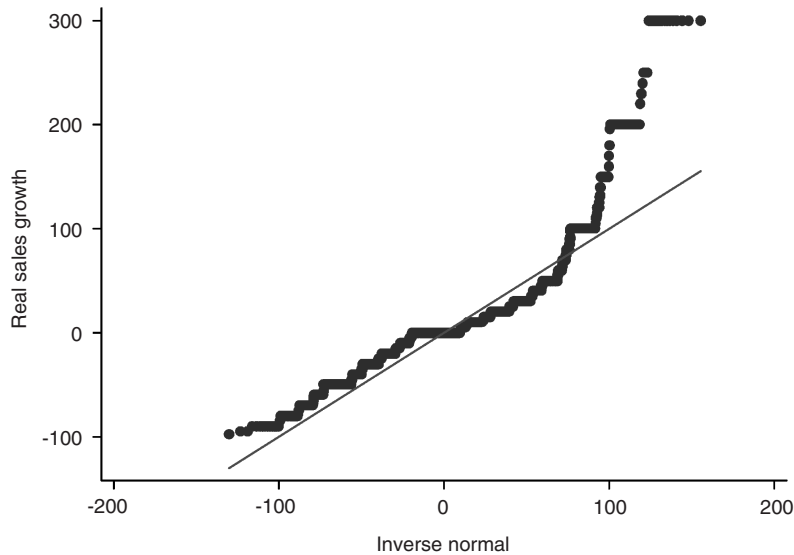
Source: BEEPS (2005).
[1]This figure presents a distributional diagnostic plot, in which quantiles of firm's real sales growth are plotted against quantiles of a normal distribution.

extent of their reporting to government, managers presumably most often respond based on their own experiences. Therefore, with caution, the responses can be interpreted as indicating the firms' own behavior (Johnson and others, 2000). Second, all the firms in the survey are registered firms, which implies they all have at least some operations in the formal economy. We are therefore ignoring unregistered firms, which could bias our estimates of formal activity upward.

The survey also has a large number of questions on the firms' perceptions of the quality and integrity of public services and the regulatory burden faced by firms. In the survey, enterprise managers were asked to rate the extent to which tax, regulatory, financing, and legal obstacles constrained the operation of their business. The ratings were quantified from 1 to 4, with 1 denoting no obstacle and 4 a major obstacle. In addition to these general constraints, firms were also asked more detailed questions to understand the nature of these constraints. For instance, businesses were asked to evaluate whether the country's courts were fair and impartial, rated from 1 (always) to 6 (never). Finally, the survey asks questions about the extent of bribery and corruption, including the percent of sales in unofficial payments firms typically make.[7]

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[7]Precise details of all the variables are in Appendix II.

Table 1 contains sample statistics of the variables we consider, broken down by their level of formality. More than 70 percent of the sample is made up of small firms; only 10 percent of sample firms are large, with more than 250 employees. In terms of firm characteristics, although nearly 17 percent of firms were originally state owned or subsidiaries of state-owned companies, only about 10 percent were still state-owned companies in 2005. More than one-fifth of them are exporters, and they are concentrated mostly in the manufacturing (37 percent) and retail (26 percent) sectors. Firms are on average 16 years old, but there are some in the sample that are 180 years old.

Table 1. Summary Statistics: Arithmetic Mean of Variables							
	All Firms	Formal Firms 100 percent reported			Informal Firms Less than 100 percent reported		
		Sales	Wage bill	Work force	Sales	Wage bill	Work force
General characteristics of firms							
Number of firms	9,308	5,657	5,655	6,210	3,221	3,229	2,713
Sales growth	12.62	12.75	12.01	12.68	12.45	13.87	12.90
Percent of sales reported to tax authorities	88.77	100.00	97.74	96.35	69.04	73.12	71.60
Percent of wage bill reported to tax authorities	87.19	97.33	100.00	96.33	69.49	64.76	66.54
Percent of workforce reported to tax authorities	90.28	98.54	99.27	100.00	75.81	74.52	68.02
Government ownership	0.10	0.13	0.13	0.13	0.05	0.05	0.05
Exporter	0.23	0.24	0.24	0.24	0.22	0.22	0.22
Small	0.71	0.67	0.67	0.68	0.77	0.78	0.77
Large	0.10	0.11	0.12	0.11	0.06	0.06	0.06
Age	15.59	16.52	16.91	16.36	13.50	13.11	13.52
Mining	0.95	1.06	1.10	1.04	0.70	0.69	0.71
Construction	9.45	8.98	8.80	8.68	10.31	10.54	11.08
Manufacturing	37.23	37.82	38.33	37.70	37.29	36.33	37.09
Transport	6.57	6.90	6.69	6.74	5.69	6.07	5.92
Retail	25.84	25.35	25.08	26.00	27.03	27.41	25.78
Real estate	8.77	9.42	9.35	9.16	7.44	7.43	7.74
Hotel	5.53	4.80	4.72	4.91	6.34	6.63	6.61
Courts fair and impartial	2.95	3.03	3.02	3.00	2.83	2.85	2.85
Constraints faced by firms							
Access to financing	2.25	2.16	2.16	2.16	2.44	2.43	2.47
Tax rates	2.76	2.65	2.67	2.68	3.00	2.97	3.00
Organized crime/mafia	1.65	1.57	1.57	1.58	1.79	1.80	1.82
Anticompetitive practices constraint	2.30	2.19	2.19	2.21	2.49	2.49	2.51
Percent of sales in unofficial payments	1.03	0.69	0.68	0.75	1.70	1.73	1.76

|	All Firms	Formal Firms 100 percent reported			Informal Firms Less than 100 percent reported		
		Sales	Wage bill	Work force	Sales	Wage bill	Work force
Institutional variables							
Log of real GDP per capita in 2005	7.71	7.66	7.65	7.66	7.78	7.81	7.82
CPI Inflation in 2005 (annual percent)	6.05	6.17	6.13	6.23	5.81	5.92	5.63
Real interest rate in 2005 (percent)	4.77	4.55	4.82	4.51	5.20	4.71	5.32
Rule of law	1.75	1.70	1.71	1.70	1.81	1.81	1.83
Cost of registering property (percent of property value)	3.03	3.05	3.10	3.08	3.07	3.02	2.99
Cost of licenses (percentage of per capita income)	321.95	315.01	314.36	309.76	334.15	339.67	352.40

Source: Business Environment and Enterprise Performance Survey (2005).
Note: The table reports the arithmetic mean of firm characteristics, constraints faced by firms, and institutional variables. Formal firms are classified as such if they report 100 percent of their sales, wage bill, or workforce for tax purposes. The mean should be interpreted as the share of the sample for which the following dummy variables is equal to one: exporters (=1 if exporter); small (=1 if number of workers <50); large (=1 if number of workers >250); industry dummies (=1 if mining, construction, manufacturing, transport, retail, real estate, hotel). Perception on whether a country's courts are fair and impartial are rated from 1 (always) to 6 (never). Firms' perception of the quality and integrity of public services and the regulatory burden faced by firms are captured by the variables rating the constraints faced by firms. The ratings were quantified from 1 (no obstacle) to 4 (major obstacle). Rule of law is a synthetic index from Kaufmann, Kraay, and Mastruzzi (2006) which includes perceptions of both violent and nonviolent crime, the effectiveness and predictability of the judiciary, and the enforceability of contracts, with higher values denoting a better quality of rule of law.

Note that evasion is a matter of degree, and that the various dimensions of informality identify slightly different samples (Figure 2). On average, firms report 87 percent of their wage bill, 89 percent of their sales, and 90 percent of their workforce to tax authorities. To make this point more explicit, we further separate the sample into formal and informal firms, where we define as informal those that report less than 100 percent of their sales, wage bill, or workforce. Note that on average, informal firms report between 69 and 73 percent of their sales, between 64 and 69 percent of their wage bill, and between 68 and 75 percent of their workforce, depending on the proxy being used. Under all measures, firms are more informal in terms of reporting their wage bills for tax purposes.

A second important point is that tax evasion is not limited to small and medium-size firms, as is often believed. Although we find that, on average,

Figure 2. Distribution of Reported Wage Bill
(In percent)
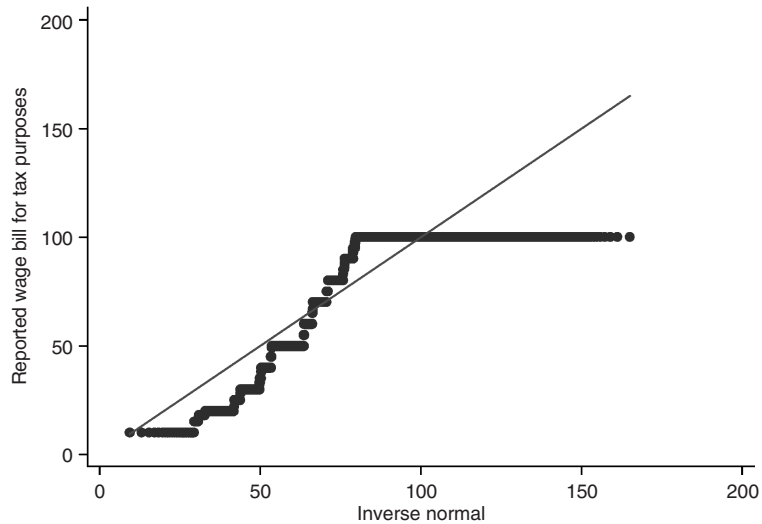
Source: BEEPS (2005).
Note: This figure presents a distributional diagnostic plot, where quantiles of a firm's wage bill reported for tax purposes is plotted against quantiles of a normal distribution.

informal firms are smaller and more concentrated in the construction, retail, and hotel industries, there are large firms in the sample that are in the manufacturing or retail sector and are also evading taxes. In terms of the constraints firms face, on average, firms report that financing, taxes, and anticompetitive practices pose a minor to moderate obstacle. Informal firms tend to report somewhat higher obstacles, and they report being subject to greater corruption as measured by higher unofficial payments (measured as a percentage of sales) than formal firms.

In order to address the question of whether the impact of the various firm-level obstacles on firm growth varies based on the national level of institutional development, we complement the firm-level data with cross-country-level indicators from various sources. We would expect that a poor legal environment creates incentives for firms to operate informally and to have a differential impact on the growth of formal and informal firms. We use the composite risk measure of political, financial, and economic risk produced by Political Risk Services in their *International Country Risk Guide*. We also use the index of rule of law from Kaufmann, Kraay, and Mastruzzi (2006) as a proxy for the quality of legal institutions and the level of legal enforcement in a country.[8] The index includes perceptions of both violent

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[8]Available via the Internet: http://info.worldbank.org/governance/kkz2005/tables.asp.

and nonviolent crime, the effectiveness and predictability of the judiciary, and the enforceability of contracts, with higher values denoting a better quality of rule of law. The cost of regulation is proxied by the cost of registering property, measured as a percent of property value, and by the cost of dealing with licenses, measured as a percentage of per capita income, both from the World Bank cross-country data on the costs of doing business for 2005.[9] Finally, we use country-level controls, including real GDP per capita, real interest rates, and consumer price inflation in 2005.

Table 2 presents correlations between sales growth and the extent of formality, firm-level constraints, and the level of institutional development in the sample countries. As can be seen from the simple correlations, both sales growth and the level of formality are negatively correlated to financial and tax constraints, as well as to higher organized crime and anticompetitive practices. As expected, formality is positively correlated with the quality of enforcement, measured by the rule of law variable and fair and impartial courts. Note that in the simple correlations, sales growth is positively correlated with fair and impartial courts, but negatively correlated with rule of law. Sales growth is negatively correlated with regulatory burden, as measured by the cost of registering property and the cost of dealing with licenses; this correlation is very small but positive for formality.

III. Empirical Strategy and Results

Empirical Model

First we estimate a simple ordinary least squares (OLS) model with the share of firm's wage bill (workforce or sales) that is reported for tax purposes as the dependent variable. In order to allow for intracountry correlation across firms, we run the regressions with clustered standard errors. From the analysis in Section II, we can write the share of operations conducted in the formal sector (SF) as

$$SF_i = f(Z_i) = \alpha + \gamma_i + \eta T_i + \mu a_i + \beta X_i + \varepsilon_i, \tag{11}$$

where SF is a function of a vector of variables, Z_i, which include regulation costs (T), the quality and efficiency of the legal system (a), and firm-level and countrywide controls (X_i). A positive coefficient indicates that an increase in the level of the independent variable increases the formal nature of the firm. Our firm-level controls include the firm's age, size, and industry dummies, as well as dummies equal to 1 if the firm is owned by the government and if it is an exporter. In line with earlier research (Dabla-Norris, Gradstein, and Inchauste, 2008), we expect formality to increase with firm age and size. Government-owned and exporting firms are expected to be more formal, because their operations are typically well known to tax authorities. Our country-level controls include the log of real GDP per capita, CPI inflation,

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[9]Available via the Internet: www.doingbusiness.org.

Table 2. Correlation Matrix

	Sales Growth	Percent of Sales Reported to Tax Authorities	Percent of Wage Bill Reported to Tax Authorities	Percent of Workforce Reported to Tax Authorities	Courts Fair and Impartial	Access to Financing	Tax Rates	Organized Crime/Mafia	Anti-competitive Practices Constraint	Percent of Sales in Unofficial Payments	Real Per Capita GDP	Consumer Price Inflation	Real Interest Rate	Rule of Law	Cost of Registering Property	Cost of Dealing with Licenses
Sales growth	1.00															
Percent of sales reported to tax authorities	-0.02	1.00														
Percent of wage bill reported to tax authorities	-0.07	0.69	1.00													
Percent of work force reported to tax authorities	-0.03	0.67	0.73	1.00												
Courts fair and impartial	0.01	0.10	0.08	0.08	1.00											
Access to financing constraint	-0.05	-0.09	-0.08	-0.09	-0.07	1.00										
Tax rates	-0.05	-0.11	-0.10	-0.10	-0.09	0.32	1.00									
Organized crime/mafia	-0.04	-0.11	-0.11	-0.10	-0.10	0.18	0.19	1.00								
Anticompetitive practices constraint	-0.07	-0.10	-0.10	-0.11	-0.08	0.21	0.27	0.36	1.00							
Percent of sales in unofficial payments	0.05	-0.20	-0.22	-0.21	-0.10	0.03	0.08	0.12	0.09	1.00						
Real per capita GDP	-0.12	0.04	0.02	0.02	0.14	0.04	0.02	-0.08	-0.02	-0.16	1.00					
Consumer price inflation	0.18	-0.07	-0.10	0.00	-0.13	-0.11	-0.08	0.02	-0.10	0.08	-0.48	1.00				
Real interest rate	-0.12	0.04	0.11	0.01	0.00	0.05	0.09	0.07	0.16	0.02	-0.29	-0.55	1.00			
Rule of law	-0.15	0.09	0.10	0.06	0.14	0.05	0.09	-0.05	0.02	-0.15	0.84	-0.52	0.05	1.00		
Cost of registering property (percent of property value)	-0.06	-0.01	0.00	-0.02	-0.02	0.03	0.09	-0.08	0.10	0.00	0.10	-0.12	0.21	0.27	1.00	
Cost of licenses (percentage of per capita income)	-0.03	-0.02	-0.03	-0.02	-0.08	-0.03	-0.12	0.06	0.05	-0.02	-0.15	0.09	0.06	-0.26	0.33	1.00

Sources: BEEPS (2005); World Bank, Doing Business Survey (2005); International Country Risk Guide (2003–06); Kaufmann, Kraay, and Mastruzzi (2006); World Bank, World Development Indicators.

Note: The table reports the cross-correlations between sales growth and the extent of formality, firm-level constraints, and the level of institutional development in the sample countries. Perception on whether a country's courts are fair and impartial are rated from 1 (always) to 6 (never). Firms' perception of the quality and integrity of public services and the regulatory burden faced by firms are captured by the variables rating the constraints faced by firms. The ratings were quantified from 1 (no obstacle) to 4 (major obstacle). Rule of law is a synthetic index from Kaufmann, Kraay, and Mastruzzi (2006) that includes perceptions of both violent and non-violent crime, the effectiveness and predictability of the judiciary, and the enforceability of contracts, with higher values denoting a better quality of rule of law.

and real interest rates. We expect formality to be higher in countries with higher incomes per capita, lower inflation, and lower real interest rates.

Our proxies for the costs of regulation include the severity of tax constraints faced by individual firms, the cost of registering property, and the cost of licenses measured for the country as a whole. We expect formality to decrease as these costs increase. Finally, our measures of the quality and efficiency of the legal system include firm-level data on constraints related to access to finance, organized crime, anticompetitive practices, the share of sales in unofficial payments that are required, and a countrywide measure of rule of law. We expect firms to become less formal with higher finance, crime, and anticompetitive constraints, as well as with higher unofficial payments and with overall poorer levels of rule of law.

Next, we estimate a simple OLS model with clustered standard errors to estimate the determinants of sales growth, measured by the real percentage change in sales growth over the preceding 36 months. We write sales growth as

$$\Delta Y_i = f(SF_i, Z_i) = \alpha + \gamma_i + \delta SF_i + \eta T_i + \mu a_i + \beta X_i + \varepsilon, \tag{12}$$

where sales growth (ΔY) is a function of the level of formality of a firm (SF), as well as of Z_i, defined above. A positive coefficient indicates that an increase in the level of the independent variable increases the sales growth of the firm. With respect to the control variables, we expect private, exporting, medium-size, and relatively younger firms to have higher sales growth. We also expect sales growth to be higher in countries with lower incomes per capita, lower inflation, and lower real interest rates.

Because the level of formality could potentially be endogenous in the sales growth regression, we instrument for the level of formality.[10] In order to find a suitable instrument, we had to find a variable that was highly correlated with formality but was orthogonal to sales growth. One natural candidate was survey data on the original establishment of the firm, which would influence the path of formal operations, but would not affect current sales growth performance. In particular, we construct a dummy variable equal to 1 if the firm was originally established as a state-owned enterprise or if it was established as a private subsidiary of a formerly state-owned firm.[11] We suggest that state-owned firms and their subsidiaries would most likely be required to report fully on their operations at the time of their establishment. Even though these would later be privatized, prior knowledge of their operations available to tax authorities would make it harder for them to misreport in the future. This variable is orthogonal to current sales growth, because there is no reason to believe that past ownership history would necessarily affect performance of the firm in the future. Moreover, a simple

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[10]In this context, Equation (1) is the first stage of the IV (2SLS) regression.

[11]One concern is multicollinearity between currently state-owned and originally state-owned firms. The simple correlation between these two variables is relatively low at 0.18.

correlation between current sales growth and the originally state-owned dummy is very close to zero (0.0049), whereas the correlation coefficient between the share of the reported wage bill and the instrument is substantially higher (0.1166). One possible concern is whether this is a strong enough instrument (Stock, Wright, and Yogo, 2002). We test for weak instruments in the first-stage regressions and find that this is a strong enough instrument as measured by an F-test on the excluded variables.[12]

Results

We first test whether the propensity to operate in the formal sector decreases with the tax and regulatory burden and with financing constraints, and increases with the quality of enforcement and formal sector efficiency as predicted in Proposition 1. We then test Proposition 2, namely, that the sensitivity of firm growth with respect to tax, regulatory, financing, and legal constraints is related to the extent of formal activity undertaken by the firm.

Determinants of Formality

Tables 3 and 4 present our basic specification on the determinants of formality, using the three alternative proxies for formality (sales, workforce, and wage bill). Table 3 reports results using firm-level data only for all three proxies of informality. To control for unobserved heterogeneity across countries, we use country fixed effects under each proxy. Table 4 reports results for each proxy using country-level institutions. However, given the high degree of correlation between the fixed-effect dummies and countrywide institutional variables, a fixed-effects model is not possible. As a result, we control for country characteristics by including real per capita GDP, real interest rates, and consumer price inflation.

We find that firms are more formal using all three proxies of formality if they are owned by the state. The results suggest that government-owned firms report an additional 3 percent of their wage bill, 2½ percent of their workforce, and 1½ percent of their sales compared with their privately owned counterparts. Similarly, we find that small firms tend to be more informal. Firms that have more than 50 employees report an additional 3 percent of their wage bill, an additional 2 percent of their workforce, and an additional 2 percent of their sales than their smaller counterparts.

Consistent with Proposition 1, we find that the propensity to operate in the formal sector decreases in the regulatory burden and increases with the quality of enforcement. In particular, various regulatory constraints, including constraints in access to financing and tax rates, significantly decrease the propensity to operate formally across firms. For example, firms

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[12]A test for weak identification measured by the Cragg-Donald $(N-L) \times \text{minEval}/L2$ F-stat is equal to 17.95, greater than the critical value of about 11, thus rejecting the null hypothesis that this is a weak instrument. The identification/IV relevance test measured by the Anderson canon. corr. LR statistic also rejects the null hypothesis of an irrelevant instrument.

Table 3. Determinants of Formality

Dependent variable: Share of formal operations proxied by the share of wage bill, workforce, and sales reported for tax purposes.

$$SF_i = f(Z_i) = \alpha + \gamma_i + \eta T_i + \mu a_i + \beta X_i + \varepsilon_i$$

	Percent of Reported		
	Wage bill	**Workforce**	**Sales**
	(1)	**(2)**	**(3)**
Government ownership	3.457	2.929	1.775
	(0.982)***	(0.952)***	(0.883)*
Exporter	0.482	1.522	1.376
	(0.765)	(0.738)**	(0.706)*
Small	−2.578	−1.646	−2.031
	(0.541)***	(0.653)**	(0.477)***
Large	0.510	−0.012	0.252
	(0.731)	(0.506)	(0.635)
Age	0.053	0.028	0.021
	(0.019)**	(0.018)	(0.013)
Courts fair and impartial	0.593	0.619	0.682
	(0.292)*	(0.258)**	(0.233)***
Access to financing constraint	−1.146	−1.059	−1.177
	(0.334)***	(0.214)***	(0.263)***
Tax rate constraint	−0.819	−0.318	−0.511
	(0.300)**	(0.247)	(0.271)*
Organized crime constraint	−0.332	−0.393	−0.469
	(0.482)	(0.329)	(0.351)
Anticompetitive practices constraint	−0.680	−0.507	−0.478
	(0.311)**	(0.258)*	(0.334)
Percent of sales in unofficial payments	−1.457	−1.151	−1.126
	(0.247)***	(0.241)***	(0.200)***
Constant	85.619	84.506	86.498
	(2.153)***	(1.440)***	(1.525)***
Country fixed effects	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes
Observations	6,139	6,173	6,148
R-squared	0.14	0.12	0.11

Source: BEEPS (2005).

Note: The table presents regression results on the determinants of the share of operations that firms conduct in the formal sector (*SF*), proxied by the percentage of sales, workforce, and wage bill that are reported for tax purposes. γ are country fixed effects, *T* are the costs of regulation measured by the severity of tax constraints faced by individual firms. The quality and efficiency of the legal system, *a*, is proxied by firm-level ratings on the constraints faced with regard to access to finance, organized crime/mafia, anticompetitive practices, and the share of sales in unofficial payments. *X* are firm-level controls including firm age, size, and industry dummies, as well as dummies equal to 1 if the firm is owned by the government and if it is an exporter. Robust clustered standard errors are in parentheses; *significant at 10 percent; **significant at 5 percent; ***significant at 1 percent.

Table 4. Determinants of Formality

Dependent variable: Share of formal operations proxied by the share of wage bill, workforce, and sales reported for tax purposes.

$$SF_i = f(Z_i) = \alpha + \eta T_i + \mu a_i + \beta X_i + \varepsilon_i$$

	Percent of Reported Wage Bill			Percent of Reported Workforce			Percent of Reported Sales		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Government ownership	3.196	3.331	3.212	2.594	2.689	2.606	1.404	1.523	1.434
	(1.456)**	(1.497)**	(1.418)**	(1.491)	(1.508)*	(1.461)*	(1.388)	(1.406)	(1.352)
Exporter	−0.040	0.068	0.229	0.980	1.054	1.251	0.831	0.923	1.059
	(0.997)	(1.005)	(0.890)	(1.109)	(1.059)	(0.946)	(1.130)	(1.080)	(0.994)
Small	−3.089	−3.084	−3.195	−2.081	−2.084	−2.175	−1.796	−1.808	−1.873
	(0.642)***	(0.639)***	(0.572)***	(0.722)**	(0.699)***	(0.684)***	(0.535)***	(0.542)***	(0.473)***
Large	1.189	1.192	1.001	−0.211	−0.221	−0.401	0.601	0.591	0.436
	(0.949)	(0.946)	(0.930)	(0.632)	(0.625)	(0.576)	(0.822)	(0.820)	(0.802)
Age	0.035	0.043	0.044	0.031	0.035	0.042	0.023	0.028	0.031
	(0.024)	(0.023)*	(0.024)*	(0.026)	(0.026)	(0.027)	(0.021)	(0.021)	(0.022)
Courts fair and impartial	0.508	0.403	0.392	0.556	0.485	0.434	0.752	0.669	0.658
	(0.280)*	(0.281)	(0.270)	(0.279)*	(0.284)	(0.291)	(0.233)***	(0.221)***	(0.230)**
Access to financing constraint	−0.745	−0.789	−0.783	−0.799	−0.834	−0.849	−0.929	−0.962	−0.964
	(0.448)	(0.460)	(0.430)*	(0.334)**	(0.309)**	(0.308)**	(0.341)**	(0.342)**	(0.324)***
Tax rate constraint	−0.770	−1.027	−0.831	−0.380	−0.539	−0.462	−0.761	−0.956	−0.803
	(0.351)**	(0.354)**	(0.384)**	(0.312)	(0.312)	(0.327)	(0.372)*	(0.379)**	(0.405)*
Organized crime constraint	−0.994	−1.000	−0.991	−0.791	−0.796	−0.745	−0.815	−0.821	−0.815
	(0.473)*	(0.458)**	(0.469)**	(0.381)*	(0.377)**	(0.354)*	(0.423)*	(0.386)**	(0.405)*
Anticompetitive practices constraint	−1.116	−0.943	−1.010	−0.972	−0.857	−0.872	−0.835	−0.696	−0.743
	(0.433)**	(0.402)**	(0.372)**	(0.510)*	(0.422)*	(0.447)*	(0.541)	(0.454)	(0.499)
Percent of sales in unofficial payments	−1.819	−1.818	−1.805	−1.540	−1.541	−1.530	−1.412	−1.412	−1.401
	(0.212)***	(0.210)***	(0.218)***	(0.217)***	(0.213)***	(0.221)***	(0.179)***	(0.179)***	(0.184)***

67

Era Dabla-Norris and Gabriela Inchauste

Table 4 *(concluded)*

Log of GDP per capita (constant 2000 U.S. dollars)	0.133 (1.772)	−7.089 (2.421)***	−1.838 (1.460)	0.111 (1.723)	−4.487 (2.306)*	−2.263 (1.276)*	−0.080 (1.479)	−5.728 (2.331)**	−1.676 (1.178)
Inflation, consumer prices (annual percent)	−0.078 (0.474)	−0.561 (0.438)	−0.197 (0.389)	0.161 (0.425)	−0.147 (0.362)	0.000 (0.316)	−0.118 (0.358)	−0.495 (0.330)	−0.213 (0.291)
Real interest rate (percent)	0.337 (0.281)	−0.184 (0.273)	0.316 (0.224)	0.101 (0.204)	−0.232 (0.228)	0.050 (0.159)	0.092 (0.169)	−0.316 (0.210)	0.077 (0.138)
Rule of law		8.774 (2.709)***			5.577 (3.126)*			6.841 (2.804)**	
Registering property cost (percent of property value)			−2.233 (0.933)**			−2.410 (1.056)**			−1.838 (0.927)*
Rule of law × Cost of registering property			0.853 (0.346)**			0.963 (0.401)**			0.698 (0.347)*
Constant	95.520 (17.998)***	141.808 (20.286)***	113.481 (14.577)***	94.460 (16.877)***	123.955 (12.295)***	115.835 (14.397)***	95.921 (11.118)***	132.118	110.440
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,230	4,230	4,230	4,255	4,255	4,255	4,240	4,240	4,240
R-squared	0.1	0.11	0.11	0.08	0.09	0.09	0.08	0.09	0.08

Sources: BEEPS (2005); World Bank, Doing Business Survey (2005); ICRG (2003–06); Kaufmann, Kraay, and Mastruzzi (2006); World Bank, World Development Indicators.

Note: *T* are the costs of regulation measured by the severity of tax constraints faced by individual firms, the cost of registering property and the cost of licenses measured for the country as a whole. The quality and efficiency of the legal system, *a*, is proxied by firm-level ratings on the constraints faced with regard to access to finance, organized crime/mafia, anticompetitive practices, the share of sales in unofficial payments, and a country-wide measure of rule of law. *X* includes firm-level and country-level controls. Our firm-level controls include firm age, size, and industry dummies, as well as dummies equal to 1 if the firm is owned by the government and if it is an exporter. Our country-level controls include the log of real GDP per capita, CPI inflation, and real interest rates. Robust clustered standard errors are in parentheses; *significant at 10 percent; **significant at 5 percent; ***significant at 1 percent.

that rate financing constraints as a major obstacle tend to hide an additional 1 percentage point of their workforce and sales for tax purposes as compared with firms that rate financing constraints as a moderate obstacle. Similarly, firms that rate tax constraints as a major obstacle tend to hide an additional 1 percentage point of their wage bill and sales for tax purposes as compared with firms that rate tax constraints as a moderate obstacle. Finally, firms that rate anticompetitive practices as a major obstacle tend to hide between ½ and 1 percentage point of their wage bill and workforce for tax purposes as compared with firms that rate tax constraints as a moderate obstacle. The quality of enforcement, on the other hand, significantly increases formal sector operations, as measured by more fair and impartial courts, fewer anticompetitiveness constraints, and lower levels of corruption. In particular, a 1 point increase in the share of sales spent on unofficial payments leads firms to hide an additional 1½ to 2 percentage points of their wage bill, workforce, and sales for tax purposes. Note that these results are similar across different proxies for formality, whether we control for country fixed effects (Table 3) or use country-level controls (Table 4).

When we include institutional variables (Table 4), we find that the level of formality increases with the quality of enforcement, as measured by a countrywide index of rule of law. For instance, a one-unit increase in the index of rule of law leads to a 5 to 9 percentage point increase in reported wage bill, workforce, and sales. We also find that the level of formality decreases with the regulatory burden, as measured by the cost of registering property. A 1 percentage point increase in the cost of registering property (as a share of property value) leads roughly to a 2 percentage point decline in reported wage bill, workforce, and sales. To test whether a stronger legal system reduces the impact of a higher regulatory burden on the incidence of informality, we include an interaction term between the cost of registering property and the rule of law. As in Dabla-Norris, Gradstein, and Inchauste (2008), we find that the negative impact of the regulatory burden on a firm's decision to operate formally is dampened with better enforcement quality (Table 4, columns 3, 6, 9).

Determinants of Firm Growth

Next we examine the determinants of firm growth. Table 5 presents our basic specification of firm growth using country-level controls.[13] Column 1 presents results using all firms; columns 2–4 distinguish between formal and informal firms. The results in column 1 show that firms that are relatively young, in the private sector, exporters, and relatively large grow significantly faster than their counterparts. In particular, small firms (fewer than 50 workers) grow 9 percentage points slower a year than their larger

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[13]Robustness checks were made to include average GDP growth, the average education of the firm's workforce, and whether or not the firm receives a subsidy. The results are very similar and are available on request.

counterparts, and each additional year in operation slows firm growth by about 0.2 percentage point. Formal firms grow at a slightly slower pace than their informal counterparts when using the percent of reported wage bill to proxy the level of formality of a firm (column 1).[14] With regard to the impact of constraints firms face, we find that lower quality of enforcement, as measured by constraints posed by organized crime and anticompetitive practices, negatively affect firm growth for all firms. In particular, firms that rate organized crime and anticompetitive practices as a major obstacle tend to grow 1 to 1½ percentage points slower than firms that rate financing constraints as a moderate obstacle.

To test whether constraints have a differential impact on the growth of formal and informal firms, we separate the sample and define formal firms as those that report 100 percent of their wage bill; informal firms are those that report less than 100 percent of their wage bill. We also include a category "very informal" firms (those that report less than 50 percent of their wage bill). Columns 2–4 in Table 5 present the results. As shown in column 2, growth in formal firms is negatively affected by greater tax constraints. This result holds whether we measure taxes with the average tax constraint, high tax rates, or weakness in tax administration (not reported here). In particular, formal firms that rate tax rates as a major obstacle grow 2 percentage points slower than formal firms that rate tax rates as a moderate obstacle. In contrast, tax constraints are not significantly associated with growth in informal firms. Similarly, we find that formal firms that rate access to financing as a major obstacle experience 1 percentage point lower growth than formal firms that rate it as a moderate obstacle, whereas this variable is found to be insignificant for informal firms. These results provide evidence that tax and financial obstacles have a much greater impact on the operation and growth of formal firms than on that of informal firms.

We also find that different measures of the quality of enforcement lead to lower growth for different types of firms. In particular, constraints posed by anticompetitive practices lead to lower growth in formal firms, whereas they are found to be insignificant for informal and highly informal firms. This is important to the extent that growth in formal firms is curtailed by the existence of a large informal sector that engages in anticompetitive practices, because it suggests potential negative spillovers from informal to formal firms. On the other hand, enforcement quality as measured by an improved perception of fair and impartial courts leads to higher growth in formal firms, but is found to be insignificant for informal firms. This suggests that formal firms benefit to a greater extent from efficient and well-functioning legal systems.

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[14]Sales growth in formal and informal firms is insignificantly different when using the other two proxies of formality, but the results on the impact of constraints, regulatory burden, and rule of law for formal vs. informal firms are similar to those described below. The results of these regressions are available from the authors on request.

In contrast, constraints posed by organized crime lead to significantly lower sales growth in informal firms, but are insignificant for formal firms. In particular, informal firms that rate organized crime as a major obstacle grow 2½ percentage points slower than informal firms that rate organized crime as a moderate obstacle. These results together point to the informal firm's inability to take full advantage of public goods provided, such as the legal and judicial system, and their inability to seek police or law enforcement help when confronted with organized crime. This likely reduces informal firm productivity further, because it leads to larger amounts of resources being diverted for protection or unofficial payments.

Table 5. Determinants of Sales Growth

Dependent variable: Real change in sales over the past 36 months.

$$\Delta Y_i = f(SF_i,\, Z_i) = \alpha + \delta SF_i + \eta T_i + \mu a_i + \beta X_i + \varepsilon$$

	All Firms	Formal Firms	Informal Firms	Very Informal Firms
	(1)	(2)	(3)	(4)
Government ownership	−4.369	−4.539	−2.688	−2.949
	(2.370)*	(2.176)*	(4.787)	(11.021)
Exporter	7.881	8.854	6.621	14.244
	(2.212)***	(2.245)***	(3.388)*	(8.226)
Small	−9.074	−9.402	−7.747	−10.992
	(2.521)***	(2.790)***	(3.317)**	(6.094)*
Large	−0.653	−0.98	1.591	−3.583
	(2.257)	(2.954)	(3.186)	(8.556)
Age	−0.157	−0.154	−0.18	−0.416
	(0.044)***	(0.033)***	(0.104)	(0.202)*
Courts fair and impartial	0.564	1.06	−0.703	−0.107
	(0.395)	(0.515)*	(0.729)	(0.720)
Access to financing constraint	−0.608	−1.219	0.458	1.381
	(0.641)	(0.677)*	(1.094)	(2.011)
Tax rate constraint	−0.738	−2.304	2.527	3.932
	(0.944)	(0.768)***	(1.843)	(2.366)
Organized crime constraint	−1.327	−0.121	−2.62	−2.938
	(0.604)**	(0.886)	(0.904)***	(1.676)*
Anticompetitive practices constraint	−1.522	−1.418	−1.77	−2.594
	(0.597)**	(0.432)***	(1.155)	(2.025)
Percent of sales in unofficial payments	0.327	0.376	0.276	0.573
	(0.320)	(0.620)	(0.461)	(0.822)
Log of GDP per capita (constant 2000 U.S. dollars)	−7.409	−7.864	−7.326	−11.088
	(3.327)**	(3.284)**	(4.093)*	(4.556)**
Inflation, consumer prices (annual percent)	−0.003	−0.33	0.693	0.959
	(0.634)	(0.588)	(1.030)	(1.291)
Real interest rate (percent)	−0.981	−1.125	−0.709	−0.561
	(0.460)**	(0.436)**	(0.665)	(0.806)

	All Firms	Formal Firms	Informal Firms	Very Informal Firms
Table 5 *(concluded)*				
	(1)	**(2)**	**(3)**	**(4)**
Constant	105.632	95.953	90.493	126.503
	(33.533)***	(32.151)***	(37.194)**	(46.895)**
Percent of reported wage bill	−0.134			
	(0.043)***			
Country fixed effects	No	No	No	No
Industry effects	Yes	Yes	Yes	Yes
Observations	4,230	2,765	1,616	559
R-squared	0.08	0.08	0.10	0.15

Source: BEEPS (2005).

Notes: *SF* is the share of operations conducted in the formal sector as measured by the percentage of their wage bill reported for tax purposes. *T* are regulation costs measured by the severity of tax constraints faced by individual firms. The quality and efficiency of the legal system, *a*, is proxied by firm-level ratings on the constraints faced with regard to access to finance, organized crime/mafia, anticompetitive practices, and the share of sales in unofficial payments. *X* includes country and firm-level controls. Firm-level controls include firm age, size, and industry dummies, and dummies equal to 1 if the firm is owned by the government and if it is an exporter. Country-level controls include the log of real GDP per capita, CPI inflation, and real interest rates. Column (2) presents results for formal firms (those reporting 100 percent of their wage bill), column (3) for informal firms (those reporting less than 100 percent of their wage bill); column (4) for very informal firms (those reporting less than 50 percent of their wage bill). Robust clustered standard errors are in parenthesis. *significant at 10 percent; **significant at 5 percent; ***significant at 1 percent.

In terms of the impact of countrywide controls, we find that firms in countries with higher GDP per capita, or higher real interest rates, grow at a slower pace than firms in countries with lower levels of GDP per capita and lower real interest rates. The level of consumer price inflation is insignificant in all regressions.

To address a potential omitted variable problem in the selection of country-specific controls, Table 6 presents a country-fixed-effects specification on the determinants of firm growth. Columns 1 and 2 present results using all firms; columns 3–5 distinguish between formal and informal firms. The results are similar to those presented above and indicate that the extent to which tax, financial, and legal underdevelopment constrain a firm's growth depends very much on how formal the firm is. We find that formal firms again are the most severely affected by tax and financing obstacles, and seek to benefit from improvements in legal efficiency. Moreover, to address the potential endogeneity of formality and sales growth, we use the instrumental variables technique discussed in Section III above. In particular, we

Table 6. Determinants of Sales Growth

Dependent variable: Real change in sales over the past 36 months.

$$\Delta Y_i = f(SF_i, Z_i) = \alpha + \gamma_i + \delta SF_i + \eta T_i + \mu a_i + \beta X_i + \varepsilon$$

	All Firms		Formal Firms	Informal Firms	Very Informal Firms
	OLS	IV (2SLS)	OLS	OLS	OLS
	(1)	(2)	(3)	(4)	(5)
Government ownership	−4.288	1.188	−5.530	1.581	2.726
	(1.771)**	(3.976)	(1.703)***	(3.457)	(7.624)
Exporter	6.792	7.606	7.142	6.503	11.852
	(1.745)***	(1.611)***	(2.012)***	(2.529)**	(6.156)*
Small	−8.268	−10.721	−8.246	−7.605	−7.744
	(1.823)***	(2.010)***	(2.075)***	(2.415)***	(4.225)*
Large	−0.094	0.586	−0.582	3.336	−2.498
	(1.642)	(2.339)	(2.141)	(2.985)	(5.196)
Age	−0.140	−0.134	−0.117	−0.221	−0.357
	(0.035)***	(0.045)***	(0.030)***	(0.087)**	(0.139)**
Courts fair and impartial	0.455	1.029	0.750	−0.516	0.232
	(0.298)	(0.525)**	(0.340)**	(0.697)	(0.933)
Access to financing constraint	−0.565	−1.193	−1.243	0.838	1.069
	(0.497)	(0.837)	(0.554)**	(0.811)	(1.464)
Tax rate constraint	−0.044	−0.370	−1.442	2.730	3.707
	(0.671)	(0.758)	(0.625)**	(1.335)*	(1.935)*
Organized crime constraint	−1.075	−1.350	−0.058	−2.497	−2.416
	(0.437)**	(0.601)**	(0.637)	(0.728)***	(1.367)*
Anticompetitive practices constraint	−0.911	−1.286	−0.943	−0.925	−0.766
	(0.496)*	(0.678)*	(0.569)	(0.833)	(1.772)
Percent of sales in unofficial payments	0.044	−0.908	0.115	−0.065	−0.369
	(0.201)	(0.746)	(0.348)	(0.272)	(0.542)
Constant	21.393	78.190	12.974	9.828	15.838
	(4.720)***	(42.918)*	(2.994)***	(7.997)	(13.660)
Percent of reported wage bill	−0.124	−0.808			
	(0.038)***	(0.502)			
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes	Yes
Observations	6,139	5,550	4,136	2,201	759
Cragg-Donald $(\tilde{N}−L) \times$ minEval/ $L2$ *F*-stat		16.90			
Anderson canon. corr. *LR* statistic		17.013			
R-squared	0.08		0.08	0.12	0.17

Source: BEEPS (2005).

Note: *SF* is the share of operations conducted in the formal sector as measured by what share of their wage bill that is reported for tax purposes. γ are country fixed effects, *T* are the costs of regulation measured by the severity of tax constraints faced by individual firms. The quality and efficiency of the legal system, *a*, proxied by firm-level ratings on the constraints faced with regard to access to finance, organized crime/mafia, anticompetitive practices, and the share of sales in unofficial payments. *X* includes firm-level controls, including firm age, size and industry dummies, as well as dummies equal to 1 if the firm is owned by the government and if it is an exporter. Robust clustered standard errors are in parenthesis, with the exception of column (2) where robust standard errors are reported. *significant at 10 percent; **significant at 5 percent; ***significant at 1 percent.

Table 7. Determinants of Sales Growth: Institutions

Dependent variable: Real change in sales over the past 36 months

$$\Delta Y_i = f(SF_i, Z_i) = \alpha + \delta SF_i + \eta T_i + \mu a_i + \beta X_i + \varepsilon$$

	All Firms			Formal Firms		Informal Firms		Very Informal Firms	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Government ownership	−2.049	−4.371	−4.314	−2.646	−4.492	1.813	−2.747	9.703	−3.697
	(2.015)	(2.398)*	(2.379)*	(1.838)	(2.194)*	(5.343)	(4.891)	(14.044)	(11.470)
Exporter	7.192	8.107	8.000	7.783	9.159	6.040	6.730	18.839	14.880
	(2.217)***	(2.155)***	(2.113)***	(2.219)***	(2.149)***	(3.323)*	(3.401)*	(8.446)**	(8.171)*
Small	−9.014	−9.246	−9.136	−9.484	−9.410	−7.489	−8.161	−9.141	−11.817
	(2.843)***	(2.505)***	(2.499)***	(3.369)***	(2.784)***	(3.496)**	(3.298)**	(5.041)*	(5.762)*
Large	−0.820	−0.864	−0.779	−2.491	−1.182	3.602	1.374	−3.271	−3.746
	(2.645)	(2.270)	(2.279)	(3.541)	(2.975)	(3.197)	(3.208)	(8.041)	(8.483)
Age	−0.170	−0.150	−0.149	−0.162	−0.148	−0.210	−0.170	−0.301	−0.398
	(0.040)***	(0.045)***	(0.045)***	(0.039)***	(0.034)***	(0.101)*	(0.108)	(0.200)	(0.214)*
Courts fair and impartial	0.242	0.456	0.459	0.509	0.939	−0.509	−0.771	−0.452	−0.244
	(0.346)	(0.353)	(0.360)	(0.444)	(0.481)*	(0.734)	(0.732)	(0.971)	(0.731)
Access to financing constraint	−0.390	−0.597	−0.614	−1.172	−1.225	0.985	0.496	2.687	1.468
	(0.701)	(0.637)	(0.640)	(0.780)	(0.673)*	(1.094)	(1.082)	(1.865)	(1.992)
Tax rate constraint	0.279	−0.990	−1.001	−1.589	−2.580	4.258	2.359	4.333	3.591
	(1.025)	(0.946)	(0.903)	(0.881)*	(0.812)***	(2.075)*	(1.810)	(2.810)	(2.430)
Organized crime constraint	−0.848	−1.227	−1.205	0.334	−0.033	−1.703	−2.494	−1.195	−2.798
	(0.614)	(0.645)*	(0.641)*	(0.963)	(0.891)	(1.047)	(0.957)**	(1.544)	(1.706)
Anti-competitive practices constraint	−1.896	−1.426	−1.411	−1.615	−1.256	−2.495	−1.790	−4.417	−2.535
	(0.641)**	(0.596)**	(0.577)**	(0.540)**	(0.472)**	(1.267)**	(1.145)	(2.407)*	(2.000)
Percent of sales in unofficial payments	0.203	0.290	0.293	0.347	0.340	0.009	0.251	0.209	0.502
	(0.379)	(0.311)	(0.306)	(0.768)	(0.618)	(0.518)	(0.452)	(0.995)	(0.782)
Log of GDP per capita (constant 2000 U.S. dollars)	−1.589	−7.540	−8.123	−1.561	−8.033	−1.872	−7.422	−6.960	−11.229
	(2.746)	(3.156)**	(6.109)	(2.548)	(3.120)**	(3.548)	(3.974)*	(4.997)	(4.759)**
Inflation, consumer prices (annual percent)	0.427	0.040	−0.009	0.310	−0.301	0.658	0.750	0.512	1.067
	(0.379)	(0.615)	(0.739)	(0.356)	(0.551)	(0.727)	(1.065)	(1.016)	(1.297)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Real interest rate (percent)	-1.356 (0.167)***	-0.951 (0.443)**	-0.988 (0.590)	-1.339 (0.171)***	-1.103 (0.405)**	-1.568 (0.439)***	-0.671 (0.682)	-1.513 (0.544)**	-0.478 (0.806)
Rule of Law 2005	0.000 (0.000)	0.000 (0.000)	-7.217 -6.944	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Cost of dealing with licenses (percent of income per capita)		-0.004 (0.001)***	-0.004 (0.001)**		-0.004 (0.001)***		-0.004 (0.002)*		-0.006 (0.003)**
Composite risk	-1.561 (0.462)***			-1.475 (0.456)***		-1.918 (0.574)***		-1.676 (0.888)*	
Percent of reported wage bill	-0.135 (0.048)**	-0.138 (0.044)***	-0.110 (0.034)***						
Percent of reported wage bill × Rule of law			0.090 (0.048)*						
Constant	169.446 (21.281)***	108.277 (31.778)***	110.76 (55.800)*	151.651 (24.555)***	98.451 (30.495)***	179.613 (35.733)**	92.716	209.030 (46.683)**	130.962
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,635	4,230	4,230	2,338	2,765	1,421	1,616	456	559
R-squared	0.1	0.08	0.08	0.1	0.08	0.13	0.1	0.17	0.16

Sources: BEEPS (2005); World Bank, Doing Business Survey (2005); ICRG (2003–06); Kaufmann, Kraay, and Mastruzzi (2006); World Bank, World Development Indicators.

Note: T are the costs of regulation measured by the severity of tax constraints faced by individual firms, and the cost of licenses measured for the country as a whole. The quality and efficiency of the legal system, a, proxied by firm-level ratings on the constraints faced with regard to access to finance, organized crime/mafia, anticompetitive practices, and the share of sales in unofficial payments. We also included proxies for countrywide institutions, including a countrywide composite risk index and a countrywide measure of rule of law. X includes firm-level and country-level controls. Our firm-level controls include firm age, size, and industry dummies, as well as dummies equal to 1 if the firm is owned by the government and if it is an exporter. Our country-level controls include the log of real GDP per capita, CPI inflation, and real interest rates. Formal firms are defined as those that report 100 percent of their wage bill. Informal firms are those that report less than 100 percent of their wage bill. Very informal firms are defined as those that report less than 50 percent of their wage bill. Robust clustered standard errors are in parentheses. *significant at 10 percent; **significant at 5 percent; ***significant at 1 percent.

instrument the level of formality by a dummy equal to 1 if the firm was originally a state-owned company or a subsidiary of a state-owned company. The results are broadly similar to those presented in Table 5; however, the differential growth rates for formal and informal firms are no longer significant (column 2).

Growth and Institutions

Next we examine the effect of country-specific institutions on firm growth and informality. To this end, we add countrywide measures of rule of law, a countrywide index of risk, and the cost of registering property to the basic regressions reported in Table 5. Table 7 shows that sales growth is negatively affected by a higher composite risk index (columns 1, 4, 6, and 8). Because this measure includes political, financial, and economic risks, this result is not surprising. However, it is not very informative, because it does not show which institutional weaknesses are most damaging for firm growth. As a result, we included countrywide measures of rule of law, regulatory burden, political stability, government effectiveness, and so on. Although many of these variables, including rule of law, were insignificant, we found that sales growth declines with regulatory burden, as measured by the cost of dealing with licenses, although the magnitude of this impact is small (columns 2, 5, 7, and 9).

When we include the interaction term between rule of law and the level of formality, we find a positive and significant result, implying that better rule of law improves formal firm growth, somewhat mitigating the relatively lower growth performance when compared with informal firms. The low levels of significance of countrywide variables can be attributed to the relatively small variation across countries in each of these measures, compared with the large variation across firms within each country.

IV. Concluding Remarks

Tax and regulatory burdens, judicial inefficiency, and limited access to financing are commonly cited as constraints to firm performance and economic growth. At the same time, these constraints are also viewed as important determinants of a firm's decision to operate informally. This paper integrates the two perspectives and seeks to demonstrate that informality is an important channel through which regulatory and other policy constraints affect firm growth, using an integrated firm-level data set for transition countries. Specifically, we show that these obstacles play a significant role in shaping not only firms' incentives to operate informally, but also which firms grow.

As predicted by our theoretical model, the tax and regulatory burden faced by firms as well as the quality of the legal system are important determinants of informality. We find that firms reduce their formal

operations when there is a higher regulatory burden, but increase it with better enforcement quality. In particular, firms that rate financing and tax constraints or anticompetitive practices as major obstacles on average tend to hide an additional 1 percentage point of their workforce and sales when compared with firms that rate these as moderate obstacles. Finally, we find that the negative impact of regulatory burden on a firm's decision to operate formally is dampened with better quality of enforcement.

In terms of firm growth, we find a differential impact of regulatory burden and enforcement quality on formal and informal firms. In particular, we find that the extent to which tax, financial, and legal underdevelopment constrain a firm's growth depends very much on how formal the firm is. Growth in formal firms is negatively affected by both tax and financing constraints, whereas these have either a positive or insignificant effect for an informal firm. In contrast, tax and access to financing constraints are not significantly associated with growth in informal firms. We also find that different measures of the quality of enforcement lead to lower growth for different types of firms. In particular, constraints posed by anticompetitive practices lead to lower growth in formal firms, whereas they are found to be insignificant for informal and highly informal firms. On the other hand, enforcement quality as measured by an improved perception of fair and impartial courts leads to higher growth in formal firms; this is found to be insignificant for informal firms. In contrast, constraints posed by organized crime lead to significantly lower sales growth in informal firms, but are insignificant for formal firms.

When we look at countrywide institutions, we find that growth is negatively affected by relatively weak institutions as measured by country economic, political, and financial risk. We also find that a higher regulatory burden, proxied by the cost of dealing with licenses, reduces firm growth for all types of firms. However, the interaction term between a country-wide measure of the rule of law and the level of formality is positive and significant, implying that better rule of law improves formal firm growth.

These results provide evidence that tax and financial obstacles have a much greater impact on the operation and growth of formal firms. Moreover, they also point to the inability of the informal sector to take full advantage of public goods provided, such as the legal and judicial system, and its inability to seek police or law enforcement help when confronted with organized crime. An important policy conclusion is that countries that implement policies to reduce financial and regulatory constraints and improve their legal environment reduce the incentives for firms to operate informally, both by increasing the benefits of participating in the formal sector and by reducing the costs of doing so. Moreover, to the extent that these obstacles have a differential impact on growth of formal and informal firms, our results point to the importance of lowering tax, regulatory, and financing constraints to foster the growth of formal firms. Our results also suggest that the negative impact of policy constraints on firm performance may not be as disastrous in an economy with a smaller informal sector.

APPENDIX I

See Table A1.

	Table A1. Countries in the Sample			
	Country	**Number of Firms**	**Percent**	**Cumulative**
1	Albania	201	2.16	7.36
2	Armenia	340	3.65	76.89
3	Azerbaijan, Rep. of	333	3.58	86.61
4	Belarus	304	3.27	39.70
5	Bosnia and Herzegovina	191	2.05	17.73
6	Bulgaria	288	3.09	61.23
7	Croatia	228	2.45	9.81
8	Czech Republic	338	3.63	49.71
9	Estonia	209	2.25	71.19
10	Georgia	191	2.05	73.24
11	Hungary	594	6.38	46.08
12	Kazakhstan	572	6.15	83.04
13	Kyrgyz Republic	194	2.08	100.00
14	Latvia	194	2.08	66.80
15	Lithuania	199	2.14	68.94
16	Macedonia, FYR	289	3.10	5.20
17	Moldova	325	3.49	64.72
18	Poland	960	10.31	30.41
19	Romania	575	6.18	58.13
20	Russia	568	6.10	95.87
21	Serbia and Montenegro	195	2.09	2.09
22	Slovak Republic	209	2.25	51.96
23	Slovenia	221	2.37	20.10
24	Tajikistan	190	2.04	97.92
25	Turkey	546	5.87	15.67
26	Ukraine	560	6.02	36.43
27	Uzbekistan	294	3.16	89.77
	Total	9,308	100.00	

APPENDIX II

Table A2. Variables and Sources

Variable	Definition	Original Source
Sales growth	Over the past 36 months, how have sales changed (increased/decreased/no change), and what is the percent of change for your company, in real terms (i.e., after allowing for inflation)?	Business Environment and Enterprise Performance Survey (BEEPS, 2005)
Percentage of sales declared to tax authorities	Recognizing the difficulties many firms face in fully complying with taxes and regulations, what percentage of total annual sales would you estimate the typical firm in your area of business reports for tax purposes?	BEEPS (2005)
Percentage of workforce declared to tax authorities	Recognizing the difficulties many firms face in fully complying with labor regulations, what percentage of total workforce would you estimate the typical firm in your area of business reports for tax purposes?	BEEPS (2005)
Percentage of wage bill declared to tax authorities	Recognizing the difficulties many firms face in fully complying with labor regulations, what percentage of total wage bill would you estimate the typical firm in your area of business reports for tax purposes?	BEEPS (2005)
Financing constraint	How problematic is access to financing (e.g., collateral required or financing not available) for the operation and growth of your business: no obstacle (1), a minor obstacle (2), a moderate obstacle (3), or a major obstacle (4)?	BEEPS (2005)
Tax rate constraint	How problematic are tax rates for the operation and growth of your business: no obstacle (1), a minor obstacle (2), a moderate obstacle (3), or a major obstacle (4)?	BEEPS (2005)
Tax administration constraint	How problematic is tax administration for the operation and growth of your business: no obstacle (1), a minor obstacle (2), a moderate obstacle (3), or a major obstacle (4)?	BEEPS (2005)
Organized crime/ mafia	How problematic is organized crime/mafia for the operation and growth of your business: no obstacle (1), a minor obstacle (2), a moderate obstacle (3), or a major obstacle (4)?	BEEPS (2005)
Percent of sales in unofficial payments	On average, what percentage of total annual sales do firms like yours typically pay in unofficial payments/gifts to public officials?	BEEPS (2005)

Table A2 *(concluded)*		
Variable	**Definition**	**Original Source**
Courts are fair and impartial	How often do you associate the description "fair and impartial" with the court system in resolving business disputes: always (1), usually (2), frequently (3), sometimes (4), seldom (5), never (6)?	BEEPS (2005)
Government ownership	Dummy variable that takes on the value 1 if any government agency or state body has a financial stake in the ownership of the firm, zero otherwise.	BEEPS (2005)
Firm-size dummies	A firm is defined as small if it has between 2 and 49 employees, medium if it has between 50 and 249 employees, and large if it has more than 250 employees.	BEEPS (2005)
Risk	Countrywide composite risk index capturing measures of political, economic, and financial risk produced by the International Country Risk Guide (ICRG).	ICRG, closest date to 2005 available, ranging from 2003 to 2006.
Rule of law	Synthetic index, rescaled adding two points to the index to avoid negative values, where a higher indicator denotes a higher quality rule of law.	Kaufmann, Kraay, and Mastruzzi (2006)
Log GDP per capita	Log of per capita GDP in constant 2000 U.S. dollars.	World Development Indicators (WDI)
Real interest rate	Real interest rate (in percent) in 2005	WDI
Consumer price inflation	Consumer price inflation in 2005 (in annual percent)	WDI
Cost of registering property	Cost of registering property measured as a percentage of property value.	World Bank, Doing Business Survey (2005)
Cost of dealing with licenses	Dealing with licenses cost (in percent of income per capita).	World Bank, Doing Business Survey (2005)

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