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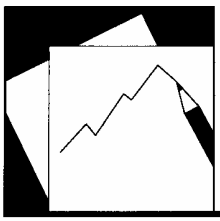

IMF Working Paper

What Causes Firms to Hide Output? The Determinants of Informality

Era Dabla-Norris, Mark Gradstein, and Gabriela Inchauste

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What Causes Firms to Hide Output? The Determinants of Informality

Prepared by Era Dabla-Norris, Mark Gradstein, and Gabriela Inchauste[1]

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Abstract

In many developing countries, a significant part of economic activity takes place in the informal sector. Earlier work has examined the determinants of the size of the informal sector, focusing separately on factors such as tax and regulation burden, financial market development, and the quality of the legal system. We revisit this issue by using an integrated dataset which contains rich information on all these aspects. Testing the channels affecting the degree of informality, we find evidence that all previously identified factors indeed play a role in driving informality. In particular, and consistent with the suggested theoretical model, we find support for the significance of the quality of the legal system.

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Author(s) E-Mail Address: edablanorris@imf.org; grade@bgu.ac.il; minchauste@imf.org

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I. INTRODUCTION

Much economic activity, especially in developing countries, occurs in the informal sector. Estimates suggest that, depending on the measure used, it generates between 10 and 20 percent of the aggregate output in developed countries and more than a third of aggregate output in developing countries, reaching in some countries more than 50 percent (Schneider and Enste, 2002).[2] Concerns have been expressed with regard to the effect of informality on economic growth,[3] as well as to its impact on the erosion of the tax base with ensuing detrimental effects on the quality and quantity of publicly provided goods and services.

Progress in understanding the causes of informality has recently been made, through both theoretical and empirical work. Existing theories on the informal sector almost invariably assume that formality imposes fiscal burdens on a firm, such as taxes or costs of complying with regulatory requirements, as well as entails benefits of better access to productive public goods (see e.g., Azuma and Grossman, 2002; Loayza, 1996; Marcouiller and Young, 1995). The latter can be interpreted generally as infrastructure provided by the government or, more specifically, as an enabling legal framework that allows better access to financial services, as in Straub, 2005. This trade-off then determines the decisions of individual economic units whether or not to go informal and, ultimately, the relative size of the informal sector.

The empirical literature relates the size of the informal sector to proxies such as the tax burden (e.g., Cebula, 1997; Giles and Tedds, 2002), entry costs (Auriol and Warlters, 2005); institutional quality and regulatory burden, in particular of labor (Friedman and others, 2000, Johnson and others, 1997, 1998, 2000; Botero and others, 2004); and financial development (Straub, 2005).[4] Although earlier literature mostly relied on case studies and proxies, such as electricity consumption and currency in circulation,[5] a more recent trend is to employ micro-based data, typically elicited through firm-level surveys. Additionally, more recent work tends to dismiss the importance of the tax burden emphasized in earlier literature. For instance, Friedman and others, 2000 do not find any significant effect of taxes on informality; if there is any effect at all, high taxes seem to be associated with smaller informal sectors.

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[2] As in Schneider and Enste (2002), we define informal activity as all economic activity that contributes to GDP but is currently unregistered and untaxed. More specifically, given data limitations, in this paper we primarily focus on unregulated production by firms that engage in tax evasion.

[3] This has been the subject of some scrutiny recently. For instance, although it has been suggested that a large informal sector implies, inter alia, slower economic growth (Loayza, 1996; Dabla-Norris and Feltenstein, 2005), Sarte, 2000 offers a more nuanced view.

[4] Schneider and Enste (2002) and Schneider and Klingmair (2003) contain excellent surveys of this work.

[5] Schneider and Enste (2002) comprehensively summarize this literature.

Altogether, although the existing literature contains a relatively rich offering of the potential determinants of informality, few studies have compared them relying on the same dataset.[6] In this paper, therefore, we take a fresh look at the causes of informality. To this end, we offer a simple general-equilibrium model where the quality of the legal system manifests itself not in offering a better access to government-provided services, as in the earlier literature, but in enforcing better compliance with existing entry regulations. In particular, better legal quality implies a higher probability of detection of informal entrepreneurs who avoid entry regulation requirements, such as licensing fees and compliance with standards.

This framework generates several predictions. In particular, we find that both regulation burden and legal quality are important determinants of informality. Moreover, the elasticity of informality with respect to the regulation burden is smaller, the better the quality of the legal system is. This implies that although the regulatory burden may be conducive to informal activity, it may not have such an effect in countries with a strong rule of law. We also find that informality is associated with smaller and less productive firms.[7]

We test these predictions using data from the World Business Environment Survey (WBES) compiled by the World Bank for a large number of developing and developed countries. It reports relatively rich information on the different obstacles (i.e., legal, financial, regulatory, corruption) firms face, as well as information on the intensity of informal activity for small and large firms. This dataset enables us to, in effect, run a horse race between the different channels of informality, the quality of the legal system, financial constraints, and the regulatory burden and to analyze how firms in different legal systems perceive obstacles to formality.

The rest of the paper proceeds as follows. Section II describes the analytical framework and derives its main predictions. Section III then describes the data and the empirical model. The results are presented in Section IV, and Section V concludes.

II. Analytical Framework

A. Description of Model

The model is kept as simple as possible to generate empirically testable predictions. Its essential feature is that the quality of legal enforcement captures the likelihood of detecting informal activity. In particular, it draws on Rauch, 1991, augmenting it with institutional

[6] Friedman and others (2000) and Johnson and others (2000) do accomplish this, the former primarily in the context of cross-country regressions, and the latter in the context of transition economies; but they ignore the financial development factor, and their selected samples can be criticized as either macro-based or nonrepresentative.

[7] In a related paper, Erickson (2004) also obtains a bifurcation of firm sizes based on bureaucratic regulations. However, it ignores the importance of the legal system, which is the focus of our paper.

features pertinent to the empirical analysis below. Specifically, we assume that firms use labor as an input, and their production function is

$$y_i = a_i f(L), f'>0, f''<0 \quad (1)$$

where L is the amount of labor employed and a_i is interpreted as firm i's productivity from other factors. We assume for concreteness that firm productivities are uniformly distributed in the population, in the unit interval. Productivity can have several interpretations. For example, it may reflect the education level of the firm's entrepreneur, as in Lucas 1978. Alternatively, it can include the accumulated skills, experience and know how within the firm. Assuming that the firms engage in learning by doing (Arrow, 1962), age in the industry may be an important determinant of productivity, and we also make use of this interpretation in our empirical analysis.

Letting w denote the wage rate; and C the cost of complying with regulatory requirements and bribes in the formal sector; and normalizing the output price to one, the profits of a firm operating in the formal sector can be written as:[8]

$$P_i^F = a_i f(L) - wL - C \quad (2)$$

The costs of regulation can be a significant factor, as documented in Djankov et al., 2002, who find that in more than a third of their sample countries these costs constitute more than 50 percent of GDP per capita. It is a reflection of this significance that in the surveys of the business climate by the World Bank, data from which is employed below, a central question specifically mentions the costs of regulations as a potential factor affecting firms' willingness to hide output.

If the firm chooses to operate informally, it avoids the direct cost of regulatory requirements but faces a likelihood of being caught and fined. We denote p the probability of being caught when operating informally and interpret it as being dependent on the quality of the legal system.[9] In contrast, weak institutional quality implies lax enforcement, either because of

[8] We ignore the independent effects of corruption in generating an underground economy. A large underground economy can be a result of firms seeking to escape a predatory bureaucracy in the formal economy (Shleifer, 1997, Johnson et al., 1998). There could be a reverse causality if the level of corruption is itself the outcome of a process in which firms decide how much to hide and hiding requires bribe payments. In the empirical section, we are only able to test for the correlation between corruption and hidden activity rather than the direction of causality.

[9] It is not too difficult to provide a somewhat more detailed underpinning for the interpretation of p as being related to the quality of the legal system. For suppose that setting ρ entails a cost, say; $\phi(\rho)$, ϕ', $\phi''>0$, $\phi(0) = 0$; for example, $\phi(p) = \gamma p^2/2$. Larger values of γ imply that it is marginally costlier to set a given level of p – because of governance

(continued…)

incompetence or because of associated bribery and corruption of public officials.[10] We suppose that, when caught, the firm is fined by the full amount of its profits.[11] While p can be more fully endogenized (in fact, the literature on tax evasion and optimal auditing deals precisely with this issue, see Allingham and Sandmo, 1972, for a classical paper), here it is assumed to be exogenously given. In the appendix we consider the case where p is itself a function of the fraction of output that firms hide.

The assumptions above imply that the profits of an informally operating firm can be written as follows:

$$P_i^{\mathrm{I}}(\text{not caught}) = a_i f(L) - wL \text{ , with prob } 1\text{-}p \tag{3a}$$

$$P_i^{\mathrm{I}}(\text{caught}) = 0, \text{ with prob } p \tag{3b}$$

so that the expected profits are

$$P_i^{\mathrm{I}} = [a_i f(L) - wL](1\text{-}p) \tag{4}$$

Note that, for analytical tractability, we assume that the production technology is idenitical in both sectors. In reality, production in the informal sector often generates an efficiency loss either because firms scale down production to avoid being seen or because the production technology itself is inefficient. Additionally, we assume two distinct sectors. As is shown in the appendix, the model can be extended so that firms can hide a fraction of their activity; making the probability of getting detected and the regulatory burden faced by firms dependent on this fraction yields similar qualitative results as reported below. From equation (4), the probability p, the probability of being caught, can be interpreted as capturing the strength of the legal system.

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inefficiency, for example. Further, suppose that the government maximizes the net expected revenue from imposing fines on the informal sector and the costs associated with increasing the probability of detection. In such an expanded framework, it can be shown that larger values of γ lead to smaller probability of detection chosen by the government.

[10] A broader interpretation is that weak institutional quality manifests in the inability of informal entrepreneurs to secure property rights, access credit markets, and have recourse to the legal system.

[11] This assumption is made for simplicity; nothing substantial changes when the fine is fixed at different rate. Azuma and Grossman, 2002, whose focus is somewhat different, study the government policy with regard to taxing the formal and the informal sector.

The entrepreneurs decide which sector to operate in given the competitive wage and the regulatory costs; and the competitive wage clears the labor market.

B. Analysis and Implications

Profit maximization implies that at the internal solution:

$$a f'(L(a)) - w = 0 \tag{5}$$

Equation (5) determines the demand for labor in the formal and the informal sectors respectively,

$$L(a) = G(w/a);\ G' < 0 \tag{6}$$

The decision whether to operate a firm in the informal sector or to be a worker is determined from:

$$[\underline{a}\, f(L(\underline{a})) - wL(\underline{a})](1-p) = w \tag{7}$$

where $\underline{a}$ is the cutoff productivity level that makes a person indifferent between the two possibilities. Note that all individuals with lower productivity become workers. Rewriting $\underline{a}$ as $\underline{a}(w; p)$, differentiation of (7) reveals that a is increasing in both arguments.

The decision whether to operate a firm in the formal or the informal sector is determined from:

$$a^* f(L(a^*)) - wL(a^*) - \mathrm{C} = [a^* f(L(a^*)) - wL(a^*)](1-p),$$

or

$$[a^* f(L(a^*)) - wL(a^*)]p - \mathrm{C} = 0 \tag{8}$$

where a^* denotes the cutoff productivity level. Differentiating the left hand side in (8) while applying the envelope theorem establishes that it monotonically increases in productivity; it is clearly negative when productivity is small enough, and positive when it is large enough. This implies existence of a unique solution to (8), $a^*(w; \mathrm{C}/p)$, which – as revealed by differentiation – increases in both arguments. Assuming that C is not excessively large guarantees that $a^* > \underline{a}$.

Total demand for labor is then $\int_{\underline{a}}^{1} G(w/a)da$, and it must be equal the supply of labor, a, generating the labor market clearing equation:

$$\int_{\underline{a}}^{1} G(w/a)da = \underline{a} \tag{9}$$

Equations (6) and (9) jointly determine the equilibrium. Differentiation reveals that the left hand side decreases in $\underline{a}$, while the right hand side is increasing in $\underline{a}$. Moreover, when a tends to 0, the left hand side exceeds the right hand side, and when $\underline{a}$ =1, the opposite holds. Intuitively, as the number of workers in the economy goes to 0, demand for labor exceeds supply, whereas, as all agents in the economy choose to be workers, total labor supply exceeds labor demand. Continuity of the labor demand correspondence establishes the existence and uniqueness of the equilibrium. Its basic structure is summarized below:

Proposition 1. At equilibrium, lowest productivity individuals become workers; those with intermediate productivities are informal sector entrepreneurs; and high productivity people are formal sector entrepreneurs.

Recalling that productivity is associated with experience, this implies that less experienced firms tend to go informal. Moreover, since lower productivity is associated with a smaller labor input as the marginal product of labor is lower for less productive firms, the derived equilibrium has an immediate implication for the relationship between informality and firm size, whereby smaller firms are more likely to operate informally.

Proposition 2. Informality is negatively associated with firms' productivity and their size.

The size of the informal sector is conveniently given by $a^* - \underline{a}$. Since a^* is increasing in C, and a is independent of C, an increase in the regulatory burden clearly increases the size of the informal sector. Moreover, as a^* is decreasing in p, whereas $\underline{a}$ increases in p, it follows that the quality of the legal system reduces the size of the informal sector.

We can then conduct comparative statics analysis summarized as follows:

Proposition 3. A higher regulatory burden and a weaker legal enforcement give rise to a larger informal sector. Stronger legal enforcement also implies higher workers' wage rate.[12]

[12] Unfortunately the firm level data used in the empirical portion of the paper does not have information on wages to test this hypothesis.

While higher cost of regulation increases firms' propensity to go informal, the elasticity of this relationship turns out to depend on the quality of the legal system. From twice differentiation of (8), we obtain that $d^2a^*/dCdp < 0$. This implies

Proposition 4. The stronger the legal system, the less responsive the size of the informal sector to regulatory costs.

III. EMPIRICAL STRATEGY

A. Data and Summary Statistics

We use the World Business Environment Survey (WBES) data to test the predictions of the above model. The sample consists of firm level survey responses of over 4,000 firms in 41 countries. As can be seen in Appendix IV, a vast majority of the coverage is developing and transition countries.[13] The survey covers firms with a minimum of five employees.[14] It reports on firm's perception of the quality and integrity of public services, the regulatory burden faced by the firms; the extent of bribery and corruption; financial constraints; taxes, rules and regulations, legal systems, as well as on firm size and other characteristics. More importantly for testing our hypothesis, the survey has information about the propensity to operate informally. Specifically, the latter can be retrieved from answers to the following question:

> "Recognizing the difficulties many enterprises face in fully complying with taxes and regulations, what percentage of total sales would you estimate the typical firm in your area of activity keeps "off the books"? The answers are reported as follows:
>
> j=1 if none at all,
> j=2 if 1–10 percent,
> j=3 if 11–20 percent,
> j=4 if 21–30 percent,
> j=5 if 31–40 percent,
> j=6 if 41–50 percent, and
> j=7 if more than 50 percent.

Arguably, this variable is only a rough proxy for informality for two reasons. First, all the firms in the survey are registered firms, which implies that they all operate in the formal economy, but many of them hide at least some output. Therefore, we are ignoring firms that

[13] The original survey was conducted for 10,000 firms in 80 countries. However, the sample is reduced because most firm-level or country-level variables are missing for the other 39 countries.

[14] As smaller firms are more likely to be informal (see discussion below), this creates a sample bias problem, which we partially overcome by specifically focusing some of the analysis on smaller firms.

are completely unregistered, particularly small enterprises, and omitting a potentially important part of the economy in developing countries (see de Soto 1989). This omission would likely bias our estimates of hidden activity downwards for economies where there is a greater incidence of informality. Second, the question is 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 towards the average behavior of other firms in that environment.

The survey also has a large number of questions on the nature of corruption, tax and regulatory, financing and legal constraints firm face. In the survey, enterprise managers were asked to rate the extent to which these 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 enforced decisions, rated from 1 (always) to 6 (never), as well as the overall quality and efficiency of the court system, also rated from 1 (very good) to 6 (bad). We also investigate these variables in addition to the general legal constraint.[15]

The survey includes information on the efficiency of government in delivering services, which we include as a proxy for some of the benefits of operating formally. This variable is rated from 1 (very efficient) to 6 (very inefficient). The survey also contains a breakdown of firms by size as measured by the number of employees. Small firms employ 5 to 50 employees, medium sized firms employ between 51 and 500 employees, while large firms employ more than 500 employees. We construct two dummy variables for large and small and interpret our results in relation to medium sized firms. As other firm level controls, we use indicators of firm ownership, industry, and firm age. We control for industry effects by including dummy variables for manufacturing, services, construction, agriculture, and services.

Table 1 contains sample statistics of the variables we consider, broken down by firm specific constraints, size and other characteristics. Over a third of the sample (37 percent) is made up of small firms, while only 18 percent of sample firms are large, with more than 500 employees. In terms of firm characteristics, 90 percent are private, slightly over 80 percent are nationally owned, and they are mostly concentrated in the services (44 percent) and manufacturing (37 percent) sectors. Firms are on average 20 years old, but there are some in the sample which are over 400 years old. In terms of the constraints firms face, on average firms report that financing and corruption obstacles pose a minor to moderate obstacle, while tax regulations/administration pose a moderate to major obstacle. A larger share of small and medium sized firms operate in informal settings as shown in Panel B of Table 1. Moreover, firms that have higher degrees of informality tend to report moderate to major obstacles in each of the categories identified above.

[15] It should be noted that the WBES survey only covers firms already in existence, so we cannot infer anything about the relative importance of these obstacles for potential entrepreneurs who are considering the decision to be formal versus informal.

In order to address the question of whether the incidence of informality and the impact of the various firm-level obstacles vary based on the national level of institutional development, we complement the firm level data with cross-country level indicators from various sources. Our theoretical framework implies that a poor legal environment creates incentives for firms to operate informally. We use the index of Rule of Law from Kaufmann et. al (1999) as a proxy for the quality of legal institutions and level of legal enforcement in a country. The index includes perceptions of both violent and non-violent crime, the effectiveness and predictability of the judiciary, and the enforceability of contracts. The data on cost of regulation and taxes for formal firms is obtained from the cross-country data set of Djankov et al. (2002). The variable on regulatory burden includes both the direct monetary costs and opportunity cost of the time related to establishment of a business, as a share of 1999 per capita GDP. To examine the effect of financial development on the incidence of informality noted by Straub (2005), we consider as a proxy private credit by deposit money banks and other financial institutions as a share of GDP from Beck et al (2000). Entrepreneurial talent or productivity is an important feature of our theoretical model. While we have no direct measures of how the stock of entrepreneurial productivity varies across firms in the survey, we measure this with educational attainment rates as measured by in the country average years of schooling in population over 25 years of age and with firm age. Finally, we use data on GDP per capita to control for the level of development of a country.

Table 2 presents correlations between the level of institutional development, extent of informality, and firm level constraints in the sample countries. Precise details of all the variables are in the Appendix. As can be seen from the simple correlations, greater informality is negatively correlated with real GDP per capita, educational levels, and efficiency of government in delivering services. It is also negatively correlated with rule of law and the availability of private credit, although this latter correlation is very small. On the other hand, informality is positively correlated with the regulatory burden and with survey-based obstacles discussed earlier, including financing, corruption and tax and regulation constraints, as well as the enforceability of court's decisions.

B. Empirical Model

We use an ordered probit model to estimate the share of informal sales in a particular industry.[16] From the theoretical model presented in section 2, we can write that the share of sales firms keep in the informal sector as:

$$SI_i = f(Z_i) = f(a^i, S, C, p)$$

where the reduced form dependent variable, the share of sales kept informal (SI), is a function of a vector of variables, Z, which include firm productivity (a^i), the size of the firm (S), regulation costs (C), and the quality and efficiency of the legal system (p). As noted in

[16] See G.S. Maddala (1983) for a full discussion of this model.

the previous section, there are 7 categories of responses to the question of hidden sales, increasing in the percentage of sales that are hidden. A positive coefficient indicates that an increase in the level of the independent variable increases the chance that a firm has a higher propensity to hide sales.

Propositions 1 and 2 imply that smaller, less experienced or less able firms are likely to go informal. Proposition 3 postulates that higher regulation costs are associated with a greater informality, while Proposition 4 notes that the extent of this effect depends on the strength of the legal system.

IV. RESULTS

The previous literature and the above model identify several determinants of informality, such as regulatory burden, tax burden, financial development, and the quality of the legal system. One goal of the empirical analysis is to find out which of these are relevant in our integrated sample. Further, as indicated in Proposition 4, the overall quality of the legal system moderates the potential influence of other factors such as that of excessive regulations on informality. Testing this prediction is our additional objective.

A. Basic Specification

Table 3 presents the ordered probit basic specification. Columns 1 to 6 report coefficient estimates with firm characteristics, educational attainment, and country fixed effects to control for unobserved heterogeneity among countries by including dummy variables for each country. We proxy for the benefits of operating in the formal sector by including a variable that measures the effectiveness of government service delivery beginning in column 2. Firm level obstacles including financial, legal, corruption, and tax and regulatory obstacles are introduced one at a time and then simultaneously in column 6. Marginal effects are also calculated for this final specification and are presented in the Appendix. As expected, all firm level obstacles have a positive and significant effect on the incidence of informality, even when all obstacles are considered together.[17] The propensity for firms to hide sales is decreasing in the effectiveness of government service delivery as expected. Small firms tend to have a higher incidence of informality relative to large firms. Firm age is negatively associated with informality, but this effect is not significant when fixed effects are included, suggesting that there is unobserved heterogeneity across firms and countries that is highly correlated with firm age. Educational attainment is negatively and significantly associated with informality, suggesting that entrepreneurial talent or productivity is negatively related to the prevalence of informality.

[17] Some may argue that each of the constraints discussed above are themselves endogenous, as firms that keep a greater portion of their business off the books are more likely to have perceptions of larger constraints. To control for this, we instrument each of the constraints by a country-wide rule of law index. The results are qualitatively similar to those reported here, and are available upon request.

Given that this is an ordered probit, it is difficult to gauge the magnitude of the probability of a firm being at a particular level of informality given the constraints noted above. In Table 4, we use the fitted values from the ordered probit in Table 3, column 6 to calculate the probability of being in each category of informality, conditional on each of the constraints. We find that a firm that sees financing as a major obstacle has a 16 percent probability of having over 50 percent of its sales off the books, while one that sees it as a minor obstacle has only a 7.6 percent probability of having such a level of informality. Similarly, a firm that sees corruption (regulatory) constraints as a major obstacle has a 17 (16) percent of having over 50 percent of its sales off the books, while one that sees it as a minor obstacle has only a 8 (9) percent probability of having such a level of informality.

B. Obstacles and Size of Firms

To investigate whether these firm-level obstacles affect the extent of informality differently based on firm size, we interact the size dummies (small and large) with individual obstacles one at a time, and finally all together. While having independent interest, this exercise may also provide improved estimates. Specifically, recalling that our sample is likely to be biased as it excludes very small, unregistered firms, focusing on the small firms part of the sample may provide a better indication of the overall extent of informality. Moreover, this specification posits that a firm's decision on its level of informality will be affected by an obstacle at three levels: (i) at the country level, as captured by the fixed effects, (ii) at the firm size level, and (iii) at the firm-specific level, in that firms have idiosyncratic exposures to each of the obstacles, which is picked up by the interaction between each of the obstacles and size.

Table 5 shows that while firms are affected by financing, corruption, tax and regulatory and legal obstacles, the impact on informality clearly depends on firm size. Column 1 shows that financing obstacles increase the incidence of informality for small firms relative to medium firms, but there is no statistically significant differing effect between medium and large firms. Columns 2 and 3 show that corruption and taxes and regulatory obstacles have a larger effect on the extent of informality in both small and large firms. Legal obstacles, on the other hand, have a larger effect on informality for large relative to small and medium sized firms. When all obstacles and interactions are taken together, financing and tax regulation constraints appear to have a larger effect on the incidence of informality for small firms, but the legal and corruption obstacles are no longer significant, possibly due to high collinearity when all of the interactions are included.

To gain greater understanding of what these general constraints are capturing, we run similar regressions as those in Table 5, but further disaggregate the elements of each of the constraint. In particular, the general financing constraint is further disaggregated in the survey by asking firms to rate how great an obstacle the following issues pose: collateral requirements of banks/financial institutions, bank paperwork/bureaucracy, high interest rates, need for special connections, banks lack money to lend, corruption of bank officials, access to foreign banks, access to non-bank equity, access to export finance, access to lease finance for equipment, and inadequate credit information on customers. We find that special connections, access to non-bank equity and the availability of credit information all significantly increase the share of informality of firms (Table 6). When each of these is

further interacted with the size of firms, we find that inadequate credit information is particularly problematic for large firms.

The general regulatory constraint is further disaggregated in the survey by asking firms to rate how problematic each of the following regulatory areas are for the operation and growth of the firm: business licensing, customs/foreign trade regulations, labor regulations, foreign currency/exchange regulations, environmental regulations, fire and safety regulations, tax/administration regulations, and high taxes. We find that customs/foreign trade regulations, labor regulations, and fire and safety regulations all significantly increase the share of informality of firms. When each of these is further interacted with the size of firms, we find that customs/foreign trade regulations is particularly problematic for large firms (Table 6).

On corruption, firms are asked whether it is common for firms to make irregular payments, whether firms know in advance how large these payments are, whether the service is usually delivered as agreed after the additional payment is made, whether one has recourse to another official or his superior to avoid an unofficial payment, and the share of the value of sales spent on these unofficial payments. We find that firms in industries where it is common to make irregular payments (especially small firms) and where the share of the value of sales is relatively large (especially large firms), have a greater probability of increasing their level of informality (Table 6, columns 5 and 6).

Finally, for the general legal constraint the survey asks firms to rate whether in resolving business disputes, the country's court system is fair and impartial, honest/uncorrupt, quick, affordable, consistent, and whether its decisions are enforced. We find that dishonesty and lack of enforceability of court decisions both increase the level of informality of firms. The former is a greater problem for small firms, while the inability to enforce court decisions is more problematic for large firms (Table 6, columns 7 and 8).

C. Informality and Country-Specific Institutions

Next, we examine the effect of country-specific institutions on informality.[18] We include three country-wide institutional variables, namely an index of the rule of law, regulatory burden, and the availability of financing. Consistent with our theoretical framework, the index of the Rule of Law is a proxy for the quality of the legal system for operating in the formal sector. Our theory predicts that a more efficient legal system reduces informality

[18] We find a high degree of correlation between the fixed effect dummies and country-wide institutional dummies. We therefore control for country characteristics by including the Log of GDP per capita rather than by fixed effects in Table 3. Additionally, since much of the variation in these institutional variables is across countries rather than within country, this specification can be viewed as measuring the full effect of country-wide institutional variables.

while a higher regulatory burden increase the extent of hidden activity.[19] Columns 1 through 6 in Table 7 confirm that the theoretical predictions in the model are borne out by the data. More developed and efficient legal institutions reduce the incidence of informality even controlling for other country specific institutions and firm level obstacles. Regulatory burden has a positive effect on informality but is not statistically significant in all specifications. The financial development indicator is significant but of the wrong sign in almost all specifications. Following La Porta et al (1997), who suggest that financial development itself is a function of the efficiency of the legal system, we instrument the financial development measure using dummies for the origin of the legal system in columns 3 through 6; however, the estimated coefficient is either insignificant or continues to be of the wrong sign.[20]

Proposition 4 suggests that a stronger legal system reduces the impact of tax and regulatory burden on the incidence of informality. To test for this prediction, we include an interaction term between the rule of law and regulatory burden variable. The interaction term between Rule of Law and the regulatory burden (in column 5), however, is negative and significant suggesting that consistent with Proposition 4, while heavier regulation of entry can be a significant barrier to formality, its effect depends on the quality of the legal environment. To examine whether the quality of the legal system has an impact on the efficiency of credit markets, in column 6, we introduce an interaction term between the Rule of Law and our measure of financial development. We find that while financial development in and of itself does not reduce informality, more developed credit markets reduce informality in countries with a better rule of law.

V. CONCLUDING REMARKS

Informality is a widespread phenomenon, with the informal sector constituting half of economic activity in some developing and transition economies. Because of the concerns about its effects on growth and the government's ability to raise revenues, and hence provide adequate public services, recent work has focused on the determinants of informality. In particular, the tax burden, excessive regulations, financial constraints, and weaknesses of the legal system have all featured as possible factors affecting firms' propensity to go informal.

This paper relies on a rich dataset which allows us to integrate these various factors. The firm-level survey we employ elicits explicit responses about the obstacles the firms view as most constraining, and it also contains information about their unreported sales. As discussed in the theoretical part, the quality of the legal system is found to be an important factor in predicting informality. Although other obstacles also play a role, we find that, controlling for

[19] The rule of law index used here is a general assessment of the prevailing rule of law and is therefore unlikely to show reverse causality from the decision to be informal to this institutional index.

[20] The instruments are dummies for the origin of the legal system (French and English) and are viewed as a proxy for the government's proclivity to intervene in the economy and the stance of the law towards the security of property rights in the country. The two instruments explain over 23 percent of the cross-country variation in the financial development indicator.

the quality of the legal system, there is no significant evidence that a lower regulatory burden or more limited access to bank credit leads to lower informality as measured by the share of hidden sales. These empirical results are consistent with our simple general-equilibrium model in which the strength of the legal system determines the expected punishment for being informal.

Table 1. Summary Statistics

A. Basic Summary Statistics					
	Number of Obs.	Mean	Standard Deviation	Minimum	Maximum
WBES Variables					
Percent of sales not reported to tax authorities	4,477	2.93	2.16	1.00	7.00
Small	4,477	0.37	0.48	0.00	1.00
Large	4,477	0.18	0.38	0.00	1.00
Private	4,477	0.89	0.32	0.00	1.00
National	4,477	0.82	0.38	0.00	1.00
Agriculture	4,477	0.05	0.23	0.00	1.00
Construction	4,477	0.08	0.27	0.00	1.00
Services	4,477	0.44	0.50	0.00	1.00
Manufacturing	4,477	0.37	0.48	0.00	1.00
Age	4,477	20.26	25.41	0.00	426.00
Efficiency of service delivery	4,425	3.11	1.17	1.00	6.00
General constraint-financing	4,255	2.81	1.14	1.00	4.00
General constraint-corruption	3,940	2.43	1.17	1.00	4.00
General constraint-taxes and regulations	4,307	3.07	0.98	1.00	4.00
Courts-enforceability	4,160	3.62	1.44	1.00	6.00
Country-Wide Variables					
Rule of law	4,477	4.19	0.86	3.10	6.01
Entry costs	4,477	0.58	0.75	0.02	4.95
Private credit /GDP	4,003	0.54	0.41	0.07	1.41
Real GDP per capita	4,477	6,474.63	8,466.95	449.93	31,772.66
Educational attainment	4,477	7.77	2.23	2.45	12.25

B. Informality and Firm Size								
	Percent of sales not reported to tax authorities							
	0	1–10	10–20	20–30	30–40	40–50	>50	Total
	(percent of total number of firms in the sample 1/)							
Size of the firm								
Small	33	13	12	11	6	11	14	100
Medium	44	13	11	9	6	8	10	100
Large	56	12	8	4	4	5	11	100
General financing constraint								
No obstacle	60	12	7	5	3	6	7	100
Minor obstacle	44	16	11	8	5	6	10	100
Moderate obstacle	38	13	11	10	7	9	11	100
Major obstacle	36	13	13	10	6	9	14	100
General corruption constraint								
No obstacle	58	12	8	5	4	5	8	100
Minor obstacle	40	19	12	9	5	6	10	100
Moderate obstacle	36	13	11	11	7	10	12	100
Major obstacle	33	11	13	11	6	11	16	100
General constraint - taxes and regulation								
No obstacle	64	9	7	4	1	5	10	100
Minor obstacle	45	17	11	7	4	6	10	100
Moderate obstacle	40	15	12	8	6	7	10	100
Major obstacle	38	11	11	11	6	10	12	100
Enforceability of court decisions								
Always	56	10	7	7	5	7	7	100
Mostly	48	12	10	7	4	6	14	100
Frequently	44	16	10	8	5	8	9	100
Sometimes	37	13	11	11	6	9	12	100
Seldom	34	14	13	11	7	10	12	100
Never	37	12	13	8	4	12	14	100
Total 1/	42	13	11	9	5	8	11	100

Sources: Author estimates based on WBES Survey, Beck et al (2000), Djankov et al (2002), Kaufmann et al (1999), World Development Indicators, and Barro and Lee.

1/ Total number of firms in the sample is 4,477.

Table 2. Correlation Matrix 1/

	Percent of Sales not Reported to Tax Authorities	Real GDP Per Capita	Educational Attainment	Small	Large	Age	Efficiency of Service Delivery	General Constraint-Financing	General Constraint-Corruption	General Constraint-Taxes and Regulations	Courts-Enforceabi-lity	Rule of Law	Entry Costs	Private Credit/GDP
Percent of sales not reported to tax authorities	1.000													
Real GDP per capita	-0.192	1.000												
Educational attainment	-0.114	0.499	1.000											
Small	0.117	0.008	0.162	1.000										
Large	-0.100	-0.040	-0.120	-0.376	1.000									
Age	-0.110	0.187	-0.012	-0.265	0.265	1.000								
Efficiency of service delivery	-0.108	0.112	0.060	-0.044	0.045	0.032	1.000							
General constraint-financing	0.166	-0.228	-0.079	0.070	-0.098	-0.125	-0.127	1.000						
General constraint-corruption	0.206	-0.364	-0.272	-0.001	-0.001	-0.064	-0.221	0.281	1.000					
General Constraint-Taxes and Regulations	0.137	-0.110	-0.002	0.048	-0.111	-0.065	-0.279	0.349	0.299	1.000				
Courts-enforceability	0.092	-0.101	-0.044	0.008	-0.002	-0.034	-0.192	0.095	0.220	0.123	1.000			
Rule of law	-0.232	0.852	0.529	0.037	-0.060	0.176	0.174	-0.279	-0.424	-0.199	-0.198	1.000		
Regulatory burden	0.082	-0.285	-0.348	-0.051	0.071	-0.051	-0.054	0.037	0.210	0.018	0.116	-0.286	1.000	
Private credit/GDP	-0.070	0.722	0.264	-0.005	0.030	0.173	0.216	-0.231	-0.294	-0.293	-0.094	0.709	-0.173	1.000

Sources: Author estimates based on WBES Survey, Beck et al (2000), Djankov et al (2002), Kaufmann et al (1999), World Development Indicators, and Barro and Lee.

1/ Number of observations is 3,206.

Table 3. Determinants of Informality: Basic Specification
(dependent variable: percent of total sales kept off the books)

	(1)	(2)	(3)	(4)	(5)	(6)
Small	0.148	0.123	0.128	0.141	0.129	0.125
	(0.040)***	(0.042)***	(0.043)***	(0.042)***	(0.042)***	(0.045)***
Large	-0.193	-0.198	-0.227	-0.196	-0.214	-0.212
	(0.052)***	(0.053)***	(0.055)***	(0.053)***	(0.053)***	(0.057)***
Private	0.240	0.229	0.230	0.200	0.201	0.239
	(0.061)***	(0.063)***	(0.065)***	(0.063)***	(0.064)***	(0.068)***
National	0.325	0.265	0.271	0.289	0.331	0.243
	(0.049)***	(0.051)***	(0.052)***	(0.050)***	(0.050)***	(0.055)***
Agriculture	-0.238	-0.309	-0.263	-0.262	-0.267	-0.330
	(0.108)**	(0.109)***	(0.114)**	(0.109)**	(0.113)**	(0.118)***
Construction	-0.179	-0.214	-0.200	-0.190	-0.209	-0.251
	(0.096)*	(0.098)**	(0.100)**	(0.098)*	(0.099)**	(0.103)**
Services	-0.210	-0.218	-0.219	-0.205	-0.231	-0.244
	(0.080)***	(0.081)***	(0.082)***	(0.081)**	(0.082)***	(0.084)***
Manufacturing	-0.206	-0.234	-0.216	-0.216	-0.219	-0.242
	(0.081)**	(0.081)***	(0.083)***	(0.082)***	(0.083)***	(0.085)***
Age	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Educational attainment	-0.083	-0.073	-0.065	-0.070	-0.131	-0.059
	(0.017)***	(0.018)***	(0.018)***	(0.018)***	(0.021)***	(0.018)***
Efficiency of service delivery		-0.062	-0.051	-0.050	-0.058	-0.035
		(0.016)***	(0.017)***	(0.016)***	(0.017)***	(0.018)*
General constraint-financing		0.080				0.047
		(0.017)***				(0.019)**
Courts-enforceability					0.039	0.026
					(0.013)***	(0.014)*
General constraint-taxes and regulations				0.121		0.076
				(0.021)***		(0.024)***
General constraint-corruption			0.107			0.070
			(0.018)***			(0.019)***
Country fixed effects	YES	YES	YES	YES	YES	YES
Observations	4,477	4,207	3,902	4,256	4,117	3,599
PseudoRsq	0.07	0.07	0.07	0.07	0.06	0.07

Notes: Standard errors in parentheses.
* significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

Table 4. Predicted Level of Informality Rate from Ordered Probit Results in Table 3, Column (6)

	Percentage of Firms in General Financing Constraint Category				
	All Firms	No Obstacle	Minor Obstacle	Moderate Obstacle	Major Obstacle
Percent of total sales kept off the books					
None at all	40.7	52.7	46.4	38.8	33.0
1–10	13.4	13.0	13.6	13.5	13.4
11–20	11.1	9.8	10.7	11.3	11.8
21–30	8.7	7.1	8.1	9.0	9.7
31–40	5.4	4.1	4.8	5.6	6.2
41–50	8.0	5.7	6.9	8.4	9.6
51 or more	12.7	7.6	9.5	13.4	16.3
Number of observations	4,284	857	731	1,098	1,598

	Percentage of Firms in General Corruption Constraint Category				
	All Firms	No Obstacle	Minor Obstacle	Moderate Obstacle	Major Obstacle
Percent of total sales kept off the books					
None at all	40.7	52.4	42.2	35.6	30.7
1–10	13.4	13.0	13.6	13.6	13.5
11–20	11.1	9.7	11.1	11.7	12.1
21–30	8.7	7.1	8.5	9.4	10.1
31–40	5.4	4.1	5.2	5.9	6.6
41–50	8.0	5.7	7.6	9.0	10.1
51 or more	12.7	7.9	11.8	14.8	16.9
Number of observations	4,284	1,235	1,021	899	1,129

	Percentage of Firms: Courts - Decisions Enforced						
	All Firms	Always	Usually	Frequently	Sometimes	Seldom	Never
Percent of total sales kept off the books							
None at all	40.7	47.5	47.0	44.5	39.2	35.4	33.4
1–10	13.4	12.5	12.9	13.2	13.7	13.7	14.0
11–20	11.1	9.8	10.2	10.6	11.4	11.8	12.2
21–30	8.7	7.4	7.7	8.1	9.0	9.6	10.0
31–40	5.4	4.5	4.7	5.0	5.6	6.0	6.4
41–50	8.0	6.7	6.9	7.3	8.2	9.1	9.6
51 or more	12.7	11.7	10.6	11.5	12.9	14.3	14.4
Number of observations	4,284	404	660	693	1,250	864	413

	Percentage of Firms in Regulation Constraint Category				
	All Firms	No Obstacle	Minor Obstacle	Moderate Obstacle	Major Obstacle
Percent of total sales kept off the books					
None at all	40.7	51.8	48.0	42.3	34.1
1–10	13.4	12.7	13.1	13.6	13.6
11–20	11.1	9.6	10.2	11.1	11.8
21–30	8.7	7.1	7.7	8.6	9.6
31–40	5.4	4.2	4.6	5.3	6.1
41–50	8.0	6.0	6.6	7.7	9.3
51 or more	12.7	8.7	9.8	11.6	15.5
Number of observations	4,284	408	716	1,356	1,804

Table 5. Determinants of Informality: Firm Size and Obstacles
(dependent variable: percent of total sales kept off the books)

	(1)	(2)	(3)	(4)	(5)
Small	-0.177	-0.021	-0.214	0.083	-0.341
	(0.087)**	(0.079)	(0.104)**	(0.086)	(0.146)**
Large	-0.291	-0.490	-0.529	-0.482	-0.806
	(0.112)***	(0.114)***	(0.140)***	(0.130)***	(0.197)***
Private	0.214	0.241	0.209	0.204	0.243
	(0.063)***	(0.065)***	(0.063)***	(0.064)***	(0.068)***
National	0.282	0.276	0.299	0.333	0.266
	(0.051)***	(0.052)***	(0.050)***	(0.050)***	(0.055)***
Age	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Educational attainment	-0.075	-0.074	-0.073	-0.130	-0.068
	(0.018)***	(0.018)***	(0.018)***	(0.021)***	(0.018)***
Efficiency of service delivery	-0.065	-0.060	-0.059	-0.062	-0.052
	(0.016)***	(0.017)***	(0.016)***	(0.016)***	(0.018)***
Legal regulation constraint*Small				0.012	-0.002
				(0.020)	(0.022)
Legal regulation constraint*Large				0.073	0.055
				(0.032)**	(0.035)
Tax regulation constraint*Small			0.112		0.067
			(0.030)***		(0.037)*
Tax regulation constraint*Large			0.108		0.077
			(0.044)**		(0.051)
General corruption constraint*Small		0.060			0.025
		(0.026)**			(0.030)
General corruption constraint*Large		0.102			0.054
		(0.040)***			(0.045)
General finance constraint*Small	0.104				0.068
	(0.026)***				(0.031)**
General finance constraint*Large	0.030				0.001
	(0.037)				(0.041)
Country fixed effects	YES	YES	YES	YES	YES
Industry dummies	YES	YES	YES	YES	YES
Observations	4,207	3,902	4,256	4,117	3,599
PseudoRsq	0.07	0.07	0.07	0.06	0.07

Notes: Standard errors in parentheses.
* significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

Table 6. Determinants of Informality: Firm Size and Breakdown of Obstacles
(dependent variable: percent of total sales kept off the books)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Financial Constraints								
Finance constraint-special connections	0.059							
	(0.021)***							
Finance constraint-access to non bank equity	0.048							
	(0.021)**							
Finance constraint-credit	0.067							
	(0.021)***							
Inadequate credit*Large		0.113						
		(0.051)**						
Regulatory Constraints								
Customs regulations - survey			0.061					
			(0.019)***					
Labor regulations - survey			0.045					
			(0.022)**					
Fire regulations - survey			0.053					
			(0.022)**					
Customs regulations*Large				0.095				
				(0.047)**				
Corruption Constraints								
Corruption-common for firms to pay additional payments					-0.095			
					(0.017)***			
Percent of sales in bribes					0.06			
					(0.019)***			
Common to make addl payments*Small						-0.089		
						(0.026)***		
Percent of sales in bribes*Large						0.085		
						(0.049)*		
Legal Constraints								
Courts-honest							0.033	
							(0.016)**	
Courts-quick							-0.021	
							(0.019)	
Courts-affordable							0.021	
							(0.015)	
Courts-enforceability							0.024	
							(0.015)	
Courts enforceability *Large								0.097
								(0.039)**
Courts honest*Small								0.048
								(0.022)**
Country fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Industry dummies	YES	YES	YES	YES	YES	YES	YES	YES
Observations	3267	3267	3754	3754	2832	2832	3972	4069
PseudoRsq	0.07	0.06	0.07	0.07	0.08	0.07	0.07	0.07

Notes: Standard errors in parentheses.
* significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.
Only interaction terms that are significant are reported in the table. Additional results are available upon request.

Table 7. Determinants of Informality: Institutions
(dependent variable: percent of total sales kept off the books)

	(1)	(2)	(3)	(4)	(5)	(6)
Small	0.145	0.126	0.206	0.169	0.209	0.203
	(0.043)***	(0.048)***	(0.042)***	(0.047)***	(0.042)***	(0.042)***
Large	-0.187	-0.199	-0.173	-0.161	-0.173	-0.171
	(0.053)***	(0.058)***	(0.051)***	(0.056)***	(0.052)***	(0.052)***
Private	0.235	0.227	0.179	0.147	0.168	0.176
	(0.067)***	(0.074)***	(0.062)***	(0.068)**	(0.063)***	(0.062)***
National	0.345	0.257	0.272	0.212	0.273	0.276
	(0.049)***	(0.056)***	(0.048)***	(0.054)***	(0.048)***	(0.048)***
Age	-0.001	-0.001	-0.002	-0.002	-0.002	-0.002
	(0.001)	(0.001)	(0.001)**	(0.001)*	(0.001)***	(0.001)**
Log real GDP per capita			-0.015	-0.037	-0.036	0.012
			(0.034)	(0.037)	(0.036)	(0.037)
Educational attainment			-0.026	-0.011	-0.035	-0.012
			(0.011)**	(0.011)	(0.011)***	(0.013)
Efficiency of service delivery	-0.082	-0.049	-0.056	-0.029	-0.055	-0.056
	(0.017)***	(0.019)**	(0.016)***	(0.018)	(0.016)***	(0.016)***
General constraint-financing		0.041		0.080		
		(0.020)**		(0.019)***		
General constraint-taxes and regulations		0.096		0.035		
		(0.025)***		(0.023)		
General constraint-corruption		0.074		0.097		
		(0.021)***		(0.020)***		
Courts-enforceability		0.011		0.030		
		(0.015)		(0.014)**		
Rule of law in 2000	-0.565	-0.574	-0.229	-0.110	-0.137	-0.137
	(0.070)***	(0.076)***	(0.052)***	(0.057)*	(0.067)**	(0.071)*
Regulatory burden	0.091	0.073	0.007	0.018	0.613	0.017
	(0.031)***	(0.034)**	(0.024)	(0.025)	(0.280)**	(0.024)
Private sector credit	1.587	1.750				
	(0.159)***	(0.187)***				
Private sector credit (IV)			0.551	-0.099	0.427	1.882
			(0.114)***	(0.143)	(0.127)***	(0.711)***
Private sector credit (IV) * Rule of law						-0.270
						(0.142)*
Rule of law * Regulatory burden					-0.162	
					(0.075)**	
Country fixed effects	YES	YES	NO	NO	NO	NO
Industry dummies	YES	YES	YES	YES	YES	YES
Observations	4,065	3,282	3,955	3,206	3,955	3,955
PseudoRsq	0.07	0.07	0.03	0.03	0.03	0.03

Notes: Standard errors in parentheses.
* significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

APPENDIXES

I. EXTENDED MODEL

In this section we extend our basic model to consider the case where firms can hide a fraction of their activity, and where the probability of getting detected, p, and the regulatory burden faced by firms, C, is dependent on this fraction. Let n_i denote the share of firm i's activity taking place in the informal sector (and, therefore, 1- n_i takes place formally). We now let the cost of regulation in the formal sector to be positively related to the fraction of activity the firm chooses to carry out formally, C(1- n_i); and the probability of detecting informal activity be related to its share, $p(n_i)$.

Firm i's expected profits are then given as follows:

$$P_i = (1- n_i)\,[a_i f(L) - wL - C(1- n_i)] + n_i[a_i f(L) - wL][1- p(n_i)] \tag{A1}$$

The demand for labor is determined from:

$$\begin{aligned} & a_i f'(L) - wL = 0 \\ \text{or,} \quad & \\ & L(a) = G(w/a);\ G' < 0; \end{aligned} \tag{A2}$$

Assuming an internal solution, the fraction of informal activity is determined by differentiating (A1) with respect to n_i:

$$C + (1- n_i)C' - (p + n_i p')(a_i f(L) - wL) = 0 \tag{A3}$$

so that we can write the explicit solution of (A3) as $n(a_i, w)$.

The decision whether to operate a firm or to be a worker is determined from:

$$\begin{aligned} & (1- n(\underline{a}, w)\,[\underline{a} f(L(\underline{a})) - w L(\underline{a}) - C(1- n(\underline{a}, w)] + \\ & n(\underline{a}, w)[\underline{a} f(L(\underline{a})) - w L(\underline{a})][1- p(n(\underline{a}, w))] = w \end{aligned} \tag{A4}$$

where $\underline{a}$ is the cutoff ability level that makes a person indifferent between the two possibilities. As in the simple model, all individuals with lower ability become workers. Equations (A2-A4) fully determine the equilibrium. Its properties hinge upon the shape of C(.) and p(.) functions. Suppose, for instance, that

$$C(1- n) = \beta(1- n), \text{ and } p(n) = \gamma n,\ 0 < \beta, \gamma < 1$$

where β is interpreted as the marginal cost of the regulatory burden, and γ, the probability of getting caught with respect to a marginal increase in informal activity.

Differentiation of (A3) reveals – taking into account the second order conditions and employing the envelope theorem – that $dn/dC > 0$, $dn/dp < 0$. That is, the extent of informality is positively related to the burden of regulation and negatively to the quality of enforcement. This reinforces the results in the main text.

II. Determinants of Informality: Basic Specification—Marginal Effects

(dependent variable: percent of total sales kept off the books)

	None at	1–10	11–20	21–30	31–40	41–50	51 or more
Small 1/	-0.048 ***	-0.001	0.005 ***	0.008 ***	0.006 ***	0.011 ***	0.019 ***
Large 1/	0.083 ***	-0.001	-0.010 ***	-0.014 ***	-0.011 ***	-0.019 ***	-0.029 ***
Private 1/	-0.094 ***	0.002	0.012 ***	0.016 ***	0.012 ***	0.021 ***	0.031 ***
National 1/	-0.096 ***	0.002	0.012 ***	0.016 ***	0.012 ***	0.021 ***	0.032 ***
Agriculture 1/	0.131 ***	-0.006	-0.019 **	-0.022 ***	-0.017 ***	-0.028 ***	-0.039 ***
Construction 1/	0.099 **	-0.003	-0.013 **	-0.017 **	-0.013 **	-0.022 **	-0.032 ***
Services 1/	0.095 ***	0.000	-0.011 ***	-0.015 ***	-0.012 ***	-0.022 ***	-0.035 ***
Manufacturing 1/	0.095 ***	0.000	-0.011 ***	-0.015 ***	-0.012 ***	-0.021 ***	-0.034 ***
Age	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Educational attainment	0.023 ***	0.000	-0.003 ***	-0.004 ***	-0.003 ***	-0.005 ***	-0.009 ***
Efficiency of service delivery	0.014 *	0.000	-0.001 *	-0.002 *	-0.002 *	-0.003 *	-0.005 *
General constraint-financing	-0.018 **	0.000	0.002 **	0.003 **	0.002 **	0.004 **	0.007 **
General constraint-corruption	-0.027 ***	0.000	0.003 ***	0.004 ***	0.004 ***	0.006 ***	0.010 ***
General constraint-taxes and regulations	-0.030 ***	0.000	0.003 ***	0.005 ***	0.004 ***	0.007 ***	0.011 ***
Courts-enforceability	-0.010 *	0.000	0.001 *	0.002 *	0.001 *	0.002 *	0.004 *

Notes: * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

1/ dy/dx is for discrete change of dummy variable from 0 to 1.

III. Variables and Sources

Variable	Definition	Original Source
Percentage of sales declared to tax authorities	Recognizing the difficulties many enterprises face in fully complying with taxes and regulations, what percentage of total sales would you estimate the typical firm in your area of activity keeps "off the books": 1: none; 2: 1-10%; 3: 11-20%; 4: 21-30%; 5: 31-40%; 6: 41-50%; 7: over 50%.	World Business Environment Survey (WBES)
Tax and regulatory ronstraint	How problematic are tax and regulatory constraints for the operation and growth of your business: no obstacle (1), a minor obstacle (2), a moderate obstacle (3) or a major obstacle (4)?	World Business Environment Survey (WBES)
Financing cnstraint	How problematic is financing for the operation and growth of your business: no obstacle (1), a minor obstacle (2), a moderate obstacle (3) or a major obstacle (4)?	World Business Environment Survey (WBES)
Legal constraint	How problematic is functioning of the judiciary for the operation and growth of your business: no obstacle (1), a minor obstacle (2), a moderate obstacle (3) or a major obstacle (4)?	World Business Environment Survey (WBES)
Corruption constraint	How problematic is corruption for the operation and growth of your business: no obstacle (1), a minor obstacle (2), a moderate obstacle (3) or a major obstacle (4)?	World Business Environment Survey (WBES)
Need special connections with banks	Is the need of special connections with banks/financial institutions no obstacle (1), a minor obstacle (2), a moderate obstacle (3) or a major obstacle (4)?	World Business Environment Survey (WBES)
Access to non-bank equity	Is the access to non-bank equity/investors/partners no obstacle (1), a minor obstacle (2), a moderate obstacle (3) or a major obstacle (4)?	World Business Environment Survey (WBES)
Inadequate credit/financial information on consumers	Is inadequate credit/financial information on customers no obstacle (1), a minor obstacle (2), a moderate obstacle (3) or a major obstacle (4)?	World Business Environment Survey (WBES)
Customs regulations	How problematic are customs/foreign trade regulations for the operation and growth of your business: no obstacle (1), a minor obstacle (2), a moderate obstacle (3) or a major obstacle (4)?	World Business Environment Survey (WBES)
Labor regulations	How problematic are labor regulations for the operation and growth of your business: no obstacle (1), a minor obstacle (2), a moderate obstacle (3) or a major obstacle (4)?	World Business Environment Survey (WBES)
Fire, safety regulations	How problematic are fire and safety regulations for the operation and growth of your business: no obstacle (1), a minor obstacle (2), a moderate obstacle (3) or a major obstacle (4)?	World Business Environment Survey (WBES)
Firms have to make "additional payments" in advance	It is common for firms in my line of business to have to pay some irregular "additional payments" to get things done: (1) always, (2) mostly, (3) frequently, (4) sometimes, (5) seldom, (6) never.	World Business Environment Survey (WBES)

Proportion of revenues paid as bribes	On average, what percentage of revenues do firms like yours typically pay per year in unofficial payments to public officials: (1) 0%, (2) less than 1%, (3) 1% to 1.99%, (4) 2% to 9.99%, (5) 10% to 12%, (6) 13% to 25%, (7) over 25%	World Business Environment Survey (WBES)
Courts enforceability	I am confident that the legal system will uphold my contract and property rights in business disputes: (1) fully agree, (2) agree in most cases, (3) tend to agree, (4) tend to disagree, (5) disagree in most cases, (6) fully disagree.	World Business Environment Survey (WBES)
Courts are quick	In resolving business disputes, do you believe your country's courts to be quick: (1) always, (20 usually, 93) frequently, (4) sometimes, (5) seldom, (6) never	World Business Environment Survey (WBES)
Courts are affordable	In resolving business disputes, do you believe your country's courts to be affordable: (1) always, (20 usually, 93) frequently, (4) sometimes, (5) seldom, (6) never	World Business Environment Survey (WBES)
Courts are fair and impartial	In resolving business disputes, do you believe your country's courts to be fair and impartial: (1) always, (20 usually, 93) frequently, (4) sometimes, (5) seldom, (6) never	World Business Environment Survey (WBES)
Government	Dummy variable that takes on the value one if any government agency or state body has a financial stake in the ownership of the firm, zero otherwise.	World Business Environment Survey (WBES)
Private	Dummy variable takes on the value one if full private ownership, zero otherwise.	World Business Environment Survey (WBES)
Manufacturing	Dummy variable that takes on the value one if firm is in the manufacturing industry, zero otherwise.	World Business Environment Survey (WBES)
Services	Dummy variable that takes on the value one if firm is in the service industry, zero otherwise.	World Business Environment Survey (WBES)
Firm-size dummies	A firm is defined as small if it has between 5 and 50 employees, medium size if it has between 51 and 500 employees and large if it has more than 500 employees.	World Business Environment Survey (WBES)
Credit/GDP	Private credit by deposit money banks and other financial institutions as a share of GDP. It measures the amount of credit issued to the private sector, excluding credit issued to the government and public enterprises, as well as loans made by the central bank.	Beck et al (2000)
Regulatory burden	Cost and time involved in carrying out the procedures a start-up entrepreneur has to comply with in order to obtain a legal status, as a share of 1999 per capita GDP.	Djankov et al (2002)
Rule of law	Synthetic Index, rescaled adding 4 points to the index to avoid negative values where a higher indicator denotes a higher quality rule of law.	Kaufmann et al (1999)
Log GDP per capita	Log of the 1999 per capita GDP in 1995 constant US dollars.	World Development Indicators
Educational attainment	Average schooling in the total population over 25 in 2000.[1]	Barro and Lee (2002)

[1] In 1990 for Lithuania and Kazakhstan.

IV. Countries in Sample

Country	Number of Firms	Percent	Cummulative
Argentina	83	1.85	1.85
Bolivia	87	1.94	3.80
Brazil	172	3.84	7.64
Bulgaria	93	2.08	9.72
Canada	88	1.97	11.68
Chile	94	2.10	13.78
China	78	1.74	15.52
Colombia	91	2.03	17.56
Croatia	105	2.35	19.90
Czech Republic	94	2.10	22.00
Dominican Republic	90	2.01	24.01
Ecuador	82	1.83	25.84
France	86	1.92	27.76
Germany	76	1.70	29.46
Hungary	114	2.55	32.01
India	136	3.04	35.05
Indonesia	70	1.56	36.61
Italy	79	1.76	38.37
Kazakhstan	102	2.28	40.65
Lithuania	29	0.65	41.30
Malaysia	45	1.01	42.31
Mexico	78	1.74	44.05
Pakistan	74	1.65	45.70
Panama	73	1.63	47.33
Peru	101	2.26	49.59
Philippines	90	2.01	51.60
Poland	197	4.40	56.00
Portugal	80	1.79	57.78
Romania	125	2.79	60.58
Russian Federation	474	10.59	71.16
Slovak Republic	23	0.51	71.68
Slovenia	118	2.64	74.31
Spain	86	1.92	76.23
Sweden	79	1.76	78.00
Thailand	352	7.86	85.86
Turkey	120	2.68	88.54
Ukraine	185	4.13	92.67
United Kingdom	66	1.47	94.15
United States	94	2.10	96.25
Uruguay	86	1.92	98.17
Venezuela	82	1.83	100.00
Total	4,477	100.00	

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