Informality: the Doorstep of the Legal System

Francesco Flaviano Russo*

February 2010

Abstract

Many entrepreneurs operate informally because starting and running a business legally is costly. Using a dynamic model of industry equilibrium, I show that the costs associated to the legal system can rationalize the cross country variability of the size of the informal economy. The model implies that the business start-up costs matter more than taxes and labor market regulations. Small, less productive, entrepreneurs, facing high entry costs, can only start informally, waiting to become more productive before legalizing. Informality appears to be the doorstep of the legal system.

JEL: O17, L51

Keywords: Informal Firms, Regulation, Start-up Costs

*University of Naples Federico II and CSEF. Via Cinthia, Monte Sant' Angelo, 80126, Napoli, Italy. tel. (+39) 0815260490 e-mail: russoffr@gmail.com. I would like to thank Francois Gourio, Luigi Guiso, Tullio Jappelli, Laurence Kotlikoff, Gerard Llobet, Robert Margo, Laura Moretti, Dilip Mookherjee, Marco Pagano, Daniele Paserman, Jeremy Smith, Adrien Verdelhan and the seminar participants at Boston University, University of Salerno, CSEF, LUISS Guido Carli and EIEF for helpful comments. All remaining errors are mine. An earlier version of the paper circulated as "The Cost of the Legal System and the Hidden Economy"

1 Introduction

What explains the existence of an informal economy, operating outside the legal system? I propose an answer based on the idea that the informal economy is a response to an adverse legal-institutional environment. The cross country variability in its size is thus an immediate consequence of the different costs created by the legal systems in different countries.

There are two categories of costs associated to the legal system. On the one hand there are costs of participation, that each legal firm faces in order to comply with the existing laws and regulations. Along with the payment of all the relevant taxes, the firms are typically subject to severance payments in case of separation from the workers. On the other, there is a cost of access, associated to the business start-up procedures, both because of the fees required by the government and because this procedures absorb working time, generating foregone revenue.

Using a dynamic model of industry equilibrium, I show that these different costs have a different impact on the size and composition of the informal economy. The main result of the analysis is that the costs of access matter more than taxes and labor market regulations.

I propose a model of industry equilibrium a la Hopenhayn (1992) with two sectors, the legal and the informal. The new elements entail the inclusion of taxation, enforced through random audits, and the possibility, for informal firms, to legalize. While substantially complicating the analysis, these new features still deliver a tractable framework, that, in return, provides a rich characterization of the size and productivity distribution of the firms in both sectors.

The cost of access is a barrier that protects incumbent legal firms from competition, lowering the rate of entry in the legal sector and displacing the smaller, less productive, start-ups in the informal. But higher entry costs will not influence the decision to legalize an existing informal firm, providing that, as an effect of the higher profitability of the legal firms, the benefits of legalization grow together with the costs. Conversely, the presence of firing costs limits the profits in the legal market, reducing the propensity of informal firms to legalize. However, since new entrants hire the entire labor force upon entry, the value of a new start-up in both sectors is just marginally affected by firing costs. The economy is characterized, in each period, by a big mass of new start-ups, while only a small measure of

relatively more productive informal businesses can afford to pay the entry costs. Therefore the effects working through the entry channel, like the one induced by the entry cost, are much bigger than the effects working through the legalization channel, like the one induced by firing costs. Furthermore, since legal firms don't sell in the black market, the only effect of a higher tax rate is a decreased legal output, without any effect on the informal production.

The model implies that the fraction of the cross country variability of the informal economy explained by the costs of access is three times as big as the fraction explained by the costs of participation. I obtain this result feeding in a calibrated version of the model the observed measures of the costs of the legal system, to then analyze the implied cross country measure of the informal economy and the contributions of the single costs to it.

The open question, then, is how to validate the model and its conclusions. My first test entails the simulated, model-based, size of the informal economy. I show that these measures are reasonable, in sense that they are similar to most of the available estimates of the informal economy. To independently validate the results, I also propose a regression analysis of these empirical estimates. I find that the cost of access is the only cost with a statistically significant impact on the informal economy. Finally, I show that the regressions with the simulated measure of the informal economy and the regressions with the estimated measures reach very similar conclusions.

Overall, the model puts forward a view of the informal sector as the *Doorstep* of the official. Facing high entry costs, small, less productive, firms can only start informally, waiting to become more productive and to grow before legalizing. This characterization is indeed akin to the idea of entrepreneurship and selection first formalized by Jovanovic (1982). Basically there is no other way for a potential entrepreneur to learn about his efficiency but actually entering the market. Once they enter, they survive and grow only if they learn that they are productive and otherwise exit. My point is that if it is too costly to do this learning process legally, the potential entrepreneurs will optimally choose to do it in the informal sector.

The rest of the paper is organized as follows: Section (2) briefly summarizes the related literature. Section (3) describes the model. Section (4) clarifies the details of the simulation and describes the properties of the simulated model. The key results are in section (5), devoted to the comparative statics analysis, and in section (6), which concerns the numerical

analysis. The empirical validation of the model is discussed in Section (7). Section (8) concludes. The robustness of the results is summarized in a companion appendix (available upon request), that, in addition, documents extensively the analytical properties of the model and the algorithm used to find the equilibrium in the numerical simulations.

2 Related Literature

The analysis of the informal (or hidden, or shadow) economy is the subject of a rapidly spreading literature, following the *Rational Choice* tradition initiated by Becker (1978) and fundamentally inspired by the work of DeSoto (1989). Recent contributions include Sarte (2000), Azuma and Grossman (2002), Dessy and Pallage (2003), Fugazza and Jacques (2003), Busato and Chiarini (2004), Maloney (2004), Auriol and Wartlers (2005), Choi and Thum (2005), Straub (2005), Amaral and Quintin (2006), Dabla-Norris, Gradstein and Inchauste (2008), De Paula and Scheinkman (2008) and La Porta and Shleifer (2008).

The closest work, but developed independently, is by Antunes and Cavalcanti (2007). Comparing the effects of contract enforcing and regulation costs on the informal economy, in a model characterized by credit constraints for informal firms, they find that, although the former cost is more important from a theoretical standpoint, the latter accounts for most of the observed empirical differences between the US and Europe. In a sense, the results presented in this work are complementary, comparing the effect of the regulatory environment to the effect of taxation. But this work, by taking into account a dynamic model of entry and exit, proposes a richer framework, that allows a clear separate identification of the cost of access from a fixed, per period, cost of production.

This paper is also related to the literature that analyzes the effect of labor market regulations in general, and firing costs in particular, on economic performance. Examples include Bentolilla and Bertola (1990) and Alvarez and Veracierto (2001), together with Hopenhayn and Rogerson (1993), on which the present work builds. As far as the policy implications are concerned, this work goes in the direction of highlighting good market regulations and not labor market regulations as policy instruments to reach desirable targets in terms of employment, in line with what Bertrand and Kramarz (2002) suggested.

On the empirical side, previous existing work, recently summarized by Straub (2005), already showed that higher costs of access to the legal system are robustly related to higher sizes of the informal sector, but found only weak evidence relating labor market regulations and taxes to informality. The first stylized fact has been extensively documented by Djankov, LaPorta, Lopez de-Silanes and Shleifer (2002). Their data set, in which all the identifiable costs to start a business activity are collected for a large cross section of countries, consistently shows a positive correlation between all the measures of entry cost and the available estimates of the informal economy. Using the same data, Auriol and Warlters (2005) similarly report a positive and significant effect of entry costs on the size of the informal economy. The second fact emerges from the work by Botero, Djankov, LaPorta, Lopez de-Silanes and Shleifer (2004). After collecting a comprehensive data set about the extent of labor market regulations, they were unable to find any systematic relationship with the size of the informal economy. A more clear-cut result appears in Besley and Burgess (2004), where pro-worker legislations are showed to be positively associated with the size of the informal sector in a panel of Indian states. The relationship between taxes and informality is much more controversial. Among others, Johnson, Kaufmann and Zoido-Lobaton (1998) find evidence of a positive association between more cumbersome tax burdens and bigger sizes of the informal economy, but Friedman, Johnson, Kaufmann and Zoido-Lobaton (2000), with a different empirical strategy, found a negative association. Lemieux, Fortin and Frechette (1994) and Davis and Henrekson (2004) also report ambiguous results.

3 The Model

The model builds on the framework developed by Hopenhayn (1992) and Hopenhayn and Rogerson (1993) and extends it to an economy composed by two sectors. The key new features are the inclusion of output taxation, enforced through random audits, and the modeling of the flows of productive establishments across the two sectors.

The economy is populated by a set of productive establishments, a set of households and by the government. Productive activities can take place either in the legal sector, characterized by the respect of all the laws and regulations in place, or in the informal sector, but they

result in the same final product. Specifically, the goods produced in the two sectors share the same physical characteristics (say shoes or handbags) but they are produced with different technologies (in a regular factory or in a residential basement) and, since they are sold in two different markets[1] (a regular shop or an occasional street vendor or a peddler), they are also associated to different prices. Importantly, the model completely abstracts from intrinsically illegal productions such as drugs: the good produced in the informal sector is perfectly legal if produced within the official legal and regulatory environment. According to the terminology developed by the OECD (2003), the model specifies the non observed sector of the economy as composed by underground and informal production activities, abstracting from illegal activities and home production.

Firms operating in the legal sector must pay three different costs of participation to the legal system: a proportional tax rate τ^y on each unit of output produced, a fixed cost c^f that summarizes the loss of resources implied by the necessity of complying with all the regulations, and a proportional severance payment ϕ for each job destroyed. The per period profit function of the legal firms takes the following form:

$$p_t(1-\tau^y)f(n_t,a_t) - w_t n_t - c^f - \phi I_{\{n_{t-1}\geq n_t\}}(n_{t-1}-n_t) \tag{1}$$

where I is the indicator function, p_t is the price of the good in the legal market, w_t the wage rate and $f(n_t,a_t)$ the production function, that depends upon employment n_t an upon the level of an idiosyncratic technological shock a_t. To keep the model simple, I assume a power specification for the production function, with $f(n_t,a_t) = e^{a_t}n_t^{\alpha}$, and that the exogenous technological shocks follow a Markov process described by the transition function $F(a_t,a_{t+1})$. The inclusion of the fixed cost c^f in the above expression is also fundamental to distinguish between firms exiting from the market and firms temporarily producing zero output, and thus to meaningfully talk about exit. The last term in expression (1) is the cost of job destruction, modeled as a proportional payment ϕ on the difference between the previous period level of employment and the actual one, whenever this difference is positive.

Informal firms do not pay taxes but are subject to random audits that, with exogenous

[1]Evidence from the Informal Survey and from the Micro Survey implemented by the World Bank suggests that the markets for legal and informal goods are different. See La Porta and Shleifer (1998).

probability π, result in all the production being confiscated[2]. Furthermore they are not subject to severance payments and thus they can costlessly destroy jobs. The per period profit of the informal firms is the following:

$$q_t(1-\pi)f^i(n_t^i, a_t) - w_t^i n_t^i - c^i \tag{2}$$

where q_t is the price in the informal market and $f^i(n_t^i, a_t)$ the production function for informal firms that depends upon the level of the idiosyncratic productivity shock a_t, that is the same as the one hitting the legal firms. The production function is $y_t^i = e^{a_t}(n_t^i)^\eta$. Even if informal firms must not comply with any kind of regulation, they still face a fixed cost c^i for staying in the informal sector, the (fixed) "*Cost of Informality*". As first stressed by DeSoto (1989), informals employ a lot of resources to avoid detection, either explicitly, for instance in the form of direct bribe payments to the government officials that are supposed to audit, or implicitly, for instance in terms of forgone revenue due to the impossibility to reach economies of scale (to avoid visibility) and to advertise the product. Informals also transfer resources to Mafia-like organizations that substitute for the government as providers of protection and contract enforcing, or just as a consequence of extortion[3].

Notice that, to keep the model as simple as possible, the production in the legal sector takes place using only a legal labor input n_t and the informal production only with an informal labor input n_t^i. In practice, it is often the case that firms operating in the legal sector employ part of their labor force informally. Indeed, as shown in appendix, it is possible to extend the model along this dimension without any significant change in the model set-up, but at the cost of complicating substantially the solution procedure. Also the model completely

[2]Alternatively, it can be assumed that, upon auditing, the informal firm is forced to pay the output tax relative to the current period production, perhaps with some proportional fine. The choice of just assuming the seizing of the production is dictated by the wish of distinguishing the present model of informal production from a pure model of tax evasion. The consequence of this alternative assumption for the model results are nevertheless discussed in the appendix.

[3]It is also the case that legal businesses transfer resources to such organizations. In fact the primary source of revenue for organizations like the Sicilian Mafia, the Camorra (based in Campania, a region in southern Italy) or the N'drangheta (mainly operating in Calabria, southern Italy) is exactly coming from extortions on legal businesses, typically under the treat of violence.

abstracts from the benefits of producing in the legal sector, such as contract enforcing or easier access to outside finance. In fact the only reward for producing legally is the endogenously determined higher price of the good in the legal market, that is nevertheless a significant engine of reallocation across sectors[4].

At the beginning of each period, incumbent firms in the legal sector must decide whether to stay in the sector or exit. Incumbent informal firms, conversely, must decide whether to stay in the informal sector, exit from the market or legalize their activities, switching to the legal sector upon the payment of a fixed entry cost c^e. The cost of access to the legal system, c^e, summarizes both the monetary payments required by the law to start an economic activity and the opportunity cost to comply with all the mandatory bureaucratic procedures. Informal firms that are audited face a more restricted choice set and must either legalize the activity or exit from the market. Official firm that exit must pay the proportional cost of job destruction, while no payment is due by exiting informal firms. Realistically, the choice of legalizing an informal activity is irreversible: legal firms are not allowed to disappear from the official market and to start producing in the informal sector[5]. Firms that stay in each market pay the corresponding fixed cost, observe the productivity shock and decide the optimal level of labor input and so of production.

The value function of a legal firm is:

$$W(a_t, n_t; p_t) = \max_{n_{t+1}} \Big\{ p_t(1-\tau^y) f(n_{t+1}, a_t) - w_t n_{t+1} - c^f - \phi I_{\{n_t \geq n_{t+1}\}}(n_t - n_{t+1}) + \beta \max\left[-\phi n_{t+1}; E_a W(a_{t+1}, n_{t+1}; p_t)\right] \Big\}$$

The value function of an informal, conversely, has the following form:

$$V(a_t; q_t, p_t) = \max_{n^i_{t+1}} \Big\{ q_t(1-\pi) f^i(n^i_{t+1}, a_t) - w^i_t n^i_{t+1} - c^i + \pi\beta \max\left[0; E_a W(a_{t+1}, n^i_{t+1}; p_t) - c^e\right] + (1-\pi)\beta \max\left[0; E_a V(a_{t+1}; q_t, p_t); E_a W(a_{t+1}, n^i_{t+1}; p_t) - c^e\right] \Big\}$$

[4]In the appendix, the framework is extended to take into account also a productivity enhancing public good enjoyed by legal producers, but I show that this modification leads to the exact same results.

[5]In the context of the present model this is not really an assumption: for many realistic parameterizations, legal firms never find it optimal to switch to the informal sector, even if they are allowed to do so upon the payment of the cost of job destruction.

If the informal establishment is not audited (with probability $1-\pi$), then the entrepreneur chooses to switch to the legal sector if the expected present value of a legal business, net of entry cost, is greater than the expected present value of an informal business ($E_aW - c^e > E_aV$). If the opposite is true, then the establishment stays in the informal sector. If none of the two expected values is positive ($0 > E_aW - c^e$ and $0 > E_aV$) then the choice is exiting from the market. Audited establishment (with probability π) do not have the option of staying in the informal sector. It is easy to show (see appendix), using standard dynamic programming arguments, that the value functions are unique, continuous, bounded and increasing in a and p and that W is decreasing in n and V increasing in q.

In each period there is a large number of potential entrants in both sectors. Entry in the informal sector is free, while entry in the legal is subject to the payment of the cost of access c^e. The current value of the productivity shock for entrants is drawn from the pdf $\nu(a)$, whether they are entrants in the official or in the informal sector. The values of entering can be expressed as follows:

$$W^e(p_t) = \int W(a_t, 0; p_t) d\nu(a_t)$$
$$V^e(q_t, p_t) = \int V(a_t; q_t, p_t) d\nu(a_t)$$

A potential entrepreneur will start legally only if the value of entry W^e, net of the entry cost c^e, is bigger than the value of entry in the informal V^e.

The economy is also populated by a set of identical households that own both legal and informal firms, supply legal or informal indivisible labor and buy goods in both markets. Households choose employment lotteries and have access to markets to diversify the idiosyncratic risk, so that the economy is equivalent to another economy with a representative household and the following intratemporal utility function:

$$\sum_{t=0}^{\infty} \beta^t u(\hat{c}_t, l_t)$$

The per period utility function is $u(\hat{c}_t, l_t) = \log \hat{c}_t + H l_t$ and it is defined over leisure $l_t = 1 - N_t - N_t^i$ and over the composite consumption good $\hat{c}_t$. The latter is determined by

the following CES aggregator over the consumption of the legal good c_t and of the informal good c_t^i:

$$\hat{c}_t = \left[\psi c_t^z + (1-\psi) c_t^{i\,z}\right]^{\frac{1}{z}}$$

The budget constraint of the household is the following:

$$p_t c_t + q_t c_t^i = w_t N_t + w_t^i N_t^i + \Pi_t + \Pi_t^i + T_t$$

where Π_t are the aggregate profits from the legal firms, Π_t^i the aggregate profits from the informal firms and T_t the lump sum transfers from the government, assumed to be equal to the total amount of tax proceedings[6].

Providing that the analysis is focused on a stationary equilibrium with constant prices, the consumer optimization problem can be reduced to a simple static one. Furthermore, given the lack of extra disutility for working in the informal sector and the absence of taxation on labor on the worker side, the first order conditions of the household optimization problem implies $w = w^i$[7]. The optimal levels of consumption obtained by solving the household problem will be denoted by $C(p_t, q_t, \Pi_t, \Pi_t^i, T_t)$ and $C^i(p_t, q_t, \Pi_t, \Pi_t^i, T_t)$, while the optimal labor supplies by $N(p_t, q_t, \Pi_t, \Pi_t^i, T_t)$ and $N^i(p_t, q_t, \Pi_t, \Pi_t^i, T_t)$.

In each period the state of the economy is summarized by two measures $\mu_t(a_t, n_t)$ and $\mu_t^i(a_t, n_t^i)$ that represent, respectively, the number of legal and informal firms with a given level of employment and a given productivity. Given the optimal decision rules determined by the solution to the optimization problems of the firms, it is possible to characterize the dynamic behavior of these two measures. Note that the optimal exit decision of a legal firm is characterized by a simple cut-off rule: if the level of productivity is below some threshold a^* they exit from the market, while they stay and produce if the productivity is higher.

[6]Importantly, T_t does not include the payments of the costs of access, thus implicitly assuming that the entry costs are mainly associated to long bureaucratic procedures that waste resources for the entire economy.

[7]This feature of the model, although inconsistent with a dual view of the informal sector, is consistent with survey evidence from Latin America. Maloney (2004) shows that the distributions of earnings in the informal and legal sector are not so different and that the averages are both similar and above the legally mandated minimum wage.

The choice of an informal firm, conversely, is characterized by 2 thresholds levels: if the productivity is below some value a_i^* they exit from the market, if it is between a_i^* and some other value $\hat{a_i}$ they stay in the informal sector, while if it is higher they switch to the legal sector. Now let's define the following indicator function that summarizes the optimal entry-exit choice of an official firm:

$$X(a_t, n_t; p_t) = \begin{cases} 1 & \text{if } a \geq a^* \\ 0 & \text{otherwise} \end{cases}$$

And let's similarly define the following indicator functions for an informal firm:

$$X^i(a_t; q_t, p_t) = \begin{cases} 1 & \text{if } a_i^* \leq a \leq \hat{a_i} \\ 0 & \text{otherwise} \end{cases} \qquad \chi(a_t; q_t, p_t) = \begin{cases} 1 & \text{if } a > \hat{a_i} \\ 0 & \text{otherwise} \end{cases}$$

In both cases I assume that if a firm is indifferent between stay and exit or stay and switching it stays. Then the evolution of the state of the economy can be represented by the following mappings defined over the measures μ and μ^i:

$$\mu_{t+1}(a_{t+1}, n_{t+1}) = \int \mu_t(a_t, n_t) I_{\{N(a_t, n_t; p_t) = n_{t+1}\}} X(a_t, n_t; p_t) dF(a_t, a_{t+1}) + B \int I_{\{N(a_t, 0; p_t) = n_{t+1}\}} d\nu(a_t)$$
$$+ \int \mu_t^i(a_t, n_t^i) I_{\{N^i(a_t; q_t, p_t) = n_{t+1}\}} \chi(a_t; q_t, p_t) dF(a_t, a_{t+1})$$

$$\mu_{t+1}^i(a_{t+1}, n_{t+1}^i) = \int \mu_t^i(a_t, n_t^i) I_{\{N^i(a_t; q_t, p_t) = n_{t+1}^i\}} X^i(a_t; q_t, p_t) dF(a_t, a_{t+1}) + B^i \int I_{\{N^i(a_t; q_t, p_t) = n_{t+1}^i\}} d\nu(a_t)$$

where B and B^i are the effective mass of entrants in the official and informal sectors and $N(a_t, n_t; p_t)$ and $N^i(a_t; q_t, p_t)$ are, respectively, the optimal choices of labor input by official and informal firms in period t. In each of the above expressions the first term represents the contribution of incumbent firms that decide to stay in the market and the second term the contribution of new entrants. The third term in the first expression is the contribution of informal firms switching to the legal sector. With a slight abuse of notation let's define, for each period, $\Theta_t = \{p_t, B\}$. $\Theta_t^i = \{q_t, B^i\}$. Then it is possible to write the transition function in the following more compact way: $\mu_{t+1} = \Psi(\Theta_t, \Theta_t^i, \mu_t, \mu_t^i)$, $\mu_{t+1}^i = \Psi^i(\Theta_t^i, p_t, \mu_t^i)$.

Once the measures have been determined, it is straightforward to compute all the supply side aggregate variables. For instance the output of the legal sector is determined as follows:

$$\begin{aligned} Y(\Theta_t, \Theta_t^i, \mu_t, \mu_t^i) = &\int \left[(1-\tau^y) f(a_t, N(a_t, n_t; p_t)) - c^f\right] X(a_t, n_t; p_t) d\mu_t(a_t, n_t) \\ &+ B \int f(a_t, N(a_t, 0; p_t)) d\nu(a_t) \\ &+ \int \left[(1-\pi) f^i(a_t, N^i(a_t; q_t, p_t)) - c^u\right] \chi(a_t; q_t, p_t) d\mu_t^i(a_t, n_t^i) \end{aligned} \tag{3}$$

where, again, the first integral is the output produced by incumbent legal firms, the second one the output produced by new entrants in the legal market and the last one the output produced by informal firms that switched to the legal sector. Conversely the aggregate output in the informal sector is determined as follows:

$$\begin{aligned} Y^i(\Theta_t^i, p_t, \mu_t^i) = &\int \left[(1-\pi) f^i(a_t, N^i(a_t; q_t, p_t)) - c^u\right] X^i(a_t; q_t, p_t) d\mu_t^i(a_t, n_t^i) \\ &+ B^i \int (1-\pi) f^i(a_t, N^i(a_t; q_t, p_t)) d\nu(a_t) \end{aligned} \tag{4}$$

In a similar fashion it is possible to determine the aggregate profits Π and Π^i, the aggregate labor demands L_d and L_d^i and the total tax receipts T.

A stationary equilibrium of the model is an allocation $\{Y^*, Y^{i*}, C^*, C^{i*}, L_d^*, L_d^{i*}, N^*, N^{i*}\}$, a set of prices $\{p^*, q^*\}$, a set of entry sizes $\{B^*, B^{i*}\}$ and a set of distributions $\{\mu^*, \mu^{i*}\}$ such that:

- $L_d^*(\Theta^*, \Theta^{i*}, \mu^*, \mu^{i*}) = N^*(p^*, q^*, \Pi^*, \Pi^{i*}, T^*)$ and $L_d^{i*}(\Theta^{i*}, p^*, \mu^{i*}) = N^{i*}(p^*, q^*, \Pi^*, \Pi^{i*}, T^*)$
- $Y^*(\Theta^*, \Theta^{i*}, \mu^*, \mu^{i*}) = C^*(p^*, q^*, \Pi^*, \Pi^{i*}, T^*)$ and $Y^{i*}(\Theta^{i*}, p^*, \mu^{i*}) = C^{i*}(p^*, q^*, \Pi^*, \Pi^{i*}, T^*)$
- $W^e(p^*) \leq c^e$ and $V^e(q^*, p^*) \leq 0$
- $\mu^* = \Psi(\Theta^*, \Theta^{i*}, \mu^*, \mu^{i*})$ and $\mu^{i*} = \Psi^i(\Theta^*, p^*, \mu^{i*})$

where $\Theta^* = \{p^*, B^*\}$, $\Theta^{i*} = \{q^*, B^{i*}\}$ and Π^*, Π^{i*} and T^* are all computed according to the equilibrium values. The first two relationships states that, respectively, labor and good markets must clear in both the informal and the legal sector. The third line states the free

entry conditions: providing the assumption of an unlimited supply of potential entrants, in equilibrium the value of entry must be at most equal to the cost of entry, with equality if entry is positive. The last two conditions state that the economy is in a stationary equilibrium, with the distribution over the state reproducing itself every period at the equilibrium values. In appendix, I show the existence of a model equilibrium under mild regularity conditions.

Note that the model can exhibit different types of equilibria. In particular, there can be equilibria with entry and exit in both sectors and equilibria without. In addition, an equilibrium can involve entry and exit in both sectors and a measure of firms switching from the informal to the legal sector, but it can as well involve no switch. It is also possible to have mixed situations with, for instance, positive entry in the informal sector, switching and positive exit in the legal sector, but without entry in the legal sector and without exit in the informal. In what follows, I will focus on the interesting case of an equilibrium with entry and exit in both sectors and switch. A set of sufficient conditions for the existence of such an equilibrium can be found in appendix. Given the structure of the model, it is intuitive that, in equilibrium, there will always be entry and exit in both sectors as long as the demand for both goods in non-degenerate. Thus a sufficient condition to have $B \neq 0$ and $B^i \neq 0$ is that the price must be bounded and that $\psi \neq 0$ and $\psi \neq 1$. For what concerns the switching equilibrium, what is needed is that the equilibrium price in the legal market is high enough so that the most productive informal firms will find it profitable to switch.

4 Model Simulation

4.1 Parameters and Calibration

The benchmark simulation is targeted to the US economy. The strategy employed to parameterize the model is to fix as many parameters as possible using outside information and then calibrating the remaining ones to match firm level statistics computed from the Census of Manufacturers. The goal of the calibration is to have a characterization of the legal sector that is in line with both the empirical evidence and the literature on dynamic models of industry equilibrium. At the same time, I also want to avoid positing too many asymmetries

across the two sectors, in order to model the choice of producing informally versus legally as dependent upon entry costs, labor market regulations and taxes and not upon other dimensions of the economy. In appendix (available upon request), I also propose a detailed discussion of the robustness of the model results to different possible parameter values.

According to the time span of the census, I set the time period to 5 years. The discount rate β is fixed at a value that implies, in steady state, an interest rate of 4% a year. The labor share of income α is set to 0.65, consistently with the US empirical evidence. To keep the differences across the two sectors at a minimum, I assume equal technologies, fixing[8] $\eta = \alpha$. The output tax τ^y is 29%, which is the average value of the ratio between tax receipts on corporate income and corporate income in the period 1960-2003 for the US.

I set the cost of entry c^e to 0.5% of GDP, consistently with the evidence reported by Djankov et al. (2002) for the US (see infra). I also set the severance payments parameter ϕ to 0, according to Botero et al. (2004) (see infra). I assume that the exogenous technological shock for incumbents evolves according to the following autoregressive process:

$$a_t = \rho a_{t-1} + \varepsilon_t$$

where $\varepsilon_t \sim \ i.i.d.\,(0, \sigma^2)$ and normally distributed. As far as new entrants are concerned, the pdf $\nu(a)$ is simply uniform on the same support on which a is defined.

The two preference parameters ψ and z map relative price differences into a relative size of the informal economy and therefore they are ultimately responsible for the scale of the informal activities. It follows that, consistently with the calibration strategy, it is important to set them at a value that will deliver a reasonable size of the informal economy in the US. The natural candidate values for them are the estimates in Russo (2009), which are time series estimates of the same preference parameters in the context of a similar structural model of the informal economy. According to that estimates, I set $\psi = 0.95$ and $z = 0.25$. Notice that, although these two parameters determine the size of the informal economy in the model, their influence on the comparative statics results, that are central to this paper, is just marginal: changes in the costs of the legal system translate into relative price changes, but, as long as the preference parameters are fixed, the ordering of the relative magnitudes of the changes will

[8]This rather strong assumption is relaxed in the appendix, without any significant change in the results.

be preserved (further details can be found in appendix). The remaining preference parameter H is calibrated to 1.9 to deliver a share of workers in the population of 60%.

The monitoring probability π affects the productivity differential across sectors and thus the relative price of the good in the informal market. Its real world counterpart is the probability of discovering a business in the informal economy, which should reflect both the probability of a tax audit and the probability of discovering an unregistered/illegal business. Data from the IRS indicate that, on average, slightly less than 1% of the taxpayers are subject to inspections. Nevertheless there is no available information about the efficiency of the police in detecting not authorized production that can help pinning down the value of the second probability. The only available information is the estimate of the auditing probability provided in Russo (2009) in the context of a similar structural model of the informal economy. I set π to 0.14 according to this estimate, but the results appear to be robust to several alternative parameterizations (see appendix).

For what concerns the fixed costs c^f and c^u, there are a priori reasons to believe that the fixed cost is higher in the legal sector, for instance because of the cumbersome regulatory environment or the complex tax system. Nevertheless there are also a priori reasons to believe that the fixed cost is higher in the informal sector, because of the costs of informality previously discussed. Nevertheless, providing that one of the main background assumptions of the model is that the legal system is indeed costly, I assume that the fixed cost to stay in the legal sector c^f is higher than its illegal counterpart c^u, but, in order to avoid an important asymmetry between the two sectors, only by a small amount (10%). For practical purposes, this assumption entails placing a linear restriction in the calibration exercise. This choice is also sensible from an empirical perspective, albeit conservatively. Data from the Informal Survey and from the Micro Survey implemented by the World Bank (see La Porta and Shleifer (1998)) indicate that informals and legal firms spend the same amount of money in protection and security, but legal firms devote more resources to comply with regulations. It is important to stress that this asymmetry postulated in the model is almost inconsequential for the bulk of the results: even remaining agnostic about the relative magnitude of the two fixed costs, setting them as equal, would result in the same model properties and in the same counterfactual results. But this choice of slightly different costs significantly eases

the computational burden, making faster to find an equilibrium with switching informals for a wide range of model parameters. The two fixed costs c^f and c^u, together with the two technology parameters ρ and σ, are then calibrated to reach 3 targets: an exit rate of 40%, a job turnover rate of 30% and a coefficient of serial correlation of employment of 0.93. The resulting parameters value are[9] $c^f = 0.03$, $c^u = 0.027$, $\rho = 0.82$ and $\sigma = 0.11$.

4.2 Informality as the Doorstep of Legality

Overall the model implies a characterization of the informal sector that is consistent with the survey evidence reported by Maloney (2004), La Porta and Shleifer (2008), De Paula and Scheinkman (2008) and Dabla-Norris et al (2008): small establishments, less productive, exposed to market whims and thus characterized by a high death rate.

The relative size of the informal sector implied by the benchmark calibration is 2.7% if measured in terms of output and 1.3% if measured in terms of employment. The number of informal firms is equal to 4% of the number of official firms. Informal firms are significantly smaller than their legal counterparts, both in terms of output and in terms of employment. In line with the survey evidence from the World Bank's Informal Survey and Micro Survey (La Porta and Shleifer (2008)), the productivity is also much smaller in the informal sector. Consistently with the smaller size and productivity of informal firms, the exit rate in the informal sector is also significantly higher than in the legal.

The price in the informal market is lower than the legal, providing a significant incentive for informal firms to legalize[10]. Regardless of the strong incentive, the measure of switching informal firms is somehow small. In the stationary equilibrium roughly 30% of the informals legalize, which means that, in each period, only 1.5% of the legal firms were previously informal. This feature is indeed consistent with the survey evidence summarized by LaPorta and

[9]Perhaps the persistency of the technology shock might seem high, especially as compared to what was obtained by Hopenhayn and Rogerson (1993). Nevertheless it is quite difficult to obtain a plausible exit rate from the model without appealing to persistent technology shocks. Moreover, as shown in appendix, this high persistence does not influence significantly the model results and thus should not be viewed as a limitation of the analysis.

[10]The lower price can be a consequence of the fact that the prospective buyers anticipate a lower quality from the goods sold on the informal market and, therefore, are not willing to pay high prices for them

Shleifer (2008) who report that, in their sample of developing countries (typically characterized by a higher cost of access and, therefore, by a bigger number of informal firms), 91.2% of legal firms started as legal (on average).

In the five years period, informal firms that experience favorable productivity shocks legalize, while less productive informals optimally exit. In this respect the model implies a characterization of the informal sector as a *Doorstep* of the official: many firms start informally on a small scale, then waiting to become more productive and to grow before legalizing. This pattern is indeed consistent with the survey evidence reported by Maloney (2004), showing that, in Mexico, informal firms tend to become formal with age and size. The evidence is also consistent with De Paula and Scheinkman (2008) who report that, in Brazil, only bigger and more productive informals find it profitable to legalize. A further implication is that informal firms that want to legalize do it quickly, in line with the survey evidence reported by LaPorta and Shleifer (2008). In their sample, 2/3 of the firms legalize within 5 years and 80% within 10 years, which is consistent the model parameterized with the costs of the legal system of the developing countries where the surveys were conducted.

On a theoretical level, the *Doorstep* theory is akin to the idea of entrepreneurship and selection by Jovanovic (1982). Namely the potential entrepreneurs can learn about their productivity and about the market conditions only if they actually start a business. But, if they are not productive, they are actually forced to drop out of the market. The theoretical point of the model, which will be stressed by the numerical analysis, is that, if the costs associated to the legal system are too high, then the entrepreneurs will not be willing to go through the learning step in the legal sector and would rather do it in the informal. An important implication is that the *Doorstep* theory explains the lower productivity of the informal firms as a consequence of the dynamics of new start-ups with barriers to entry in the legal sector and not just as consequence of the inferior abilities of the informal entrepreneurs.

The properties of the legal sector of the model are in line with the empirical evidence summarized, among others, by Evans (1987), Davis and Haltiwanger (1988) and Dunne, Roberts and Samuelson (1989). In particular the size distribution of the firms is stochastically increasing in age and the exiting probability is decreasing in firms' age. Also small firms account for most of the hiring rate, while large firms account for most of the firing.

5 Comparative Statics

In this section, I propose an analysis of the effects of increased costs of the legal system on the model equilibrium, holding all the remaining model parameters fixed at their benchmark values. The results are summarized in Table (1).

As already stressed by Hopenhayn (1992) and, although in the context of a different model, by Blanchard and Giavazzi (2003), the cost of access acts as a barrier that protects incumbent legal firms, reducing both the rate of entry and the rate of exit, lowering output and raising its price[11]. Overall a higher entry cost translates into higher profits and into a higher average size for the legal firms. This feature of the model highlights an underlying *Public Choice* view of the regulation process: entry regulations create rents for big incumbent firms isolating them from the threat of potential competition. But the cost of entry is not effective at insulating incumbent firms from the competition of informals that legalize. Namely a higher cost of entry, by raising the profitability of the legal firms, and in particular of the bigger and most productive legal establishments, is associated to a contemporaneous increase of both the costs and the benefits of operating legally, leaving the terms of the trade-off barely affected.

Essentially the higher cost of access is associated to a substantial increase of the rate of entry in the informal sector. The higher optimal entry size in the legal sector[12], induced by the higher entry cost, displaces the low-productivity small entrants that were previously choosing the legal sector, for which it is now profitable only to enter in the informal. Putting it simply, many start-ups are just to small to pay the entry cost. Indeed the profits of small legal businesses are still very close to zero even after the introduction of entry barriers: the real beneficiaries of the entry regulation are the bigger and more productive incumbent legal firms, whose profits grow faster than smaller incumbents. Consistently with the *Doorstep* theory, more firms start informally and are forced to wait to become more productive and

[11]Bertrand and Kramarz (2002) found also empirical evidence that, in a sample of French manufacturing establishments, more strict entry regulations are associated to lower sales, lower rates of employment, higher concentration (and so size) and higher prices.

[12]This property of the model is consistent with the empirical results by Klapper, Laeven and Rajan (2006), that find both a smaller rate of entry and a higher size of entry in the countries characterized by higher costs of access

grow before they can afford to pay the entry cost. Clearly the cost of entry in the legal sector determines an increase in the relative size of the informal economy. The size distribution of legal firms is increasing, with a clear increased measure of bigger firms. The distribution of informal firms moves towards a bigger concentration in the lower tail, substantially driven by the increased informal entry.

Increased severance payments induce a lower switching rate without significantly changing the entry rates. In fact, since new entrants in the legal sector are assumed to start with a zero labor force, and since informals do not comply with labor market regulations, the value of entry in both sectors is not affected by firing costs (if not through the discounted value of future profits). Viceversa the firing costs, by reducing the flexibility of legal firms, induce lower profits in the legal sector and a decreased present value of legal firms[13] (increasing the relative price in the legal market), thus lowering the switching rate. The economy is also characterized by a more stable labor force, with a lower hiring and firing rates, a lower job turnover and a higher serial correlation of employment. In line with Hopenhayn and Rogerson (1993), there is also a reduction of aggregate employment and a lower labor productivity.

An increased output tax induces a decrease in legal output that, by itself, determines an increase in the relative size of the informal economy. Both the average size and the average productivity of the legal firms decline and the price level in the legal market increases. The higher taxes induce also a smaller expected benefit of legalization which compensates the increased price, without any significative effect on the legalization rate.

In terms of the relative importance of the costs as determinants of the informal economy, the conclusion is that the costs of access matter more than the costs of participation. In fact the economy is characterized, in each period, by a big mass of entrants, both in the legal and in the informal sector. Increasing the cost of access to the legal sector will then affect the entry decision of many entrepreneurs that will now find it profitable only to start their activities informally. Conversely, tighter labor market regulations will mostly affect the legalization choices of a more restricted mass of relatively more productive informal firms

[13]This result is in line with the empirical evidence summarized by Almeida and Carneiro (2005). They report that, in Brazil, increasing the enforcement of labor market regulations is associated not only to a decrease of the informal labor force, but also to a decreases value added per worker and sales per worker.

that, as a consequence of the lower profitability available in the legal sector, will not find it profitable anymore to legalize. As far as tax rates are concerned, since legal firms don't sell in the informal market, there is no direct incentive effect on informal output of tax changes.

6 Numerical Analysis

The quantitative experiment entails plugging in the calibrated model the observed costs of the legal system, to then analyze the implied cross country differences in the size of the informal economy. Two main results stand out: first, the cross country variability in the extent of labor market regulations and taxation can account only for a small fraction of the cross country variability of the size of the informal economy, while the costs of access can rationalize a great part of it. Second, the cost of access accounts for a greater fraction of the informal economy in the countries characterized by bigger informal sectors. A word of caution is necessary: since the model features just three determinants of the size of the informal economy, among all possible others, the interpretation of the above results must not be that the cost of access are the only ones that matter, but rather that they are significantly more important than firing costs and tax rates.

6.1 Data

I consider two measures of the cost of access to the legal system from Djankov et al (2002): the first (ce) simply takes into account "All identifiable official expenses" necessary to get all the authorizations required to start a business, thus excluding eventual bribes that must be paid during the process. The second ($cetime$) takes into account "All identifiable official expenses and a monetized value of the entrepreneurs' time", basically considering also the time necessary to complete all the mandatory bureaucratic procedures, quantifying the related opportunity cost and adding it to the first measure. Both variables are measured as a percentage of the GDP per capita of the country. A third measure of the cost of access ($wbce$) is from the World Bank Development Indicators, and it refers to the cost of starting a business expressed as a percentage of the GNI per capita.

I take two measures of firing cost from Botero et al (2004). The first (sev) is the weeks

of "Legally mandated severance payment requirements in case of redundancy dismissal". The second (*sevadv*) adds to the first measure also the "Legally mandated advance notice requirements", basically assuming that an additional monetary cost for the firm willing to lay-off a redundant worker is the wage that must be paid during the notice period. A third measure of firing costs (*wbsev*) is reported by the World Bank Development Indicators. The tax pressure (*tax*) is from the World Bank Development Indicators and it quantifies the tax rate on income profits and capital gains.

I then construct two data sets: the first (Mixed Sample) with the data from Djankov et al. (2002) and from Botero et al (2004), together with the tax rates from the WB; the second (WB Sample) using only data from the WB, averaged over the period 2002-2006. In both cases the data are collected for the biggest sample of countries for which information is available for all variables used, which means 78 countries in the first case and 90 in the second (note that not all the countries in the Mixed sample are included in the WB sample). These numbers do not include the countries with extremely high values of the cost of entry in excess of 150% of the GDP per capita (not taking into account the opportunity cost of time), that I excluded from the analysis.

Overall there is evidence of a significant variability of all the costs, which excludes the possibility that the model results are driven just by a higher cross sectional standard deviation of the cost of access. In particular, the coefficients of variation of the cost of access measures in the Mixed samples are equal to, respectively, 63.9% (*ce*) and 80.3% (*cetime*), while the coefficients of variation of the firing cost variables are equal to 69.7% (*sev*) and 86.3% (*sevadv*) and the coefficient of variation of tax rates is equal to 59.9%. As far as the WB sample is concerned, the coefficients are 54.5% (*wbce*), 77% (*wbsev*) and 91.8% (*wbtax*).

6.2 Cost Decomposition

Imposing severance payments requirements of 9 months, starting from an unregulated process of job destruction, implies a 2.5% increase in the size of the informal economy. Even raising the requirement to 78 weeks (more than double the maximum value found in the data for the sum of severance payments and advance notice) implies a modest 5% increase. Even more strikingly, the relative size measured in terms of total labor force goes up by, respectively,

7.5% and 15%. Raising the tax rate implies stronger effects on the informal sector: a 40% increase determines a 27% increase of the relative output, while a 70% increase (up to a tax of 50% that is almost the highest sample observation) induces an increase of 56%. Vice versa imposing a cost of access to the legal sector equal to 30% of the GDP per capita, starting from a value of 0.5%, increases the relative size of the informal output by 136% and the informal employment by 85%. For a cost equal to 50%, that is still far below the biggest values found in the data, the factors become, respectively, 370% and 250%.

Looking more closely at the sample, the model implies that the observed cross country differentials in the costs of entry account, on average, for 74.9% of the cross country variability of the relative size of the informal economy, while labor market regulations and tax rates for, respectively, 10.9% and 14.2%. Using the alternative set of data from the WB, the fraction become, 63.9%, 5.2% and 30.9%. The first row of Table (2) summarizes the results and provides also information regarding the median values and the standard deviations of the individual relative contributions. The procedure behind the decomposition entails fist feeding in the model all the three observed costs of the legal system to simulate the size of the informal economy and then excluding the costs one at a time. The difference between the simulated value with all the costs and the simulated value without one of the costs is the contribution of the latter to the simulated informal economy. The relative contribution of a costs is simply obtained dividing the absolute value of the individual contribution by the sum of the absolute values of the contributions. It is necessary to compute an absolute value since the benchmark level of tax rate used in the simulation is 29%, while many countries are characterized by a lower tax level and so by a negative contribution of taxes.

Further decomposing the contributions of the different costs by quartiles of the informal economy reveals an additional result: the cost of access is a more important determinant of the informal economy for countries characterized by a bigger size of the informal economy. The second part of table (2) reports the average and median contributions of the costs in the four quartiles of the distribution of the informal economy, together with the standard deviations of the contributions. Clearly both the contribution of the cost of access in the top quartile is higher than in the bottom one and the variability of the contribution is sensibly lower. In greater detail, the cost of access, in the mixed sample, accounts for 61% of the

informal economy in the bottom quartile of the distribution but for 80% in the top quartile. Even more striking is the difference in the WB sample, with just 40% in the lower quartile and 80% in the top. Also the standard deviation drops from around 27% in the bottom quartile to 4% in the top one. The specular result is that the contribution of the tax rate is much smaller in the top quartile, with a value that drops from the 56% to the 9% in the WB sample and from 32% to 7% in the mixed sample.

7 Empirical Validation

7.1 Estimates of the Informal Economy

All the results presented in the paper come from a numerical analysis and, in particular, from the analysis of the size of the informal economy that, according to model, arises as a consequence of the cross country differentials in the costs of the legal system. But how reasonable these measures are as compared to the existing empirical evidence? The obvious way to test the model along this dimension is to compare the model based measure to the available estimates of the informal economy. Indeed it is necessary to be extremely careful at using these estimates as benchmarks, since all the estimation method hinge on strong empirical assumptions that are rarely met in practice. But it is also the case that these estimation methods are based on indicators that are extremely likely to be correlated with the extent of informal activities. In other words, it is safe to assume that the estimates provide an idea of the cross country variability of the informal economy consistent with the cross country variability of its indicators.

I consider 4 different estimates of the size of the informal economy. 3 measures are based on indirect estimation methods: the Aggregate Electricity Consumption method (Johnson et al. (1997) and (1998)), the Household Electricity Consumption method (Lacko' (1999)) and the Schneider's DYMIMIC method (Schneider (2005)), which is a combination of the MIMIC (Loayza (1996), Giles (1999)) and Currency Demand (Tanzi (1983)) methods. A fourth measure is the index of informal activities from the 2006/2007 World Competitiveness Report survey, as rescaled by LaPorta and Shleifer (2008).

Figure (1) shows a scatter plot of the size of the informal economy delivered by the model against the average estimate. The model measures are obtained feeding in the model the upper bound measure of labor market regulation (*sevadv*) and the upper bound measure of the cost of access (*cetime*), along with the measure of tax pressure (*tax*)[14]. The comparison is restricted to a sample of 70 countries given the unavailability of estimates of the informal economy for all the countries in the sample. As the plot shows, the two measures line up nicely, with a correlation equal to 52%.

It can be argued that just a high correlation of the model measures with the average estimates is not very informative, given the often different estimates delivered by different estimation methods. But breaking down the estimates according to the estimation methods reveals similar results. The first row of table (3) summarizes the results. The table reports also the correlations with the smallest and largest estimated value, to account for the possible extreme results delivered by some estimation method. The most interesting evidence is that the correlation values are higher for the electricity consumption estimates (62% for the Lacko' method and 57% for the Johnson et al. method) and for the survey measure (50%), which are not constructed using the information about the costs of the legal system used to simulate the model. The rest of table (3) reports also the correlation results for a different breakdown of the sample according to the stage of development. Overall, the correlations are higher for OECD countries than for transition or developing.

However, the model is not able to match exactly the empirical estimates and it tends to underpredict the size of the informal economy. In fact the correct interpretation of the results of this section must not be that the model is able to replicate the exact size of the informal economy, but rather than it is able to explain why the informal economy in some country is bigger or smaller than in others (which is mostly because the cost of access to the legal system is different).

[14]The results obtained feeding in the lower bound measures, or combinations of lower bound and upper bound measures for different costs, are very similar to the one reported, with the only difference of a systematically lower simulated value.

7.2 Regression with the Estimated Informal Economy

The next step of the empirical validation of the model entails running a regression of the estimated relative size of the informal economy on the costs of the legal system, controlling for the level of GDP per capita. The inclusion of the control is important because richer countries are characterized by a better law enforcement (LaPorta, Lopez De Silanes, Shleifer and Vishny (1998)) and by a better quality of government (LaPorta et al. (1999)), which can potentially influence both the size of the informal sector and the level of its determinants included in the regression equation. Richer countries are also characterized by less credit constraints and so, potentially, by a less severe influence of entry costs on the size of the informal economy (see appendix for further documentation). The regression model is the following:

$$y_j^i = \gamma_1 + \gamma_2\, c_j^e + \gamma_3\, \phi_j + \gamma_4\, \tau_j^y + \gamma_5\, x_j + \epsilon_j \tag{5}$$

Where $y_j^i = Y_j^i / Y_j$ is the ratio of informal to legal GDP, c_j^e the cost of entry in the legal sector, ϕ_j the extent of labor market regulation, τ_j^y the tax rate on output, x_j the GDP per capita and ϵ_j the error term. A simple OLS estimator will not provide consistent estimates, given the endogeneity of the cost variables. Namely countries with big informal economies are characterized, by definition, by low tax revenues and so by a limited government budget, that is typically associated to inefficient bureaucracies and thus to slow and lengthy procedures. Countries with big informal sectors can also develop labor market regulations that are dictated by the wish to control the phenomenon. Also the measure of tax pressure is computed dividing a measure of tax revenue by a measure of tax liability, and the size of the informal economy is likely to influence both the numerator and the denominator of the quantity.

The simple strategy to cope with the endogeneity consists in the use of legal origins (English common law, French civil law and Socialist), religious prevalence (Muslims and Protestants) and ethnolinguistic fractionalization as instrumental variables[15]. This choice is justified by the empirical evidence reported by LaPorta et al. (1998), Djankov et al. (2002) and Botero et al. (2004): legal origins, as well as religion and ethnic heterogeneity, are

[15]See Friedman et al. (2000) for a similar empirical strategy.

found to be, broadly speaking, good exogenous predictors of the "Quality of Government". The quality of government, in turns, is a good predictor of the degree of interventionism in the economy, which is directly related to the tax burden; but also of the efficiency of the bureaucracy and of the extent of market regulation. In fact common law countries, of British legal traditions, are characterized, in the sample, by a lower average entry cost (21% and 33% for *ce* and *cetime* as compared to, respectively, 29% and 48% of the full sample), a lower average labor market regulation (4 and 6 weeks versus 7 or 11 in the full sample) and a higher tax pressure (34% as compared to the 25% of the full sample). Conversely French civil law countries are characterized by a higher average entry cost (41% and 66%) and by higher firing costs (10 and 14 weeks). For what concerns religious prevalence, the entry cost for protestant countries (15% and 26%) is sensibly lower than the full sample average and than the average for muslim countries (48% and 70%). Severance payment requirements follow a similar pattern (3 and 8 weeks as compared to 9 or 11). Entry regulation is also positively correlated with the extent of ethnical division of the countries, with more divided countries having tighter regulations. Providing that, to some extent, also the level of GDP per capita is influenced by the size of the informal sector, at a minimum because as many businesses go and produce underground the size of the informal economy will rise, inducing a decline in the observed GDP, I also included the latitude of the capital city of the country, highly correlated with the GDP per capita, in the set of instruments. Taken together, the instrumental variables explain a big portion of the variability of the determinants of the informal economy included in the regression specification. In particular, the R^2 of a regression of the cost of access on the instruments is 0.36 for the lower bound measure (0.48 for the upper bound). For tax rates, the R^2 is equal to 0.46 while, for the GDP per capita 0.70. The only weaker results entail the labor market regulation variables, where the R^2 is just equal to 0.27 for the lower bound measure (0.20 for the upper bound).

The left panel of table (4) reports the instrumental variables regression results for the two samples of data and for different possible regression specifications. The estimated size of the informal economy is the average measure over all the available estimates. The standard errors reported in the table are robust to eteroskedasticity. The last row of the table reports the p-value for an overidentifying restrictions test. One important empirical evidence seems to

arise robustly: firing cost and tax rates have no explanatory power for the informal economy over and above the cost of access. The coefficient on the cost of access is always positive, large and statistically significant while the coefficient on firing costs and tax rates is always statistically insignificant. More specifically, a one standard deviation increase in the cost of access to the legal system (25% for the lower bound measure), is associated to an increase of the relative size of the informal economy between 10% and 12%, depending on the sample and on the exact specification of the empirical model.

An apparently puzzling, but theoretically consistent, result is the negative sign on the labor regulation variables. Basically imposing firing costs to legal businesses raises the relative convenience of using informal labor, thus shifting part of the labor demand towards the cheaper informal workers and therefore inflating the size of the informal economy. Nevertheless part of the informal economy is also composed by workers that, being temporarily unemployed, work informally while looking for a regular occupation (DeSoto (1989), Lemieux et al. (1994)). In this perspective, imposing an advance notice requirement, by raising the probability of finding a job right after the termination of an employment relationship, will actually decrease the probability that a laid-off worker will work informally, therefore reducing the size of the informal economy. If, on top of that, mandatory severance payments provide also monetary payments in case the job is not found in the notice period, then the probability of working underground will be further reduced. The quantitative question is then if the cost effect of labor market regulation for the legal firms is bigger or smaller than the positive effect for the workers, and the regression results seem to be inconclusive, given the different signs in different regression specifications. But what is more interesting is the consequence of this result for the interpretation of the comparative statics results discussed before. In particular, I can consider the theoretical model as a "best case" scenario to evaluate the negative effect of labor market regulations on the informal economy, being constructed only around the cost role of labor regulations. Then the quantitatively small effect found is actually a stronger statement in favor of the main result of the paper.

There is the possibility that the regression results just discussed suffer from omitted variables bias. In fact the costs feeded in the simulated model are just a subset of all the possible costs associated to the legal system, which are themselves just a subset of all the potential

determinants of the size of the informal economy. That should include, at a minimum, also some of the benefits associated to the legal status. To check the robustness of the results, I tried including several other possible determinants in the baseline model specification. Following La Porta and Shleifer (2008), I considered 7 other variables: the ratio of private credit over GDP from the World Bank Development Indicators, which is an indicator of financing constraints; the number of bureaucratic steps required to collect a bounced check and the time to enforce a debt contract from Djankov, LaPorta, Lopez-de-Silanes and Shleifer (2003); the time it takes to file and pay income taxes from Djankov, Ganser, McLiesh, Ramalho and Shleifer (2008); the Rule of Law and Corruption indexes from Kaufman, Kraay and Mastruzzi (2005). Table (5) summarizes the results. Overall the results appear to be robust. In the same spirit, I also checked if the results were sensitive to the particular estimate of the informal economy, implementing the regressions for each single available measure and for the lowest and highest measure. As Table (6) shows, the results of the baseline regression are again robust, but there are two important exceptions. In particular, the coefficient on the cost of access is not significant for the Johnson electricity consumption estimates and significant only at the 10% level for the Lacko' electricity consumption estimates. The problem is that these results are not directly comparable to the others, since these estimates are available only for 51 countries.

A further property of the model proposed in this paper is the higher importance of the cost of access at explaining bigger informal economies. The natural way to test this implication is to model the quantiles of the distribution of the informal economy as dependent upon the costs of the legal system, to then compare the magnitudes of the regression coefficients at different quantiles. The regression specification is the following:

$$Q_{y_j^i}(u|X_j) = X_j'\beta(u) \tag{6}$$

where $Q_{y_j^i}$ is the notation for the quantile of the distribution of the relative size of the informal economy, $u \in [0,1]$ is the quantile index, $X = \{c_j^e, \phi_j, \tau_j^y, x_j\}$ is the vector of explanatory variables and $\beta(u)$ is a vector of coefficients that depends on the quantile. The results from this exercise are summarized in figure (2), where the coefficients of the cost of access are plotted against the quantiles of the informal economy. Indeed the coefficient is significantly

higher for higher quantiles of the distribution, even if not monotonically increasing, and always statistically significant[16]. In particular, the values range from around 0.15 for the first decile to the 0.25 of the ninth decile, with a peak of 0.35 around the third quartile.

7.3 Regressions with the Simulated Informal Economy

More than just reproducing the correlation pattern observed in the data, the model is able to reproduce the regression results previously shown. The right panels of table (4) reports the results of an IV regression of the simulated size of the informal economy on the costs used to simulate it. In each regression the simulated data are obtained feeding the cost measures included in the corresponding regression specification. The regression equations include the GDP per capita and a constant term exactly as the regressions with the actual dataset, even if, given the simulation strategy, there is no need to control for the GDP. In fact the choice of including the control is inconsequential for the results (details available upon request).

In line with the previous results, the coefficient on the cost of access is always large and statistically significant, while the coefficient on the labor market regulation variable is not statistically different from zero in all regression specifications. The only discrepancy with the previous results is the statistically significant effect of tax rates on the informal economy. This finding suggests the possibility that the model tends to overstate the effect of taxes, which is a direct consequence of the exclusion of the positive effects of taxation in terms of more public goods supplied by the government. Figure (2) shows also similar quantile profiles of the coefficients on the cost of access for the regressions with actual and simulated data, with a correlation coefficient equal to 0.57 in the mixed sample and 0.67 in the WB sample.

The natural way to interpret the results in this section is that the elasticities of the effect of the costs of the legal system on the size of the informal economy are reasonable from an empirical perspective, which is a strong empirical endorsement of both the model and its results. But this last exercise reveals more than that. In particular, the empirical identification of the model estimated with simulated data is perfect: all the variability of the informal economy is induced by the cost measures and all the other characteristics of the

[16]The plot of the confidence bounds is omitted to allow an easier reading.

economy are held fixed, as if a perfect set of control variables were included in the regression specification. But the results obtained with this perfectly identified model, which indeed has a value of the R^2 very close to 1, are similar to the results obtained with the actual data, in the context of a cross country regression for which it is always problematic to establish the empirical identification: the high degree of heterogeneity of the countries included in the sample opens to the possibility of unobserved individual characteristics that, being correlated to both the informal economy and its determinants, could bias the estimates. Then how should I interpret the fact that the results obtained with the two methodologies are equal? A concrete possibility is that the identification of the empirical equation is in fact correct, therefore excluding the possibility of spurious estimates. But the problem with this argument is that it assumes that the proposed model is indeed a good stylized representation of the mechanism that relates the costs of the legal system to the informal economy, which is of course hard to prove, even acknowledging the high correlation of the model based estimates of the informal economy with their observed values.

8 Conclusion

The main message of the paper is that barriers to entry matter. Imposing a high and sometimes disproportionate cost for starting a business activity legally has the obvious side effect of discouraging potential entrepreneurs, making more attractive to start informally. The contribution of the work is showing that this effect is quantitatively very high, and in particular higher than the incentive effect implied by the costs of participation to the legal system, like the payment of taxes or the necessity to comply with labor market regulations. The general consequence is an erosion of the social contract: the proliferation of informal activities actually undermines the rule of law and, behind the obvious negative economic effects like the loss of tax revenue, imposes a great burden on every government.

The importance of barriers to entry at explaining the informal economy is an alternative to the conclusion by La Porta and Shleifer (2008). They interpret the smaller productivity of the firms in the informal market as evidence against the "*Romantic*" view of the informal sector, according to which the informal entrepreneurs are dynamic and productive, but somehow

trapped in the informal sector by cumbersome regulations. Indeed I showed that the evidence of a lower productivity is consistent with a "*Doorstep*" theory of informality, which exploits the dynamics of new start-up firms in the presence of entry regulation in the legal sector. Basically the lower productivity of the informals is a consequence of the fact that small, less productive, firms, facing high entry costs and uncertainty about their future productivity, find it profitable only to start informally. But still, with my simple model, I cannot dismiss the theory by La Porta and Shleifer (2008) and, in particular, their conclusion that informal firms are intrinsically different than their legal counterparts, being characterized by less human capital on the management side.

The results of my analysis have also a rather strong policy implication. In particular, the model implies that a labor market deregulation will mainly induce more businesses to legalize, while reducing the cost of access to the legal system will mainly increase the number of entrepreneurs that start their activities legally. But it also implies that reducing the cost of access is far more effective, at stifling economy activities, than labor market deregulation policies, in the form of lower firing costs, or policies that reduce the fiscal burden. The problem is that, although product market deregulations are not generally perceived as a threat by workers, as labor deregulations are (perhaps with the exception of the employees of the big incumbent firms that might face a positive probability of unemployment as the firms looses its protected position), they still appear as a problematic instrument to use, because of the powerful coalitions that support them[17].

It is important to stress that the conclusion of the work must not be confused with a simplistic endorsement of the abolition of any form of product market regulation. In fact the argument is against unnecessary bottlenecks in the bureaucratic process established only to appropriate rents, certainly not against screening procedures that assess the quality of the entrants, that are obviously welfare enhancing. In a sense it is not desirable to completely eliminate the incentives for producing in the informal sector, exactly because this would translate into a product market deregulation that can have important negative effects on the

[17]Caselli and Gennaioli (2008) also acknowledge the problematic facets of deregulation policies and suggest a two stages approach that is politically more feasible. Basically a contract oriented financial liberalization, by endogenously compensating the incumbents, can open the way to a product market deregulation.

economy. Making a parallel with the analysis of Acemoglu and Verdier (2000), there is here a trade-off between market failures and the informal economy, and tolerating a moderate size of the informal economy can be less dangerous that allowing an indiscriminate entry in the legal sector. The problems arise if the costs reach extremely high values and if the greatest part of them is accounted for by rent seeking behaviors, as it is the case according to Djankov et al. (2002): then the economy can end up with a higher fraction of entrepreneurs that, operating in the informal economy, do not comply also with the regulations that are designed to raise welfare, therefore fostering the emergence of the problems that the regulation is supposed to avoid. In other words, enacting a reduction of the unnecessary entry regulations, together with a rationalization of the procedures, is a plausible way to enforce a welfare enhancing regulation of the economy, otherwise threatened by the option to produce informally.

A theoretical limitation of the paper is that it postulates the idea of an informal economy that arises as an optimal "exit" response to an oppressive state, to use the terminology developed by Hirschman (1970) that first formalized this conceptual framework. Without distinguishing it from an alternative theory that is based on ethical considerations and on the costs of being informal. To be specific, there are some national or cultural contexts where informality is very much tolerated as an almost legitimate way of doing business and, therefore, where the extra cost suffered by the informals is indeed very small. This social acceptance can also foster network effects, since being informal among other informal firms is much less costly[18]. In other words, it can be the absence of a law abiding population and the lack of a strong moral commitment to be the real cause of a big informal economy, not the presence of rent-seeking governments and bureaucracies. Furthermore, this alternative theory may also be a source of a bad identification of the empirical model. Namely the countries where the cost of being a legal firm are high, can also be characterized by a small cost of being an informal, so that I can be estimating the impact of the cost of informality instead of the cost of formality. One possible defense of my empirical strategy is that the social acceptance of informality can develop as a consequence of an oppressive state, so that the prior is indeed

[18]An example is provided by De Paula and Scheinkman (2008). They highlight the role of the value added tax, typically administered through tax credit schemes, at spreading informality to the buyers and sellers of an informal firm.

the cost of the legal system. Namely the exit response triggered by the high costs of the legal system fosters a social acceptance of the response itself, that neutralizes the social stigma associated to the informality. But this mechanism, while being plausible, it is definitely not a sound ground to reject the cultural explanation of informality. That, in my opinion, deserves a more systematic analysis.

This is not the only limitation of the analysis. First, and foremost, because the modeling of the benefits associated with the production in the legal sector is severely limited. Legal firms have access to courts, which, more or less perfectly, can enforce contracts. Legal firms can also collateralize their capital to obtain loans or they can just use the financial market to raise new capital. They can also advertise the product, having access to markets beyond the local areas. Second, because the only dimension of labor market regulation considered is related to the cost of firing workers, while it is evident that, for instance, hiring costs and the flexibility of standard employment contracts, not to mention the power of the unions, could also play an important role in shaping the characteristics of the informal economies. Third, because I proposed an analysis of only the cross sectional determinants of the informal economy. I didn't provide any answer to the extremely interesting question of what drives the growth or decline of the informal economy through time. Actually the cost of access is an unlikely candidate for such an explanation, since it plausible to think about legal systems as very resilient to change. In other words, while the model developed in this paper is an empirically reasonable characterization of the cross country differentials in the size of the informal economy, it is still a limited explanation of a complex and only partially understood phenomenon.

References

Acemoglu, Daron and Thierry Verdier. 2000. "The Choice Between Market Failures and Corruption." *American Economic Review*, 90(1): 194-211.

Almeida, Rita and Pedro Carneiro. 2005. "Enforcement of Labor Regulation, Informal Labor and Firm Performance." World Bank Policy Research Working Paper 3756.

Alvarez, Fernando and Marcelo Veracierto. 2001. "Severance Payments in an Economy with Frictions." *Journal of Monetary Economics*, 47(2): 477-498.

Amaral, Pedro S. and Erwan Quintin. 2006. "A Competitive Model of the Informal Sector." *Journal of Monetary Ecnonomics*, 53(4): 1541-1553.

Antunes, Antonio R. and Tiago V. de V. Cavalcanti. 2007. "Start Up Costs, Limted Enforcement, and the Hidden Economy." *European Economic Review*, 51(1): 203-224.

Auriol, E. and Warlters, M. 2005. "Taxation Base in Developing Countries." *Journal of Public Economics*, 89(2): 625-646.

Azuma, Yoshiaki and Herschel I. Grossman. 2002. "A Theory of the Informal Sector." NBER working paper 8823.

Becker, Gary. 1968. "Crime and Punishment: an Economic Approach." *Journal of Political Economy*, 76(2): 169-217.

Bentolila, Samuel and Bertola, Giuseppe. 1990. "Firing Costs and Labor Demand: How Bad is Eurosclerosis?" *Review of Economic Studies*, 57(3): 381-402.

Bertrand, Marianne and Francis Kramarz. 2002. "Does Entry Regulation Hinder Job Creation? Evidence from the French Retail Industry." *Quarterly Journal of Economics*, 107(4): 1369-1413.

Besley, Timothy and Robin Burgess. 2004. "Can Labor Regulation Hinder Economic Performance? Evidence from India." *Quarterly Journal of Economics*, 119(1): 91-134.

Blanchard, Olivier and Francesco Giavazzi. 2003. "Macroeconomic Effects of Regulation and Deregulation in Goods and Labor Markets." *Quarterly Journal of Economics*, 118(3): 879-907.

Botero, Juan C., Simeon Djankov, Rafael LaPorta, Florencio Lopez-De-Silanes and Andrei Shleifer. 2004. "The Regulation of Labor." *Quarterly Journal of Economics*, 119(4): 1339-1382.

Busato, Francesco and Bruno Chiarini. 2004. "Market and Underground Activities in a Two-Sector Dynamic Equilibrium Model." *Economic Theory*, 400: 1-31.

Caselli, Francesco and Nicola Gennaioli. 2008. "Economics and Politics of Alternative Institutional Reforms." *Quarterly Journal of Economics*, 123(3): 1197-1250.

Choi, Jay Pil and Marcel P. Thum. 2005. "Corruption and the Shadow Economy." *International Economic Review*, 46(3): 817-836.

Dabla-Norris, Era, Mark Gradstein and Gabriela Inchauste. 2008. "What Causes Firms to Hide Output? The Determinants of Informality." *Journal of Development Economics*, 85(1): 1-27.

Davis, Steven J. and John Haltiwanger. 1992. "Gross Job Creation, Gross Job Destruction and Employment Reallocation." *Quarterly Journal of Economics*, 107(3): 819-863.

Davis, Steven J. and Henrekson, M. 2004. "Tax Effects on Work Activity, Industry Mix and Shadow Economy Size: Evidence from Rich Country Comparisons." NBER Working paper 10509.

De Paula, Aureo and Jose A. Scheinkman. 2008. "The Informal Sector." Penn Institute for Economic Research working paper 08-018.

De Soto, Hernando 1989. *The Other Path*. New York: Harper and Row.

Dessy, Sylvain and Stephane Pallage. 2003. " Taxes, Inequality and the Size of the Informal Sector." *Journal of Development Economics*, 70(1): 225-233.

Djankov, Simeon, Rafael LaPorta, Florencio Lopez-De-Silanes and Andrei Shleifer. 2002. "The Regulation of Entry." *Quarterly Journal of Economics*, 117(1): pp.1-37.

Djankov, Simeon, Rafael LaPorta, Florencio Lopez-De-Silanes and Andrei Shleifer. 2003. "Courts." *Quarterly Journal of Economics*, 118(2): 453-517.

Djankov, Simeon, Ganser, T., McLiesh, C., Ramalho, R. and Andrei Shleifer. 2008. " The Effect of Coroprate Taxes on Investment and Entrepreneurship." NBER Working Paper no 13756.

Dunne, Timothy, Roberts, Mark J. and Larry Samuelson. 1989. "The Growth and Failure of U. S. Manufacturing Plants." *Quarterly Journal of Economics*, 104(4): 671-698.

Evans, David S. 1987. "Tests of Alternative Theories of Firm Growth." *Journal of Political Economy*, 95(4): 657-674.

Friedman, Eric, Simon Johnson, Daniel Kaufmann and Pablo Zoido-Lobaton. 2000. "Dodging the Grabbing Hand: The Determinants of Unofficial Activity in 69 Countries." *Journal of Public Economics*, 76: 459-493.

Fugazza, Marco and Jean-Francois Jacques. 2003. "Labor Market Institutions, Taxation and the Underground Economy." *Journal of Public Economics*, 88: 395-418.

Giles, David E.A. 1999. "Measuring the Hidden Economy: Implications for Econometric Modeling." *The Economic Journal*, 109: 370-380.

Hirschman, Albert O. 1970. *Exit, Voice and Loyalty*. Cambridge: Cambridge University Press.

Hopenhayn, Hugo 1992. "Entry, Exit and Firm Dynamics in Long Run Equilibrium." *Econometrica*, 60(5): 1127-1150.

Hopenhayn, Hugo and Richard Rogerson. 1993. "Job Turnover and Policy Evaluation: A Genaral Equilibrium Analysis." *Journal of Political Economy* , 101(5): 915-938.

Jovanovic, Boyan 1982. "Selection and the Evolution of Industry." *Econometrica*, 50(3): 649-670.

Johnson, Simon, Daniel Kaufmann, D. and Andrei Shleifer. 1997. "The Unofficial Economy in Transition." *Brooking Papers on Economic activity* , 1997(2): 159-221.

Johnson, Simon, Daniel Kaufmann and Pablo Zoido-Lobaton. 1998. "Regulatory Discretion and the Unofficial Economy." *American Economic Review Papers and proceedings*, 88(2): 387-392.

Kaufmann, Daniel, Aart Kraay and Massimo Mastruzzi. 2005. "Governance Matters IV: Governance Indicators for 1996-2004." World Bank Policy Research Working Paper no 3630.

Klapper, Leora, Luc Laeven and Raghuram Rajan. 2006. "Entry Regulation as a Barrier to Entrepreneurship." *Journal of Financial Economics*, 82(3): 591-629.

Koreshkova, Tatyana A. 2006. "A Quantitative Analysis of Inflation as a Tax on the Underground Economy." *Journal of Monetary Economics*, 53 (4): 773-796.

Lacko', Maria. 1999. "Hidden Economy and Unknown Quantity? Comparative Analysis of Hidden Economies in Transition Countries." Univ. of Linz Working Paper.

La Porta, Rafael and Andrei Shleifer. 2008. "The Unofficial Economy and Economic Development." *Brookings Papers on Economic Activity*, 2008 (2): 275-352.

La Porta, Rafael, Florencio Lopez De Silanes, Andrei Shleifer and Robert Vishny. 1998. "Law and Finance." *Journal of Political Economy*, 106(6): 1113-1155.

La Porta, Rafael, Florencio Lopez De Silanes, Andrei Shleifer and Robert Vishny. 1999. "The Quality of Government." *Journal of Law, Economics and Organization*, 15(1): 222-278.

Lemieux, Thomas, Bernard Fortin and Pierre Frechette. 1994. "The Effect of Taxes on Labor Supply in The Underground Economy." *American Economic Review* , 84(1):231-254.

Loayza, Norman. 1996. "The Economics of the Informal Sector: a Simple Model and Some Empirical Evidence from Latin America. " *Carnagie-Rochester Series on Public Policy*, 45:129-162.

Maloney, William. 2004. "Informality Revisited." *World Development*, 32(7): 1159-1178.

OECD. 2003. *Measuring the Non Observed Economy: a Handbook*. Paris: OECD.

Russo, Francesco Flaviano 2009. "Double Business Cycle: the Hidden Economy in the US." Working Paper, Department of Economics, Boston University.

Sarte, Pierre-Daniel G. 2000. "Informality and Rent Seeking Bureaucracies in a Model of Long Run Growth." *Journal of Monetary Economics*, 46(1): 173-197.

Schneider, Friedrich. 2004. "Shadow Economies Around the World: What Do We Really Know?" *European Journal of Political Economy*, 21: 598-642.

Schneider, Friedrich and Dominik H. Enste. 2000. "Shadow Economies: Size, Causes and Consequences." *Journal of Economic Literature*, 38: 77-114.

Straub, Stephane. 2005. "Informal Sector: the Credit Market Channel." *Journal of Development Economics*, 78(2): 299-321.

Tanzi, Vito 1983. "The Underground Economy in United States: Annual Estimates 1930-1980." *IMF staff paper*, 30: 283-305.

Table 1: **Effects of the Costs of the Legal system**

		Cost of entry (% of GDP)			Sev. Payments			Output tax		
	bench	10%	20%	30%	6 months	9 months	1 year	+40%	+70%	+100%
exit rate	43.527	27.652	20.498	11.957	40.472	45.122	47.277	39.687	41.714	44.578
exit inf.	68.215	68.392	68.525	68.055	66.252	65.941	72.311	67.092	67.685	68.435
switch	31.785	31.612	31.475	31.945	27.576	21.448	15.926	32.911	32.315	31.565
avg size y	0.141	0.167	0.183	0.195	0.149	0.134	0.134	0.121	0.094	0.070
avg size n	0.059	0.075	0.085	0.091	0.062	0.060	0.059	0.062	0.060	0.059
avg prod	1.179	1.519	1.661	1.786	1.172	0.932	0.782	0.581	0.435	0.322
avg size y^i	0.087	0.061	0.039	0.023	0.086	0.086	0.087	0.089	0.088	0.087
avg size n^i	0.059	0.076	0.085	0.091	0.062	0.059	0.059	0.062	0.061	0.059
avg prod inf	0.427	-0.893	-2.441	-4.107	0.679	0.762	0.796	0.431	0.478	0.385
job turn	25.924	32.327	36.967	41.961	20.912	21.483	20.803	25.311	25.829	27.181
job corr	0.933	0.927	0.941	0.941	0.967	0.964	0.967	0.943	0.934	0.924
job turn inf	45.647	45.842	46.864	45.633	43.987	44.026	41.655	46.577	45.553	47.333
job corr inf	0.923	0.917	0.914	0.917	0.928	0.917	0.919	0.929	0.924	0.912
B	1.000	0.485	0.277	0.069	0.916	1.039	1.106	0.904	0.977	1.067
B^i	0.095	0.150	0.253	0.429	0.097	0.086	0.082	0.105	0.105	0.112
p	1.000	1.117	1.187	1.212	1.009	1.033	1.050	1.179	1.395	1.696
q	0.782	0.687	0.588	0.496	0.779	0.794	0.803	0.985	0.995	1.004
Y^i/Y	2.732	3.775	5.039	6.466	2.783	2.800	2.824	3.479	4.287	5.497
N^i/N	1.205	1.613	1.967	2.232	1.270	1.386	1.391	1.241	1.300	1.376
Q^i/Q	4.027	7.797	14.551	24.746	4.431	4.227	3.965	4.472	4.455	4.524

Notes: Selected properties of the stationary equilibrium of the model simulated under different values of the costs of the legal system. Each column reports the results for a model that is parameterized according to the benchmark for all parameters but the one indicated on top. The superscript i refers to the informal sector. p and q are the prices of the good in the legal and informal market. Q is the total number of firms and B the size of entry. The size of entry B and the price p are normalized to 1 and the corresponding quantity in the informal sector B^i and q are normalized accordingly.

Table 2: **Percentage contribution of the costs of the legal system to the simulated size of the informal economy**

		Mixed Sample			WB Sample		
		$c^e = ce$	$\phi = sev$	$\tau^y = tax$	$c^e = wbce$	$\phi = wbsev$	$\tau^y = wbtax$
Full Samp.	Mean	74.8	10.9	14.3	64.0	5.2	30.8
	Median	78.7	12.0	8.0	73.7	3.2	20.0
	Std	16.2	4.2	19.1	25.6	4.7	27.6
1^{st} Quar.	Mean	61.4	6.2	32.4	40.8	2.3	56.9
	Median	75.0	7.1	19.2	48.8	1.3	50.7
	Std	27.9	4.9	30.7	24.7	3.8	23.5
2^{nd} Quar.	Mean	78.6	11.1	10.3	59.8	1.9	38.3
	Median	78.6	11.4	9.9	69.1	2.0	29.1
	Std	6.7	1.8	8.4	27.5	1.2	28.1
3^{rd} Quar.	Mean	78.9	12.4	8.7	75.4	5.1	19.5
	Median	80.3	13.1	5.9	76.7	5.4	25.8
	Std	5.4	18.3	6.8	18.3	2.9	19.6
4^{th} Quar.	Mean	79.5	13.4	7.1	79.9	11.4	8.7
	Median	79.7	14.1	5.8	78.5	10.9	10.3
	Std	4.6	2.7	5.4	4.6	1.8	4.6

Notes: Summary statistics relative to the distribution of countries simulated from the model using data on the costs of the legal sector an keeping the parametrization at its benchmark level. Mixed Sample: $c^e = ce$ is the cost of access to the legal system as a percentage of GDP per capita computed by Djankov et al. (2002). $\phi = sev$ is the per period wage equivalent of the weeks of severance payments reported by Botero et al. (2004). $\tau^y = tax$ is the tax rate on income, profits and capital gains from the World Bank Development Indicators (WBDI). 78 countries simulated. WB Sample: all data are from the WBDI and averages over the period 2002-2006. $c^e = wbce$ is the cost of access to the legal system as a percentage of GNI per capita. $\phi = wbsev$ is the per period wage equivalent of the weeks of severance payments and $\tau^y = wbtax$ is the tax rate on income, profits and capital gains. 90 countries simulated. The Quartiles refer to the distribution of the relative size of the informal economy implied by the model.

Table 3: **Size of the Informal Economy, Correlations Model-Data**

	Avg	Johnson	Lacko	MIMIC	WEF	Min	Max
All Sample	0.521	0.576	0.621	0.383	0.502	0.533	0.441
	(70)	(51)	(51)	(70)	(68)	(70)	(70)
OECD	0.618	0.743	0.652	0.601	0.611	0.594	0.589
	(23)	(21)	(21)	(23)	(23)	(23)	(23)
Transition	0.235	0.364	0.275	0.175	0.135	0.175	0.225
	(16)	(13)	(15)	(16)	(16)	(16)	(16)
Developing	0.410	0.494	0.685	0.232	0.397	0.431	0.283
	(31)	(17)	(15)	(31)	(29)	(31)	(31)

Notes: Correlations between the estimated size of the informal economy and the size of the informal economy delivered by the simulated model with the upper bound measure of labor market regulation (*sevadv*), the upper bound measure of the cost of access (*cetime*) and the measure of tax pressure (*tax*). Johnson are the estimates obtained with the electricity consumption method (Johnson et al. (1997) and (1998)), Lacko' the estimates obtained with the Household Electricity Consumption method (Lacko' (1999)), MIMIC the estimates obtained by Schneider (2005) with the Multiple Indicators Multiple Causes method and WEF the survey based measure of the informal economy rescaled by LaPorta and Shleifer (2008). Avg is the average estimate, Min is the smallest estimate and Max the biggest. The number of observations is in brackets.

Table 4: **Regression Results, Instrumental Variables**

	Actual Data					Simulated Data				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
cetime	0.352	0.322				0.364	0.361			
	(0.127)**	(0.111)**				(0.037)**	(0.034)**			
ce			0.408	0.396				0.218	0.219	
			(0.148)**	(0.145)**				(0.022)**	(0.023)**	
wbce					0.175					0.159
					(0.050)**					(0.015)**
sevadv	-0.839		-0.284			0.004		0.052		
	(0.573)		(0.427)			(0.171)		(0.055)		
sev		-0.456		-0.007			-0.199		0.034	
		(0.363)		(0.317)			(0.124)		(0.041)	
wbsev					-0.052					-0.004
					(0.057)					(0.003)
tax	0.003	0.133	0.024	0.068	-0.159	0.176	0.157	0.092	0.087	0.056
	(0.157)	(0.115)	(0.123)	(0.105)	(0.116)	(0.036)*	(0.032)**	(0.017)**	(0.014)**	(0.005)**
R^2	0.281	0.371	0.403	0.405	0.447	0.951	0.925	0.938	0.936	0.868
obs	70	70	70	70	56	70	70	70	70	56
overid	0.986	0.752	0.566	0.411	0.461	0.412	0.514	0.202	0.175	0.453

Notes: Dependent variable is the average estimated size of the informal economy. The average is taken with respect to the Johnson's electricity consumption estimates (Johnson et al. (1997) and (1998)), Lacko's household electricity consumption estimates (Lacko' (1999)), Schneider's MIMIC estimates (Schneider (2005)) and WEF the survey based measures of the informal economy rescaled by LaPorta and Shleifer (2008). *ce* is the cost of access to the legal system relative to the GDP per capita computed by Djankov et al. (2002). *cetime* is the cost of access to the legal system plus the opportunity cost of the entrepreneurs time computed by Djankov et al. (2002). *wbce* is the cost of starting a business as a percentage of the GNI per capita reported by the World Bank Development Indicators (WBDI). *sev* is the weeks of severance payments reported by Botero et al. (2004). *sevadv* is the weeks of severance payments and advance notice requirements by Botero et al. (2004). *wbsev* is the weeks of severance payments reported by the WBDI. *tax* is the tax rate on income, profits and capital gains from the WBDI. Each regression specification includes a constant and GDP per capita. The instruments used are legal origins (French civil law, English common law and Socialist) from LaPorta et al. (1999); religion (Percentage of Muslim citizens and percentage of Protestant citizens) from the CIA World Factbook; Ethnolinguistic fractionalization from LaPorta et al. (1999); Latitude of the capital city of the country from the CIA World Factbook. Estimation is performed with a GMM estimator. Standard errors robust to eteroskedasticity are reported in brackets. Overid is the p-value of an (Hansen's J) overidentifying restriction test. **=significant at the 1% level. *=significant at the 5% level.

Table 5: **Regression Results, Instrumental Variables, Robustness**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
cetime	0.352	0.344	0.353	0.328	0.347	0.201	0.268
	(0.127)**	(0.141)**	(0.134)**	(0.108)**	(0.129)**	(0.099)*	(0.135)*
sevadv	-0.839	-0.851	-0.642	-0.336	-0.901	-0.544	-0.652
	(0.573)	(0.591)	(0.533)	(0.383)	(0.604)	(0.519)	(0.618)
tax	-0.003	0.015	0.126	0.126	0.0225	0.027	0.069
	(0.157)	(0.197)	(0.177)	(0.124)	(0.162)	(0.124)	(0.159)
privcred		-1.763					
		(4.261)					
formalism			0.414				
			(1.924)				
contracttime				-0.011			
				(0.004)*			
timetax					1.883		
					(1.859)		
rule						-8.337	
						(3.286)**	
corrupt							-5.865
							(4.725)
R^2	0.281	0.295	0.328	0.467	0.275	0.608	0.491
obs	70	70	65	70	70	70	70
overid	0.986	0.978	0.965	0.687	0.997	0.604	0.546

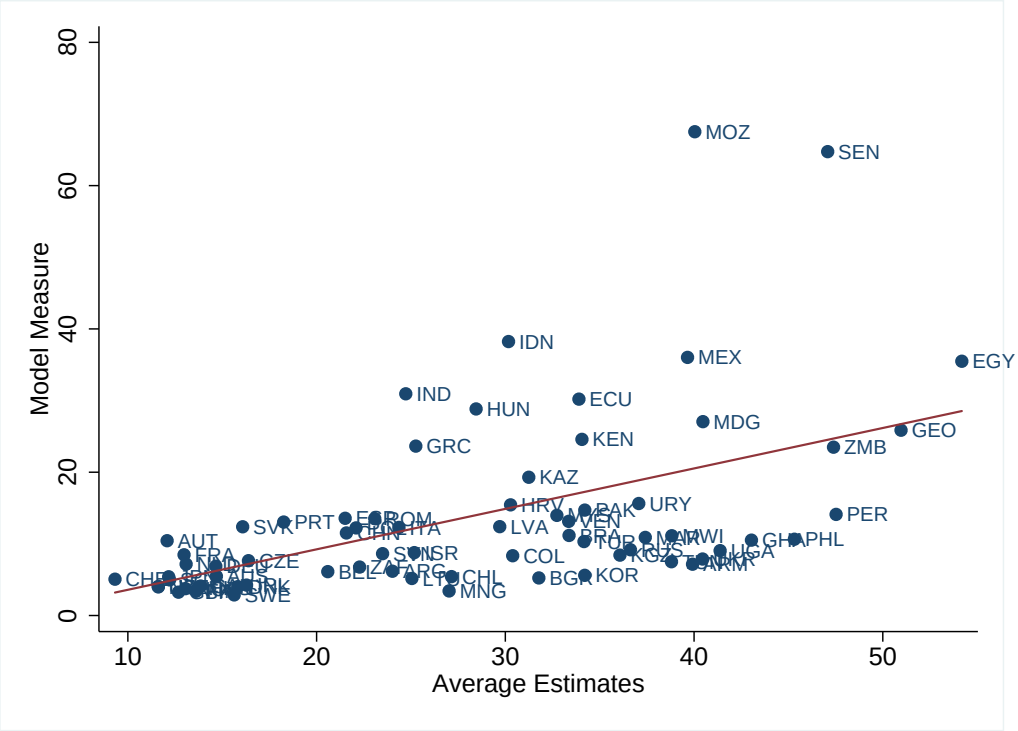
Notes: Dependent variable is the average estimated size of the informal economy. The average is taken with respect to the Johnson's electricity consumption estimates (Johnson et al. (1997) and (1998)), Lacko's household electricity consumption estimates (Lacko' (1999)), Schneider's MIMIC estimates (Schneider (2005)) and WEF the survey based measures of the informal economy rescaled by LaPorta and Shleifer (2008). *cetime* is the cost of access to the legal system plus the opportunity cost of the entrepreneurs time computed by Djankov et al. (2002). *sevadv* is the weeks of severance payments and advance notice requirements by Botero et al. (2004). *tax* is the tax rate on income, profits and capital gains from the WBDI. privcred is the ratio of private credit over GDP from the World Bank Development Indicators. formalism is the number of bureaucratic steps required to collect a bounced check from Djankov, LaPorta, Lopez-de-Silanes and Shleifer (2003). contracttime is the time (in days) to enforce a contract of unpaid debt from Djankov, LaPorta, Lopez-de-Silanes and Shleifer (2003). timetax is the time (days per year) it takes to file and pay income taxes from Djankov, Ganser, McLiesh, Ramalho and Shleifer (2008). rule is the index of the rule (in 2004) of law from Kaufman, Kraay and Mastruzzi (2005). Corruption is the corruption index (in 2004) from Kaufman, Kraay and Mastruzzi (2005). Each regression specification includes a constant and GDP per capita. The instruments used are legal origins (French civil law, English common law and Socialist) from LaPorta et al. (1999); religion (Percentage of Muslim citizens and percentage of Protestant citizens) from the CIA World Factbook; Ethnolinguistic fractionalization from LaPorta et al. (1999); Latitude of the capital city of the country from the CIA World Factbook. Estimation is performed with a GMM estimator. Standard errors robust to eteroskedasticity are reported in brackets. Overid is the p-value of an (Hansen's J) overidentifying restriction test. **=significant at the 1% level. *=significant at the 5% level.

Table 6: **Regression Results, Instrumental Variables, Robustness (continued)**

	avg	johnson	lacko	mimic	wef	min	max
cetime	0.352	0.642	0.397	0.251	0.292	0.283	0.265
	(0.127)**	(0.438)	(0.228)°	(0.114)*	(0.136)*	(0.102)**	(0.117)*
sevadv	-0.839	-1.755	-0.607	-0.394	-0.299	-0.515	-0.406
	(0.573)	(1.325)	(0.624)	(0.505)	(0.668)	(0.464)	(0.558)
tax	-0.003	0.322	0.197	-0.082	0.035	0.095	-0.136
	(0.157)	(0.351)	(0.174)	(0.151)	(0.132)	(0.119)	(0.148)
R^2	0.281	0.051	0.498	0.459	0.269	0.306	0.504
obs	70	51	51	70	68	70	70
overid	0.986	0.447	0.242	0.407	0.929	0.832	0.961

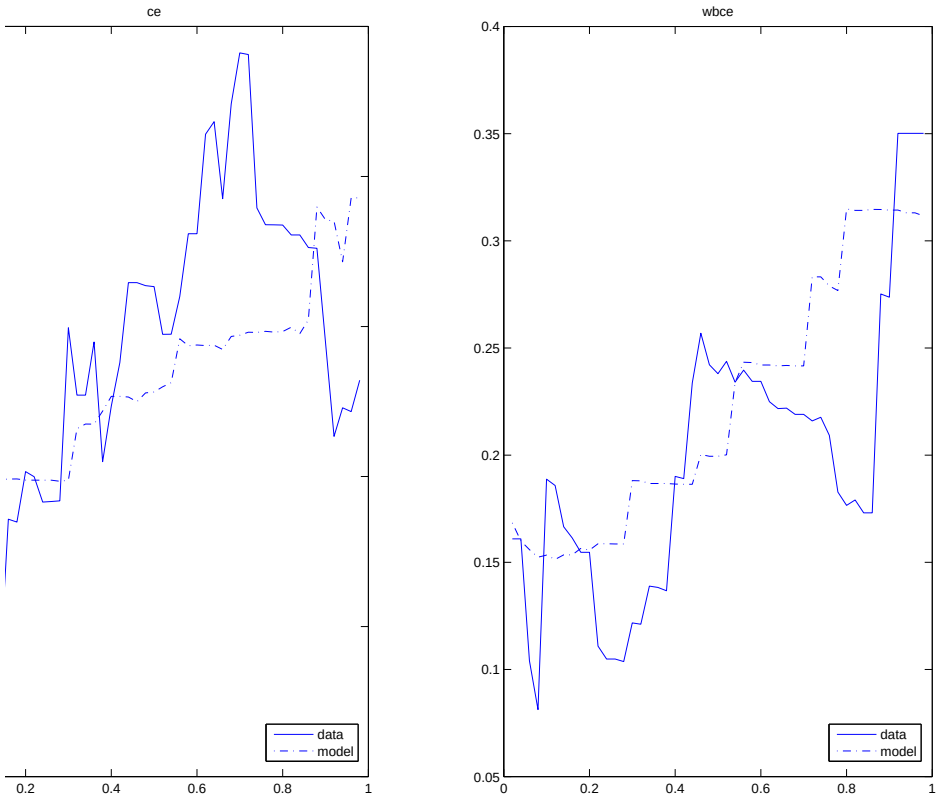
Notes: Dependent variable is the estimated size of the informal economy. Johnson are the estimates obtained with the electricity consumption method (Johnson et al. (1997) and (1998)), Lacko' the estimates obtained with the Household Electricity Consumption method (Lacko' (1999)), MIMIC the estimates obtained by Schneider (2005) with the Multiple Indicators Multiple Causes method and WEF the survey based measure of the informal economy rescaled by LaPorta and Shleifer (2008). Avg is the average estimate, Min is the smallest and Max the biggest. *cetime* is the cost of access to the legal system plus the opportunity cost of the entrepreneurs time computed by Djankov et al. (2002). *sevadv* is the weeks of severance payments and advance notice requirements by Botero et al. (2004). *tax* is the tax rate on income, profits and capital gains from the WBDI. Each regression specification includes a constant and GDP per capita. The instruments used are legal origins (French civil law, English common law and Socialist) from LaPorta et al. (1999); religion (Percentage of Muslim citizens and percentage of Protestant citizens) from the CIA World Factbook; Ethnolinguistic fractionalization from LaPorta et al. (1999); Latitude of the capital city of the country from the CIA World Factbook. Each regression specification includes a constant and GDP per capita. Estimation is performed with a GMM estimator. Standard errors robust to eteroskedasticity are reported in brackets. Overid is the p-value of an (Hansen's J) overidentifying restriction test. **=significant at the 1% level. *=significant at the 5% level. ○=significant at the 10% level.

Figure 1: **Size of the Informal Economy**



Notes: Average estimated relative size of the informal economy and relative size of the informal economy simulated from the model. The average estimate is computed over the measures obtained by Johnson's electricity consumption method (Johnson et al. (1997) and (1998)), Lacko's household electricity consumption method (Lacko' (1999)), Schneider's MIMIC method (Schneider 2005) and WEF survey measures rescaled by LaPorta and Shleifer (2008). The simulation is performed using the following costs of the legal system: *cetime*, *sevadv* and *tax*. *cetime* is the cost of access to the legal system plus the opportunity cost of the entrepreneurs time computed by Djankov et al. (2002). *sevadv* is the weeks of severance payments and advance notice requirements by Botero et al. (2004). *tax* is the tax rate on income, profits and capital gains from the World bank Development Indicators. The fitted line is estimated via OLS.

Figure 2: **Profiles of the Regression Coefficients on the Cost of Access at Different Quantiles**



Notes: Regression coefficients in the regression of the quantiles of the informal economy on the costs of the legal system. The horizontal axis is the quantile index, with 0.5 corresponding to the median. The left panel refers to the regression in the mixed sample with the lower bound measures of the cost of entry and of the firing costs, while the right panel to the WB sample. Each panel plots both the profile for the regression with actual data on the average estimate of the informal economy and for the regression of data simulated from the model using the costs used in the regression specifications. The average estimate is taken with respect to the Johnson's electricity consumption estimates (Johnson et al. (1997) and (1998)), Lacko's household electricity consumption estimates (Lacko' (1999)), Schneider's MIMIC estimates (Schneider (2005)) and WEF the survey based measures of the informal economy rescaled by LaPorta and Shleifer (2008). *ce* is the cost of access to the legal system relative to the GDP per capita computed by Djankov et al. (2002). *wbce* is the cost of starting a business as a percentage of the GNI per capita reported by the World Bank Development Indicators (WBDI).