

Massenet, Baptiste; Straub, Stéphane

Working Paper

Informal sector and economic development: The credit supply channel

SAFE Working Paper, No. 106

Provided in Cooperation with:

Leibniz Institute for Financial Research SAFE

Suggested Citation: Massenet, Baptiste; Straub, Stéphane (2015) : Informal sector and economic development: The credit supply channel, SAFE Working Paper, No. 106, Goethe University Frankfurt, SAFE - Sustainable Architecture for Finance in Europe, Frankfurt a. M., <https://doi.org/10.2139/ssrn.2611570>

This Version is available at:

<https://hdl.handle.net/10419/110414>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

Baptiste Massenet - Stéphane Straub

Informal Sector and Economic Development: The Credit Supply Channel

SAFE Working Paper No. 106

SAFE | Sustainable Architecture for Finance in Europe

A cooperation of the Center for Financial Studies and Goethe University Frankfurt

House of Finance | Goethe University
Theodor-W.-Adorno-Platz 3 | 60323 Frankfurt am Main

Tel. +49 69 798 34006 | Fax +49 69 798 33910
info@safe-frankfurt.de | www.safe-frankfurt.de

Non-Technical Summary

A popular idea in policy circles holds that granting potential entrepreneurs access to formal credit markets by improving public institutions and specific regulations is an important condition for economic development. In particular, reforms allowing economic agents to formalize, and therefore gain better access to formal credit markets, should naturally lead them to invest more and increase their productivity; ultimately, the benefits of higher overall growth would ensue. Such reforms typically include strengthening property rights on land and housing and reducing burdensome registration procedures.

This paper examines in a general equilibrium framework the chain of causality behind that line of thinking. It does so by modeling individual agents' decisions to become formal in relation to their access to a credit market plagued by moral hazard and examining the effect of these decisions on the size of the formal sector and the level of output. The main insight is that while better property rights and less burdensome regulations may under certain conditions facilitate agents' access to formal loans, such reforms interact with the characteristics of the credit market and its environment in ways that crucially shape the ultimate magnitude of the effect on formality and output.

In a nutshell, the modeling strategy relies on an overlapping-generations model where economic agents, when young, undertake productive projects, deciding whether to work in the formal or informal sector. These decisions depend on the trade-off between the costs of entry and the benefits of accessing the formal credit market, itself a function of the quality of enforcement and property rights that allow for efficient loan recovery by lenders. Entrepreneurs save part of their profits for future consumption and these savings constitute the next period's supply of credit in the economy.

In this context, the equilibrium interest rate that results from the interaction between the supply of lendable funds and the demand for credit is a key variable in determining the equilibrium level of formality. Indeed, lower entry costs and better contract enforcement unambiguously imply a larger formal sector, a higher demand for credit, and higher output as long as an infinitely elastic supply of funds is available at the prevailing interest rate (e.g., an open economy with no barriers to international capital flows and a competitive banking sector). However, absent these conditions, an increase in demand resulting from a higher rate of formality increases the interest rate, which weakens the links among reform, formality, and output.

Finally, we present empirical evidence related to the implications of our model. We find that countries with lower entry costs or a higher quality of enforcement tend to have larger credit markets and smaller informal sectors and that this relationship is stronger when the banking sector is more competitive and the economy is more open to international capital flows. Using industry-level measures of financial dependence and controlling for country fixed effects, we show that the results on credit supply also hold in a cross- and within-industry setting.

Informal Sector and Economic Development: The Credit Supply Channel*

Baptiste Massenot[†] Stéphane Straub[‡]

May 2015

Abstract

The standard view suggests that removing barriers to entry and improving judicial enforcement reduces informality and boosts investment and growth. However, a general equilibrium approach shows that this conclusion may hold to a lesser extent in countries with a constrained supply of funds because of, for example, a more concentrated banking sector or lower financial openness. When the formal sector grows larger in those countries, more entrepreneurs become creditworthy, but the higher pressure on the credit market limits further capital accumulation. We show empirical evidence consistent with these predictions.

1 Introduction

A popular idea in policy circles holds that granting potential entrepreneurs access to formal credit markets by improving public institutions and specific regulations is an important condition for economic development. In particular, reforms allowing economic agents to formalize, and therefore gain better access to formal credit markets, should naturally lead them to invest more and increase their productivity; ultimately, the benefits of higher overall growth would ensue. Such reforms typically include strengthening property rights on land and housing and reducing burdensome registration procedures.¹

This paper examines in a general equilibrium framework the chain of causality behind that line of thinking. It does so by modeling individual agents' decisions to become formal

*We are grateful to Catherine Casamatta, Rui Castro, Tiago Cavalcanti, Florencio López de Silanes, Gilles Saint-Paul and David Thesmar for very helpful comments. We gratefully acknowledge research support from the Research Center SAFE, funded by the State of Hessen initiative for research LOEWE.

[†]Goethe University Frankfurt, massenot@safe.uni-frankfurt.de

[‡]Toulouse School of Economics, ARQADE, IDEI and IAST, stephane.straub@tse-fr.eu

¹This was famously suggested by de Soto (1990) and de Soto (2000).

in relation to their access to a credit market plagued by moral hazard and examining the effect of these decisions on the size of the formal sector and the level of output. The main insight is that while better property rights and less burdensome regulations may under certain conditions facilitate agents' access to formal loans, such reforms interact with the characteristics of the credit market and its environment in ways that crucially shape the ultimate magnitude of the effect on formality and output.

In a nutshell, the modeling strategy relies on an overlapping-generations model where economic agents, when young, undertake productive projects, deciding whether to work in the formal or informal sector. These decisions depend on the trade-off between the costs of entry and the benefits of accessing the formal credit market, itself a function of the quality of enforcement and property rights that allow for efficient loan recovery by lenders. Entrepreneurs save part of their profits for future consumption and these savings constitute the next period's supply of credit in the economy.

In this context, the equilibrium interest rate that results from the interaction between the supply of lendable funds and the demand for credit is a key variable in determining the equilibrium level of formality. Indeed, lower entry costs and better contract enforcement unambiguously imply a larger formal sector, a higher demand for credit, and higher output as long as an infinitely elastic supply of funds is available at the prevailing interest rate (e.g., an open economy with no barriers to international capital flows and a competitive banking sector). However, absent these conditions, an increase in demand resulting from a higher rate of formality increases the interest rate, which weakens the links among reform, formality, and output.

Finally, we present empirical evidence related to the implications of our model. We find that countries with lower entry costs or a higher quality of enforcement tend to have larger credit markets and smaller informal sectors and that this relationship is stronger when the banking sector is more competitive and the economy is more open to international capital flows. Using industry-level measures of financial dependence and controlling for country fixed effects, we show that the results on credit supply also hold in a cross- and within-industry setting.

Related Literature The argument above is composed of two parts. First is the link between better regulations and access to credit at the individual level, which results in increased incentives to enter formality, and second is the link between these individual decisions and output or growth.

It is relatively well understood how light registration procedures and strong property rights interact to provide the necessary conditions to access the credit market. As de Soto (1990) showed in the case of Peru, and further documented by Djankov et al. (2002) for 85 countries, firms first face significant entry costs in the form of registration and license fees to be able to operate formally.²

As Straub (2005) suggested, formal lenders commonly impose an array of requirements on prospective borrowers before entering into legal contractual relationships. These requirements include making operations observable through accounting books, providing credible proof of location, and being able to attach valuable assets as collateral. Paying entry costs is necessary to satisfy these requirements.³ Moreover, smoothly functioning credit markets also rely on effective property rights in at least two ways. First, the existence of property titles is a necessary condition for collateralized credit. Second, good enforcement of such rights allows lenders to recoup their money in case of failure or conflict. Thus, slow and costly judicial processes may significantly affect access to credit for small borrowers, even in the presence of formal property titles.⁴

Most microeconomic empirical studies, however, have reported a weak or insignificant effect of improved property rights on credit market access for the poor. For example, Field and Torero (2006) found no evidence that a nationwide titling program in Peru (the biggest of its kind worldwide) increased access to private credit among the poor. The discussion alluded to the fact that banks are likely to face complex changes in the com-

²According to Djankov et al. (2002), they range from a low of two procedures, taking two days and generating a cost equivalent to 2.3% of per capita GDP in Canada, to a high of 21 procedures, 80 days, and 463% of per capita GDP in the Dominican Republic. Kaplan et al. (2011) and Bruhn (2011) provided microeconomic evidence from a program in Mexico that reducing these costs spurs entry from new entrepreneurs.

³Of course, this is not to say that such regulations and their costs are efficient. Indeed, in developing countries they often respond to extractive motivations. See Auriol and Warlters (2005) and Djankov et al. (2002).

⁴See, for example, Pagano (2001) for microeconomic evidence and Jappelli et al. (2005) and La Porta et al. (1998) for regional and cross-country evidence.

position of demand for credit and may alter the way they price loans in response to the evolution of foreclosing rules.

Besley and Ghatak (2009a) provided a complementary rationale for why informality is so prevalent. They built a model of a de Soto effect and showed that if the degree of credit market competition is low, borrowers may lose from improving property rights and thus may oppose any such reform.

The second part of the story links the level of formality to output. Such a link has been put forward by Easterly (1993) and Loayza (1996), among others. More recently, Antunes and Cavalcanti (2007) analyzed how much of the variation in size of the informal sector and in the level of per capita income across countries can be explained by regulation costs and enforcement of financial contracts. Calibrating their model to US data, they concluded that it is regulation (a fixed cost of formality) that accounts for most of the differences in the size of informal sectors between the United States and Mediterranean Europe, while for a developing country like Peru contract enforcement appears to be equally important. However, these factors fail to account for most of the income differences among countries. Importantly, Antunes and Cavalcanti assumed that the local lenders have access to world capital markets and borrow or lend any amount at a constant interest rate. In a similar exercise, D'Erasmus and Moscoso Boedo (2012) found that entry costs and imperfect debt enforcement calibrated using the Doing Business database generate a 25% drop in Total Factor Productivity (TFP) relative to the US.

Closer to our paper are Castro et al. (2004) and Antunes et al. (2008), who presented general equilibrium models with financial frictions and an endogenous interest rate. They found two effects of smaller financial frictions on the economy. First is a standard positive demand effect because individuals obtain more credit. This results in a higher interest rate, which leads to a second negative effect on the future supply of credit. Castro et al. (2004) compared the effect of higher investor protection on the economy in a closed and open economy. In the open economy, there is only the demand effect because the interest rate is taken as given. In the closed economy, the same demand effect implies a higher

interest rate, which reduces the profits and the savings of entrepreneurs and leads to the second negative effect on the supply of credit. Similarly, Antunes et al. (2008) showed that lower intermediation costs or better enforcement have the same two counteracting effects on the economy and the supply effect is quantitatively significant.

Our paper focuses on the impact of the quality of enforcement and entry costs on the size of the informal sector and output. Its main insight is to point out the importance of the second general equilibrium negative effect, which has generally been ignored in policy discussions about the merits of reducing the size of the informal sector. We show that this negative supply effect arises when there is low financial openness or weak competition in the banking sector. This finding has implications for the timing of development policies, suggesting that reforms aimed at reducing informality by removing barriers to entry or improving enforcement can be more effective in financially liberalized countries or when coupled with mechanisms to support the credit supply.

The paper is organized as follows. Section 2 develops the model. Section 3 discusses the related empirical evidence. Section 4 concludes.

2 The Model

This section presents an overlapping-generations model with (i) financial friction arising from a moral hazard problem between investors and entrepreneurs and (ii) an informal and a formal sector.

2.1 The Environment

The economy consists of an infinite sequence of two-period lived overlapping generations, with time indexed by $t = 0, 1, \dots$. There is no population growth and each generation is normalized to a continuum of size 1. Young individuals are risk-neutral entrepreneurs who invest in a project, the proceeds of which will be used for consumption when they are old.

Young entrepreneurs use a technology that transforms capital k into the final good y :

$$y = \tilde{a}k, \tag{1}$$

where \tilde{a} is a productivity parameter that can be high ($\tilde{a} = A$) or low ($\tilde{a} = 0$). The probability of success depends on the entrepreneurs' level of effort: they can work, in which case the probability of success is p_H , or shirk, in which case the probability is only $p_L < p_H$, but they enjoy a non-monetary private benefit Bk (or equivalently save on the cost of effort).

Entrepreneurs are endowed with initial capital X , which is uniformly distributed between 0 and 1, with a cumulative distribution function denoted by $D(X)$. We assume that X provides a part of the planned investment. Borrowers intend to borrow $k - X$ from banks. We follow Holmstrom and Tirole (1997) by assuming that banks can observe the outcome of the project but not the effort of the entrepreneur. These contracts specify the amount of capital to be lent and a repayment r to the lender if the project is successful.

Banks borrow funds at interest rate i and lend them to entrepreneurs. In the benchmark, the banking sector is assumed to be competitive.

Entrepreneurs can decide to enter either the formal or the informal sector. The benefit of entering the formal sector is that they can access the formal credit market, which allows them to borrow more. The downside is that entering the formal sector is costly. This section compares these costs and benefits and infers that which sector entrepreneurs decide to enter is a function of their initial endowment.

2.1.1 Operating Informally

We assume that no lending occurs in the informal sector, for example, because project output is not verifiable and enforcement is impossible. Informal entrepreneurs can nonetheless use their initial endowment to operate a project and their expected payoff is given by

$$\pi^I = p_H AX. \tag{2}$$

Alternative informal ways to enforce contracts may exist, as in Straub (2005), but we do not consider them in this paper because our question of interest does not concern the decision to become formal per se but rather the effects of institutional reforms that affect the relative attractiveness of the formal sector. In that sense, we only need the lending technology to be less efficient for informal borrowers. For example, an alternative model could assume that income is verifiable both by informal and formal lenders, but that the latter also enjoy the technical possibility of attaching assets as collateral, so formal borrowers would enjoy higher leverage on their endowment, with similar qualitative results.

2.1.2 Operating Formally

If entrepreneurs decide to operate formally, they must pay a fixed cost C that represents the direct costs of registration or the time spent on procedures. They pay this cost out of their endowment. For a project of size k , they thus now have to borrow $k - X + C$.

Furthermore, we follow Straub (2005) in assuming that enforcement is imperfect in the sense that only a fraction θ of repayments is left to lenders.

We assume that it is less profitable for banks to lend to shirking entrepreneurs than to retain the funds and that high effort is profitable by setting $p_L A + B < i < p_H A$. As a result, banks only offer contracts that induce entrepreneurs to work. This implies that the expected profit of entrepreneurs if they work should be higher than the sum of the expected profit and the private benefit if they shirk. This yields the following incentive compatibility constraint:

$$\Delta p(Ak - r) \geq Bk, \tag{3}$$

where $\Delta p = p_H - p_L$.

Banks are only willing to lend if they expect a positive profit. Their profit is given by the expected repayment r they receive from successful entrepreneurs minus the cost i of borrowing this amount. The break-even constraint of a bank contracting with a formal

entrepreneur, who borrows $k - (X - C)$, is given by:

$$\theta p_H r \geq (k - X + C)i. \quad (4)$$

Assuming a competitive banking sector, equations (3) and (4) are binding. Combining these equations gives the following financial contract:

$$k = \phi(i)(X - C), \quad (5)$$

where

$$\phi(i) = \frac{1}{1 - p_H \theta \frac{\Delta p A - B}{\Delta p i}}. \quad (6)$$

Entrepreneurs can thus borrow from banks if they operate in the formal sector.⁵ A lower interest rate i , lower entry costs C , better enforcement θ , or higher initial capital X increase the size of the loan k .

Finally, using (3) and (6), the expected profit $\pi^F = p_H(Ak - r)$ of a formal entrepreneur can be expressed as:

$$\pi^F = \frac{p_H B}{\Delta p} \phi(i)(X - C). \quad (7)$$

2.1.3 The Choice between Formal and Informal Sectors

Entrepreneurs trade off the costs and benefits of entering the formal and informal sectors. In the informal sector, entrepreneurs cannot use external financing for their projects but save on the cost of entering the formal sector. Comparing the two surpluses given by equations (2) and (7) shows that there exists a cutoff quantity of initial capital X^* below which entrepreneurs prefer to enter the informal sector and above which they prefer to enter the formal sector:

$$X^*(i) = \frac{C}{1 - \frac{\Delta p A}{B \phi(i)}} \quad (8)$$

⁵Another interpretation is that entry to the formal sector leads entrepreneurs to choose more productive technologies, consistent with La Porta and Shleifer (2008).

This threshold determines the size of the informal sector. By definition, it is bounded by 0 and 1. Zero entry costs lead to a totally formal economy. There also exists a cutoff level of C above which, and a cutoff level of θ below which, the economy is completely informal. We can demonstrate the following result:

Proposition 1 *A lower interest rate i , lower entry costs C , or better quality enforcement θ reduce the size of the informal sector.*

A larger interest rate makes entrepreneurs less creditworthy and thus increases the size of the informal sector. Better quality enforcement increases the amount that banks can recover when lending and thus increases the size of loans. The effect of lower entry costs is obvious. These results are consistent with the empirical evidence documented, for example, in Djankov et al. (2002) and Antunes and Cavalcanti (2007).

2.2 Equilibrium in an Open Economy

In this section, we present a version of the model that is consistent with the standard view on informality and economic growth. The main insight is that a larger formal sector benefits the economy because entrepreneurs' ability to access the formal credit market increases overall investment.

Consider a small open economy with free capital flows and no influence on the world interest rate. As a result, agents take the interest rate i^* as exogenous. The supply curve of capital is thus represented in Figure 1 by a horizontal line.

Equations (5) and (8) give the aggregate demand for capital, which is equal to the sum of the investments of individual entrepreneurs:

$$K^d(i) = \int_{X^*}^1 kdD(X). \quad (9)$$

When the interest rate i increases, banks respond by lending less to satisfy their break-even constraint. An indirect effect is that fewer entrepreneurs are willing to enter the formal sector. Overall, we have a standard demand function decreasing in price, as illustrated in Figure 1.

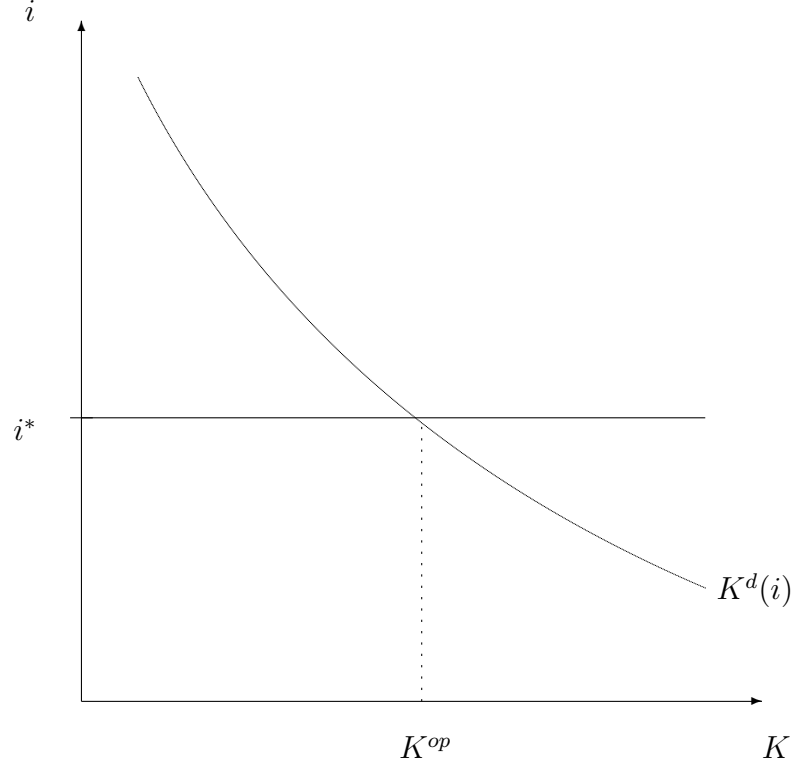


Figure 1: Equilibrium in an open economy

The equilibrium stock of capital K^{op} in an open economy (indexed by op) is given by the intersection of capital supply and demand:

$$K^{op} = K^d(i^*). \quad (10)$$

Let $Y = p_H A K^*$ be the level of output in the economy. Then, the following result holds:

Proposition 2 *In an open economy, lower entry costs C and better quality enforcement θ have a positive impact on output Y .*

Proof. From Equation (9), the function K^d is increasing in k and decreasing in X^* ; from Equation (5), k is increasing in θ and decreasing in C ; from Proposition 1, X^* is increasing in C and decreasing in θ . This proves Proposition 2. ■

Intuitively, higher quality enforcement θ and lower entry costs C have two effects on the aggregate demand for capital. First, the amount banks are willing to lend to entrepreneurs increases. Second, more entrepreneurs enter the formal sector and this

allows them to borrow more. Such changes shift the demand for capital to the right. Thus, the equilibrium stock of capital and production increase.

2.3 Equilibrium in a Closed Economy

We now show how the mechanism of the previous section is affected by the introduction of restrictions on international capital flows. Closing the economy affects the supply of credit as banks become limited in their capacity to lend based on the size of national savings $K^s(i)$. As a consequence, the equilibrium interest rate i^c of the economy is endogenously determined by capital supply and demand. We show that, in contrast to the previous section, the effect of smaller entry costs or better quality enforcement on the economy now vanishes.

Because individuals only consume at the end of their life, their savings s_t are equal to their profit:

$$s_t = \pi_t. \quad (11)$$

The supply of capital K_{t+1}^s is given by the sum of individual savings s_t :

$$K_{t+1}^s = \int_0^{X_t^*} \pi_t^I dD(X) + \int_{X_t^*}^1 \pi_t^F dD(X). \quad (12)$$

Because K_t^s is independent of the contemporary interest rate i_t , Figure 3 represents this equation as a vertical line. The closed economy (indexed by c) equilibrium interest rate i_t^c and capital K_t^c are such that the demand for capital equals the supply:

$$K_t^c = K_t^s = K_t^d(i_t^c) \quad (13)$$

What happens to the economy if entry costs decrease or enforcement improves at date t ? At date t , the demand for credit increases. However, overall lending does not change because the supply of capital is predetermined by entrepreneurs' profits at $t - 1$. The equilibrium interest rate i_t^c thus increases. This is in contrast to the open economy where

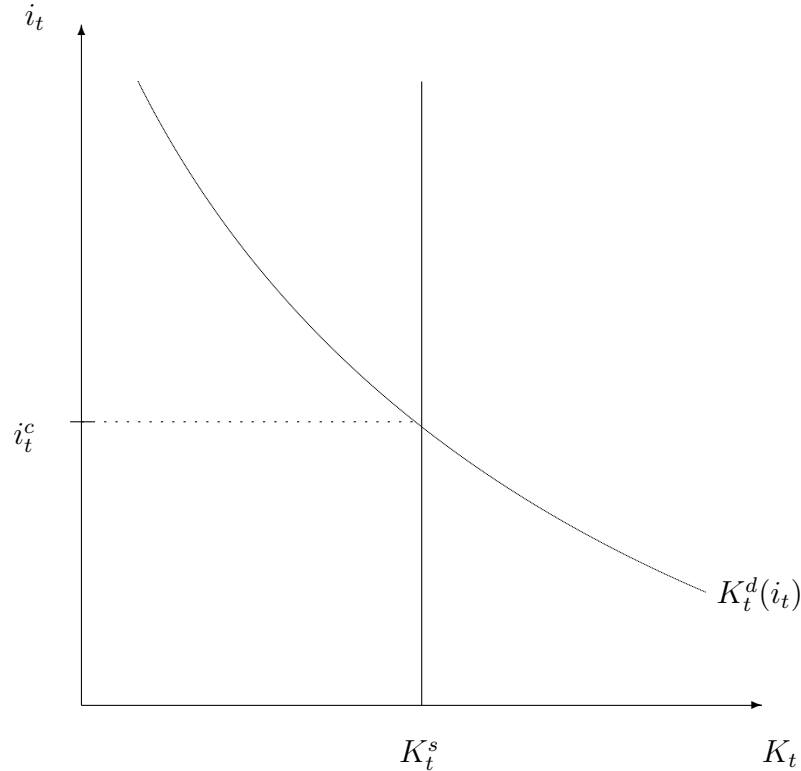


Figure 2: Equilibrium in a Closed Economy

the interest rate remains constant and the quantity of credit supplied adjusts to clear the capital market. Thus, at period t , reforms that increase the demand for credit are more successful in an open than in a closed economy.

The reforms at date t have two effects on the supply of capital at date $t + 1$. First, these reforms make entrepreneurs more creditworthy for a given interest rate. This implies that they make a higher profit and this increases the supply of credit in the next period. Only this first and positive effect is present in an open economy. In a closed economy, however, a second negative effect exists. The higher equilibrium interest rate implies that entrepreneurs make a smaller profit. At date $t + 1$, the supply of capital is thus tighter. Overall, the net effect of these reforms on the supply of credit at date $t + 1$ is ambiguous as it is the result of these two countervailing effects, but it is always smaller in a closed than in an open economy.

The following proposition summarizes and proves these results:

Proposition 3 *In a closed economy, the effect of permanent lower entry costs C or of better quality enforcement θ at date t on output Y is nil and is thus lower than in an*

open economy.

Proof. We are interested in understanding $\partial K^c/\partial C$ and $\partial K^c/\partial\theta$. In what follows, we focus on θ but the same logic applies to C . Differentiating $K^c = K^d(i^c(\theta), \theta)$ with respect to K^c and θ and rearranging gives

$$\frac{dK^c}{d\theta} = \frac{\partial K^d}{\partial\theta} + \frac{\partial K^d}{\partial i^c} \frac{\partial i^c}{\partial\theta}. \quad (14)$$

At date t , K^c is fixed so this derivative is equal to 0. Thus, a higher θ has no impact on Y_t . From Proposition 2, we know that this effect is smaller than the effect in an open economy.

At date $t + 1$, this derivative is the sum of two components. The first gives us the effect of a higher θ on K_{t+1}^c for a given interest rate. We know from Proposition 2 that this is positive. The second effect goes through the interest rate at date t . We know from Equation (9) that the demand K^d is decreasing in the interest rate and that the supply of capital K^s is predetermined. Thus, the equilibrium condition given by Equation (13) implies that the equilibrium interest rate i_t^c increases with θ . From Equation (6), we know that this decreases the profit in the formal sector. From Proposition 1, this also increases X^* . Thus, K_{t+1}^s shifts to the left. In the open economy, only the positive effect is present. In the closed economy, we have in addition the negative effect. Thus, a higher θ has a lower impact on Y_{t+1} in a closed economy than in an open economy.

We can further show that these two contradictory effects exactly cancel out. Rearranging Equation (3), we obtain the law of accumulation of capital:

$$K_{t+1}^c = \frac{p_H B}{\Delta p} K_t^c. \quad (15)$$

The growth rate of the economy is thus independent of C and θ . ■

2.4 Large Banks

We now relax the assumption of a competitive banking sector. If financial intermediaries have some market power, they ask for a higher repayment, which further reduces the savings of young entrepreneurs and thus the supply of credit.

We follow Besley and Ghatak (2009a) in assuming that the marginal cost of lending is equal to the interest rate i plus a parameter τ . There are two banks in the economy competing à la Bertrand. One has a marginal cost equal to zero ($\tau = 0$) and the other has a strictly positive marginal cost ($\tau > 0$). The efficient bank offers loan contracts such that entrepreneurs do not prefer to contract with the inefficient bank. The parameter τ can thus be thought of as a measure of competition between the two banks. The lower this parameter, the more competitive the banking sector.

We now show how the parameter τ modifies the previous analysis. The break-even constraint of the lender becomes

$$\theta p_H r \geq (k - X + C)(i + \tau), \quad (16)$$

In an open economy where the interest rate i is given, a higher τ increases the repayment that can be asked of entrepreneurs and reduces the size of the loan. Entrepreneurs thus end up with lower profit and save less. In this setting, a more concentrated banking sector thus reduces the accumulation of capital.

Let us now solve for the equilibrium interest rate in a closed economy. This is done in a simple way with the change of variables $I = i + \tau$. This yields the same result as before, that is $I = i^c$. It implies that the interest rate in an economy with a concentrated banking sector is equal to $i^c - \tau$. In the extreme case of a perfectly closed economy, i and τ are thus perfect substitutes. Finally, Proposition 3 is unchanged in the case of large banks in a closed economy.

To summarize, in an open economy, a more concentrated banking sector makes the impact of lower entry costs or better enforcement less positive. In contrast, in a closed economy, the size of banks does not change this impact.

2.5 Discussion

Note that the absence of any effects of reforms in the closed economy hinges strongly on our preference specification. Indeed, entrepreneurs save their whole profit without taking into account the future interest rate. This generates the vertical supply curve shown in Figure 2. Assuming a logarithmic utility function for young individuals would make them willing to save but would not affect the results as savings would still be independent of the interest rate. With a more general utility function (e.g., Constant Relative Risk Aversion), there would be a third effect on savings as the interest rate would then depend on the elasticity of intertemporal substitution. However, for reasonable values of this elasticity, this effect is likely to remain small and thus the impact of reforms would still be lower in a closed economy.

Another important assumption for our results stems from our overlapping-generations structure. Indeed, a higher interest rate redistributes wealth from young entrepreneurs to old consumers in our model. Given that only entrepreneurs save, this decreases savings and reduces the efficiency of reforms. Our results remain relevant, however, if entrepreneurs have a higher propensity to save than the rest of the population, as documented in Gentry and Hubbard (2004).⁶

On a more conceptual note, our framework is centered on how institutional reforms may make access to and exchanges on the credit market more efficient. Thus, it is silent on other issues, such as the fact that better enforcement may facilitate reallocation of productive assets or elicit better projects to be submitted by borrowers. Our conclusions naturally complement insights on these related topics.⁷

3 Empirical Evidence

In this section, we present empirical results consistent with the key predictions of our model. We start by showing cross-country correlations from a sample of between 100 and 140 countries depending on the specifications. We expect better quality enforcement or

⁶See also Castro et al. (2004) for a similar argument.

⁷See, for example, Besley and Ghatak (2009b) for a review of issues related to property rights.

lower entry costs to be positively related to the size of the credit market and negatively related to the size of the informal sector. We also expect this relationship to be stronger in economies that are more financially open and have a more competitive credit market. The channel emphasized in our model, linking the policy variables C and θ to both output and formality, goes through the size of the credit market. For this reason, we study the determinants of both access to credit and informality. While the results are very much in line with our theoretical framework, we cannot rule out the possibility that some unobserved country specific effects drive them. Unfortunately, the lack of time series for some of our key variables makes it impossible to use country-level fixed effects.

To overcome this problem, we perform within-country, cross-industry estimations using a firm-level dataset covering more than 21,000 firms in 67 countries between 2002 and 2006. Our model focuses in particular on how firms' access to credit is constrained by the characteristics of the supply channel. We therefore use a plausible source of exogenous variation in firms' demand for credit within each country, namely, the industry-level financial dependence measure from Rajan and Zingales (1998), to identify the effect of variations in credit supply on firms' access to credit, while controlling for country fixed effects. We expect the interactions among our policy measures (enforcement and entry costs) and the credit supply characteristics (openness and spread) to matter more for firms in more financially dependent sectors.

3.1 Data

Our cross-country characteristics consist of the following variables. We use two dependent variables: credit and size of the informal sector.

Informal WEF refers to the size of the informal sector as measured by an indicator of unofficial or unregistered business activity from the World Economic Forum's Global Competitiveness Report 2006-2007 that we take from La Porta and Shleifer (2008). This indicator is based on a survey of business leaders before 2006. It ranges from 9% of gross domestic product (GDP) for Singapore to 45% for Zambia, with an average of 28%.

Informal Schneider is our second measure of the size of the informal sector. It is

based on Schneider (2007) who estimate a multiple indicators multiple causes (MIMIC) model. The indicator variables include the age 18-64 labor force participation rate, annual GDP growth, and the change in local currency per capita. The causal variables are the tax-to-GDP ratio, the Heritage Foundation index of economic freedom, the unemployment rate, GDP per capita, and lagged values of the latent variable. This measure is available for 145 countries. It ranges from 8% for the US to 67% for Bolivia and Georgia, with an average of 34%.

Credit refers to the ratio of private credit over GDP from the World Bank. To match the date of our informality measure, we average it over the years 2003-2005. It varies from 2% to 276%, with an average of 50%.

As explanatory variables, we use proxies for the cost of entering the formal sector, the quality of enforcement, openness, and the competitiveness of the banking sector.

Steps refers to the number of steps necessary to open a business and is provided by the World Bank. The number of steps to register a business varies from 2 in Australia and Canada to 20 in Bolivia, with an average of 10. We take the average of this variable over the years 2003-2005.

Formalism is a measure of the quality of contract enforcement from the World Bank, which computed the number of legal procedures used to collect a bounced check in court. The variable ranges from 21 to 55 procedures, with a mean of 38. A higher value therefore means lower quality of contract enforcement. We take the average of this variable over the years 2003-2005.

Spread is the interest rate spread from the World Bank and we use it to proxy for the competitiveness of the banking sector. Indeed, in our model, the measure of concentration τ can also be interpreted as a spread. It is the difference between the lending rate and the deposit rate. This measure is averaged over 2000-2002. We choose to use the lagged values to mitigate the concern that the contemporary spread not only captures the degree of competitiveness of the credit market but that it may also be affected by changes in our steps and formalism measures. The variable ranges between 1 and 56 with a mean of 9. More direct measures of concentration exist but cover fewer countries.

Openness refers to the measure of regulatory restrictions on international capital flows from Chinn and Ito (2008). We average this variable over 2000-2002. We choose these years for consistency with spread, our other credit supply related variable. This index ranges from -1.85 to 2.45, where a higher value means more financial openness.

Control variables include GDP, which refers to the measure of real GDP from Heston et al. (2009). We take its average over 2000-2002. Additional controls include government final consumption expenditure, and inflation as measured by the GDP deflator (all taken from the World Development Indicators and averaged over 2003-2005). We also use the variables ethnic and religious fractionalization from Alesina et al. (2003).

The firm-level survey data consist of data from 67 World Bank Enterprise Surveys conducted between 2002 and 2006 in 62 different countries based on a homogenous survey design and include 21,896 firms. Countries span five broad regions (Africa, East Asia and the Pacific, Latin America, Eastern and Central Europe, the Middle East and North Africa) and all levels of income. All firms included are formal units, stratified by broad (two-digit ISIC) industry groups.⁸

As proxies of the degree of constraint affecting the demand for credit, we use three different variables from the survey. The first is a qualitative variable indicating the extent to which **access to finance** is a constraint on business. Firms are asked to evaluate this on a scale from 0 (no obstacle) to 4 (very severe obstacle). We generate a dummy variable equal to 1 if their answer indicates a major (3) or very severe (4) obstacle, and 0 otherwise. Additionally, we also use two variables that measure the extent to which firms rely on internal funds and retained earnings to finance either **working capital** or **new investments**.

We complete these data with the industry-level financial dependence (**FinDep**) measure from Rajan and Zingales (1998). Assuming that industries differ for fundamental technological reasons in terms of how much they depend on external finance, and that these differences partially persist across countries, this measure assigns each three-digit industry group a benchmark value corresponding to the level computed in the US sample

⁸See www.enterprisesurveys.org for more details.

of the corresponding industry. We use two alternative measures, capturing the dependence on external finance of all companies or only of mature companies, respectively.

3.2 Results

We first look graphically at the relationship across countries between our reform variables (steps and formalism) and outcomes (credit and informal). We look at this relationship in different subsamples that vary along our supply of credit variables (spread and openness). We divide our sample between countries that have low and high openness, and between countries that have a low and a high spread, high meaning above the median and low below. Consistent with the predictions of our model, Figures 3 and 4 show that the relationship between credit and steps (our proxy for entry costs) or formalism (our proxy for enforcement) is more negative in countries with a low spread (i.e., those with a more competitive banking sector) and Figures 5 and 6 show a slightly more negative relationship in countries with a high value of openness. A similar pattern emerges from Figures 7-14, which use the size of the informal sector as a dependent variable.

To further illustrate that pattern, we run ordinary least squares (OLS) regressions of credit and informal on steps or formalism, interacted with openness and spread. More specifically, we estimate the following equation:

$$Y_i = \beta_0 + \beta_1 R_i + \beta_2 S_i + \beta_3 R_i * S_i + C_i' \beta_4 + \epsilon_i, \quad (17)$$

where i indexes countries, Y refers to our outcome variable (informal or credit), β_0 is a constant, R is our reform variable (steps or formalism), S is our credit supply variable (openness or spread), C is a set of control variables, and ϵ is an error term. Our main coefficient of interest is β_3 , which captures how the variations in entry costs or in the quality of enforcement map into our outcomes depending on the degree of openness or the competitiveness of the banking sector. Tables 1 and 2 show the results.

Column 1 of Table 1 shows that the coefficient of the interaction between spread and steps is positive and significant, suggesting that higher entry costs have a more negative

impact on lending in countries with a higher spread. In a country with a spread of 0, a reduction of 10 steps would increase the size of the credit market by 90 percentage points. However, in a country with an average spread (10), the same reform would be twice less efficient. In a country with a relatively high spread of 20%, this reform would have no impact on the size of the credit market.

In columns 2 and 3, we look at the impact of steps on informality and find consistent results. A smaller number of steps has a larger impact in countries that have a lower spread. The coefficient on the interaction between steps and spread is negative and significant, suggesting that lower entry costs will have a greater impact on reduction in the size of the informal sector in countries with a smaller spread. A reduction of 10 steps reduces the size of the informal sector by 18-19 percentage points in a country with a spread of 0. This reduction would no effect in a country with a spread of 22%.

Column 4 shows that the coefficient of the interaction between openness and steps is negative and significant, which means that higher entry costs have a more negative impact on credit in countries that are more open to international capital flows. In a country with a score of 0 for openness, a reduction of 10 steps would increase the size of the credit market by 40 percentage points. In the most open country (score of 2.45), this increase would be more than 50% larger while in the least open country (score of -1.85) the increase would be almost halved.

In columns 5 and 6, we look at the impact of steps and openness on informality and find consistent results. Reducing the number of steps would have a larger impact in countries that are more open. The coefficient on the interaction between steps and openness is of the expected sign but is only significant with the measure from the WEF.

Column 1 of Table 2 shows that the coefficient of the interaction between spread and formalism is positive and significant, suggesting that a higher quality of enforcement will be more efficient in countries with a more competitive banking sector. A reduction of 10 procedures to enforce a contract corresponds to an increase in the size of the credit market of 40 percentage points in a country with a spread of 0. This to 0 with a spread of 13%.

In columns 2 and 3, we look at the impact of formalism and the spread on the size of the informal sector and find consistent results. Reducing the number of procedures to enforce a contract would have a smaller impact in countries with a more concentrated banking sector. A reduction of 10 procedures to enforce a contract would reduce the size of the informal sector by 63 percentage points in a country with a spread of 0. This effect vanishes with a spread of 10-15%.

Column 4 shows that the coefficient of the interaction between formalism and openness is negative and significant, which means that higher quality enforcement has a more positive impact on lending in more open countries. A reduction of 10 procedures to enforce a contract in a country with an openness score of 0 would increase the size of the credit market by 15 percentage points. In a highly open country, the same reform would be more than twice as efficient while in the least open country it would almost have no impact.

Columns 5 and 6 reflect the impact of formalism and openness on the size of the informal sector and shows consistent results. Reducing the number of procedures to enforce a contract would have a smaller impact in countries that are more open, although the coefficient is only significant with the measure of Schneider.

Tables 3 and 4 show that almost all our main results are robust to the inclusion of a whole set of additional control variables that are often used in the financial development literature. These controls are government spending, religion, and inflation.

Overall, this first set of results suggests that reducing the cost of entering the formal sector or improving the quality of enforcement can have a positive impact on credit and formality. The results further suggest that this is all the more true in countries that are open to international capital flows or have a low spread (i.e., with a competitive banking sector). The same policies in closed or high-spread countries would have lower or even negative impacts on credit and formality.

Next, we turn to cross-industry results. We now estimate a modified version of equation (7) with firm-level data. Our strategy relies on interacting the $R_i * S_i$ interaction term with the financial dependence index. As before, we expect that firms will have

better access to credit in countries that have lower entry costs and better enforcement, and we expect this to be all the more true in countries that have higher financial openness and a lower spread. Additionally, we also expect this effect to be stronger for firms that depend more on external financing. Thus, we expect the coefficient on the triple interaction term to be positive when the credit supply proxy is the openness variable and negative when it is the spread variable (since our dependent variables are now increasing when the degree of constraints on demand for credit is stronger). Our first objective is to control for unobserved country characteristics that may drive the correlations found above. We start by displaying results including only country fixed effects. The results therefore capture within-country and cross-industry (between and within) variations in the effects of interest.

In Table 5, panel A, results for the triple interaction among steps, openness, and industry financial dependence are never significant, while as expected the result using spread as a credit supply variable is consistently negative and significant. Thus, controlling for country fixed characteristics, we find that firms' access to credit improving more by lower entry costs in countries with a smaller spread also holds across industries ranked by their degree of financial dependence. Panel B displays similar results using the interaction among formalism, openness, and financial dependence. Again, the conclusion that higher quality enforcement is more beneficial in a more competitive banking sector appears to hold across industries.

Firms included in the Enterprise Surveys are mostly well-established productive units. Indeed, 78% of the firms in our sample were established before 1997. Table 6 therefore presents a set of robustness checks using the Rajan and Zingales financial dependence index for mature industries only. The results are consistent with those in Table 5.

Table 7 extends the results of Table 5 by adding industry fixed effects. While our theoretical framework does not make specific predictions on the within-industry pattern, we want to see if the results survive this more stringent test, which amounts to controlling also for industry-level invariant characteristics. Indeed, we still find a negative and significant sign for interactions involving the spread variable, although only when the

dependent variable is firms' reliance on internal funds and retained earnings to finance working capital.

Finally, in Table 8, we experiment with an alternative measure of industry-level financial dependence from the Enterprise Surveys themselves. We compute the country-industry-level average of finance for new investments that is provided by a domestic bank, a foreign bank, or a leasing agreement (i.e., by a formal financing mechanism). We then interact this measure with our reform-credit supply variables, and instrument it with the Rajan and Zingales index to extract the industry-level variation that relates to industries' fundamental characteristics. To further reduce concern regarding potential correlation of this industry financial dependence measure with our dependent variables, we restrict these to the qualitative constraint variable and the measure based on working capital, excluding the variables based on new investments. The results for interactions with openness are again not significant, while those with spread are negative and significant.⁹

Overall, these results provide further support for our model predictions by showing that the relationships between the reform-credit supply interactions and firms' access to credit holds also across and to some extent within industries when controlling for countries' time invariant unobserved effects. They also indicate that country-level variation in the degree of competitiveness of the banking sector is the main supply-side factor that matters in shaping firms' access to credit. This is consistent with the cross-country results, which were more systematically significant when using the banking competitiveness proxy (spread) than the openness variable, possibly because openness also captures other countervailing effects (e.g., going through the exchange rate channel).

4 Conclusion

In this paper, we presented a general equilibrium model with an informal and a formal sector. We analyzed how reforms to entry costs and judicial enforcement can affect formality and output. The conventional wisdom states that such policies should be

⁹We display only results including industry fixed effects because estimations excluding them yield very similar results.

associated with positive outcomes along these dimensions. We have shown, however, that in the context of our model this prediction becomes less obvious if we take into account characteristics of the credit market like its degree of concentration or its openness to international capital flows. We also presented empirical evidence consistent with these predictions.

Our work is in line with a number of results in the literature pointing to an ambiguous impact of the type of reforms discussed here. It also suggests the importance of taking into account general equilibrium effects when implementing such policies. Indeed, to be effective, incentives to enter formality and access credit may require that the credit supply be free to adjust smoothly to accommodate increases in demand. Both cross-country and firm-level evidence indicates that the competitiveness of the banking sector may be the more important factor in that respect.

References

- Alesina, Alberto, Arnaud Devleeschauwer, William Easterly, Sergio Kurlat, and Romain Wacziarg**, “Fractionalization,” *Journal of Economic growth*, 2003, 8 (2), 155–194.
- Antunes, A., T. Cavalcanti, and A. Villamil**, “The effect of financial repression and enforcement on entrepreneurship and economic development,” *Journal of Monetary Economics*, 2008, 55 (2), 278–297.
- Antunes, A.R. and T.V.V. Cavalcanti**, “Start-up Costs, Limited Enforcement, and the Hidden Economy,” *European Economic Review*, 2007, 51 (1), 203–224.
- Auriol, E. and M. Warlters**, “Taxation Base in Developing Countries,” *Journal of Public Economics*, 2005, 89 (4), 625–646.
- Besley, T. and M. Ghatak**, “The de Soto Effect,” *STICERD-Economic Organisation and Public Policy Discussion Papers Series*, 2009.

- Besley, Timothy J and Maitreesh Ghatak**, “Property Rights and Economic Development,” Technical Report, CEPR Discussion Papers 2009.
- Bruhn, M.**, “License to sell: the effect of business registration reform on entrepreneurial activity in Mexico,” *The Review of Economics and Statistics*, 2011, *93* (1), 382–386.
- Castro, R., G.L. Clementi, and G. MacDonald**, “Investor Protection, Optimal Incentives, And Economic Growth,” *Quarterly Journal of Economics*, 2004, *119* (3), 1131–1175.
- Chinn, M.D. and H. Ito**, “A new measure of financial openness,” *Journal of Comparative Policy Analysis: Research and Practice*, 2008, *10* (3), 309–322.
- de Soto, H.**, *The Other Path: The Invisible Revolution in the Third World*, Perennial Library, 1990.
- , *The Mystery of Capital: Why Capitalism Succeeds in the West and Fails Everywhere Else*, New York: Basic Books, 2000.
- D’Erasmus, Pablo N and Hernan J Moscoso Boedo**, “Financial structure, informality and development,” *Journal of Monetary Economics*, 2012, *59* (3), 286–302.
- Djankov, Simeon, Rafael La Porta, Florencio Lopez de Silanes, and Andrei Shleifer**, “The Regulation of Entry,” *Quarterly Journal of Economics*, 2002, *117* (1), 1–37.
- Easterly, W.**, “How Much Do Distortions Affect Growth?,” *Journal of Monetary Economics*, 1993, *32* (2), 187–212.
- Field, E. and M. Torero**, “Do Property Titles Increase Credit Access Among the Urban Poor? Evidence from a Nationwide Titling Program,” *Harvard University Department of Economics, Mimeo*, 2006.
- Gentry, William M and R Glenn Hubbard**, “Entrepreneurship and Household Saving,” *The BE Journal of Economic Analysis & Policy*, 2004, (1).

- Heston, A., R. Summers, and B. Aten**, “Penn World Table Version 6.3,” *Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania*, 2009.
- Holmstrom, B. and J. Tirole**, “Financial Intermediation, Loanable Funds, and The Real Sector,” *Quarterly Journal of Economics*, 1997, 112 (3), 663–691.
- Jappelli, Tullio, Marco Pagano, and Magda Bianco**, “Courts and Banks: Effects of Judicial Enforcement on Credit Markets,” *Journal of Money, Credit, and Banking*, 2005, 37 (2).
- Kaplan, D.S., E. Piedra, and E. Seira**, “Entry regulation and business start-ups: evidence from Mexico,” *Journal of Public Economics*, 2011.
- La Porta, Rafael, Florencio Lopez-De-Silanes, Andrei Shleifer, and Robert W. Vishny**, “Law and Finance,” *Journal of Political Economy*, 1998, 106 (6), 1113–1155.
- Loayza, N.V.**, “The Economics of the Informal Sector: A Simple Model and Some Empirical Evidence from Latin America,” in “Carnegie-Rochester Conference Series on Public Policy,” Vol. 45 Elsevier 1996, pp. 129–162.
- Pagano, M.**, *Defusing default: incentives and institutions*, Inter-American Development Bank, 2001.
- Porta, Rafael La and Andrei Shleifer**, “The Unofficial Economy and Economic Development,” *Brookings Papers on Economic Activity*, 2008, 2008 (2), 275–363.
- Rajan, Raghuram G and Luigi Zingales**, “Financial Dependence and Growth,” *American Economic Review*, 1998, pp. 559–586.
- Schneider, Friedrich**, “Shadow economies and corruption all over the world: what do we really know?,” *Economics: The open-access, open-assessment e-journal*, 2007, 1 (5), 1–29.
- Straub, S.**, “Informal Sector: The Credit Market Channel,” *Journal of Development Economics*, 2005, 78 (2), 299–321.

Figure 3: Credit and Steps: Low versus high Spread

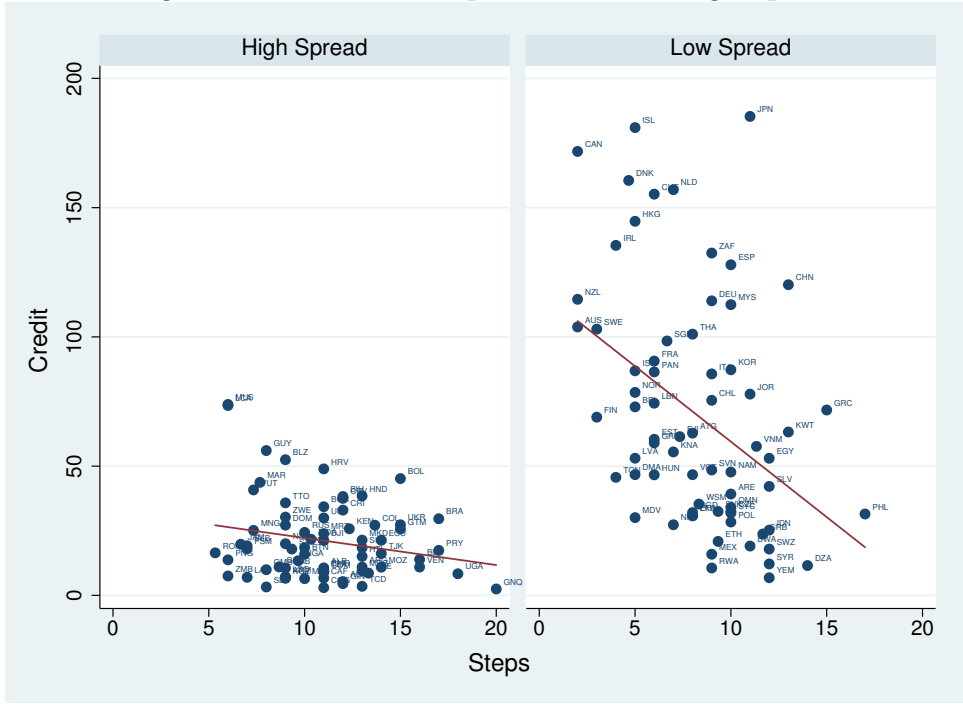


Figure 4: Credit and Formalism: Low versus high Spread

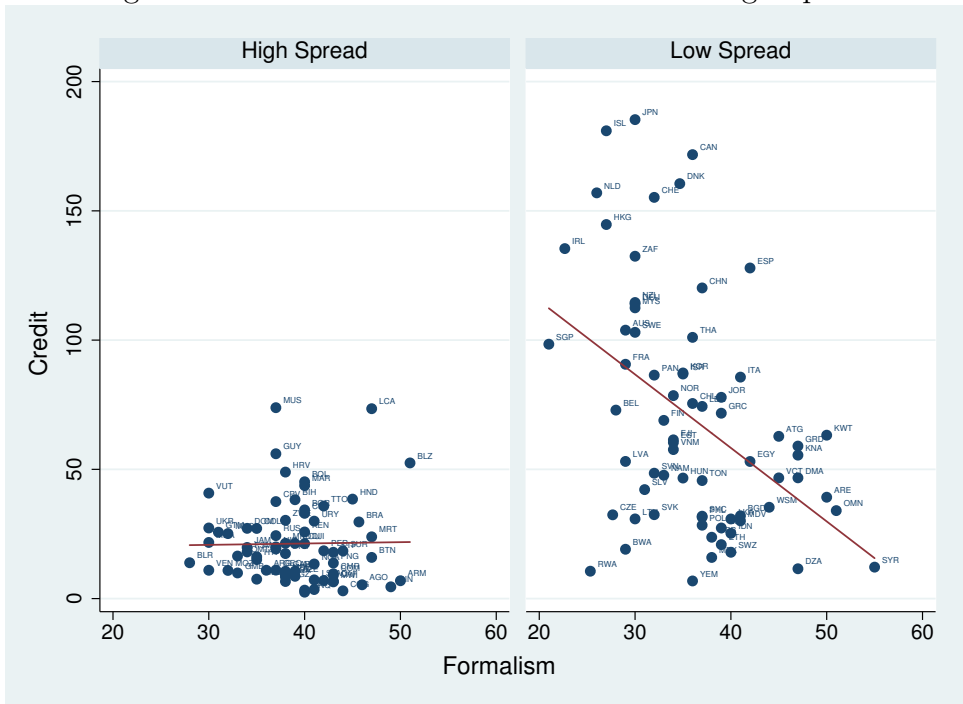


Figure 5: Credit and Steps: Low versus high Openness

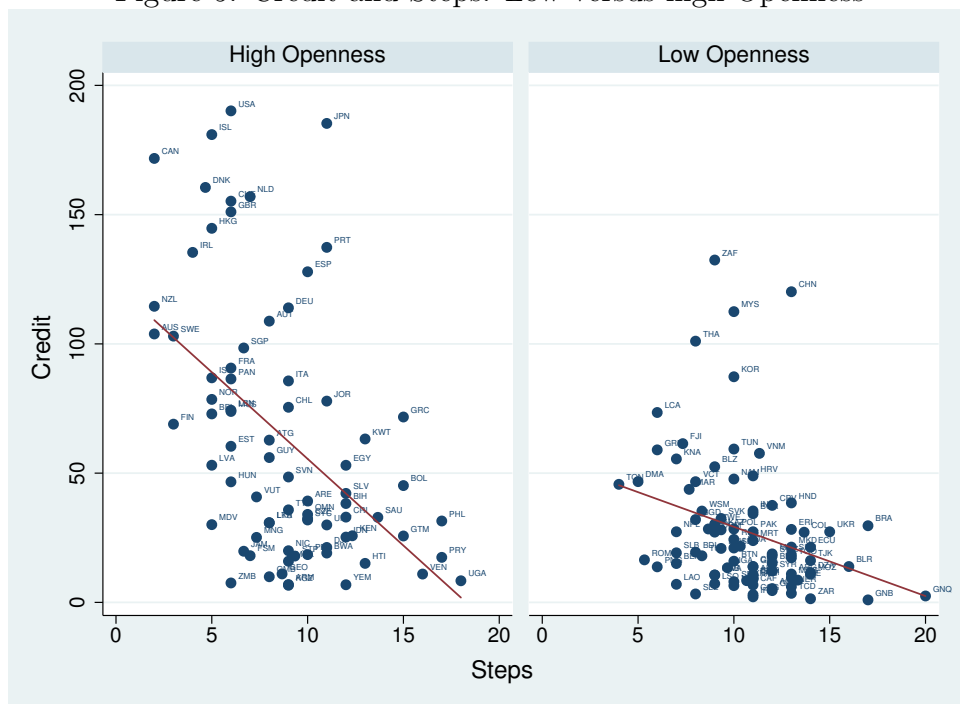


Figure 6: Credit and Formalism: Low versus high Openness

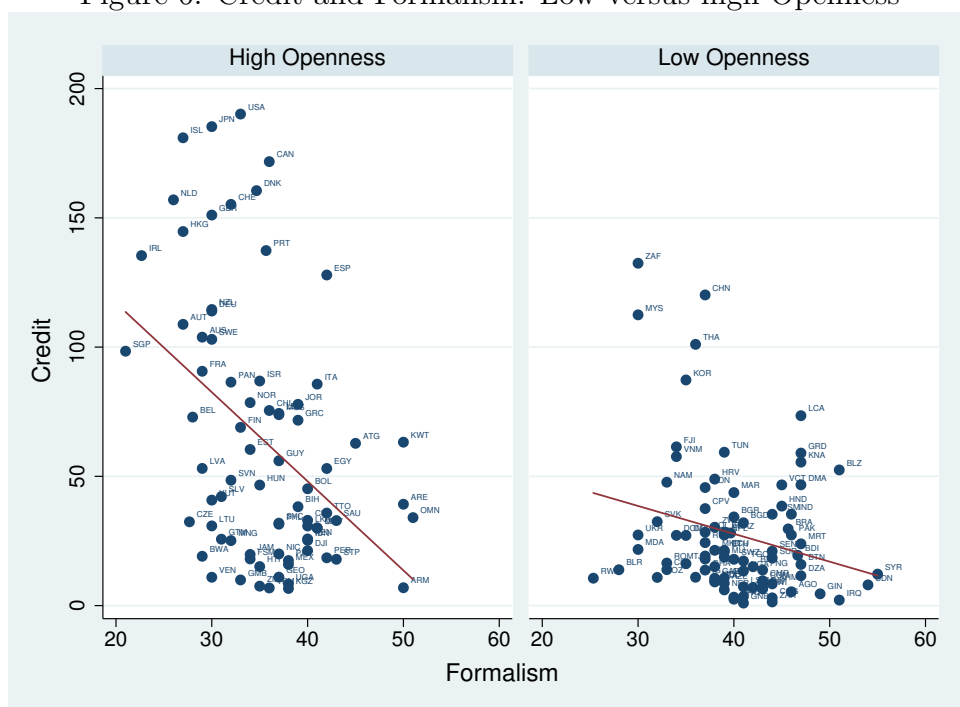


Figure 7: Informality and Steps: Low versus high Spread

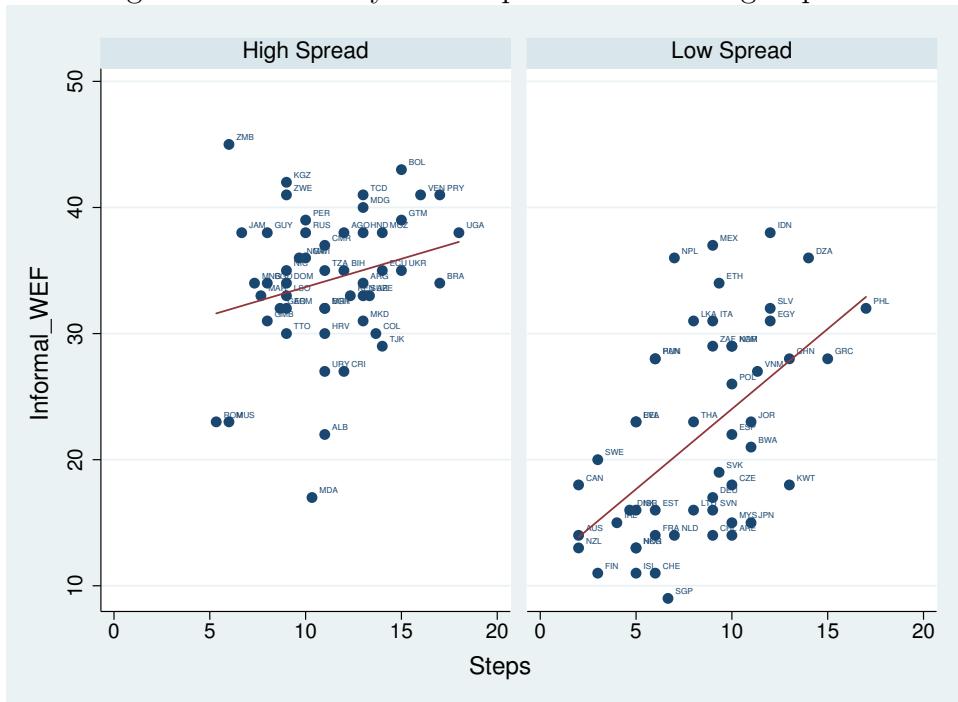


Figure 8: Informality and Formalism: Low versus high Spread

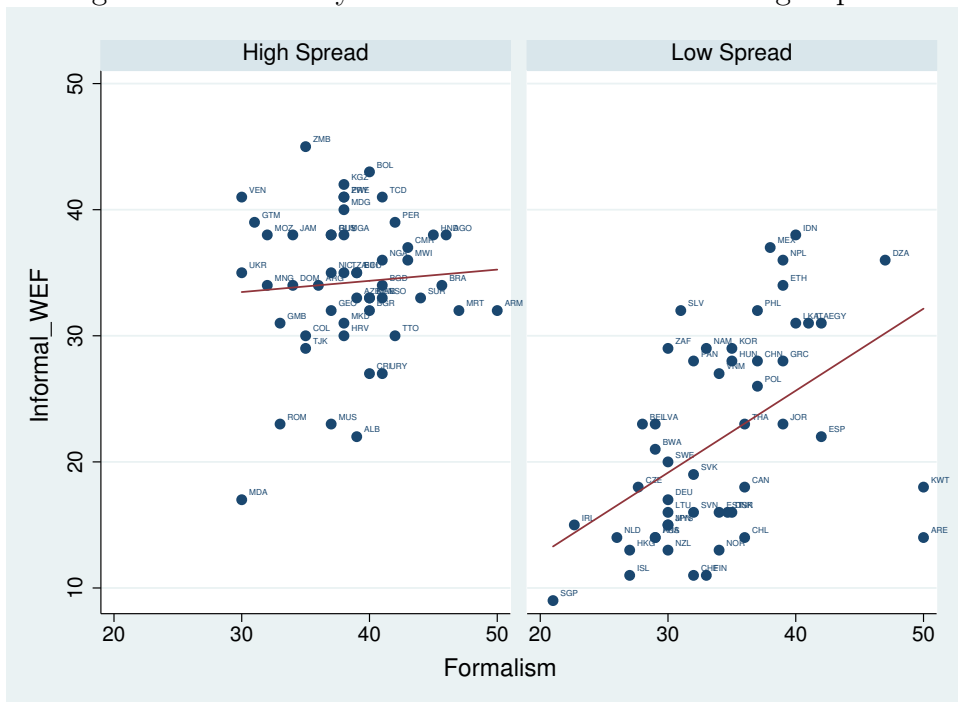


Figure 9: Informality and Steps: Low versus high Openness

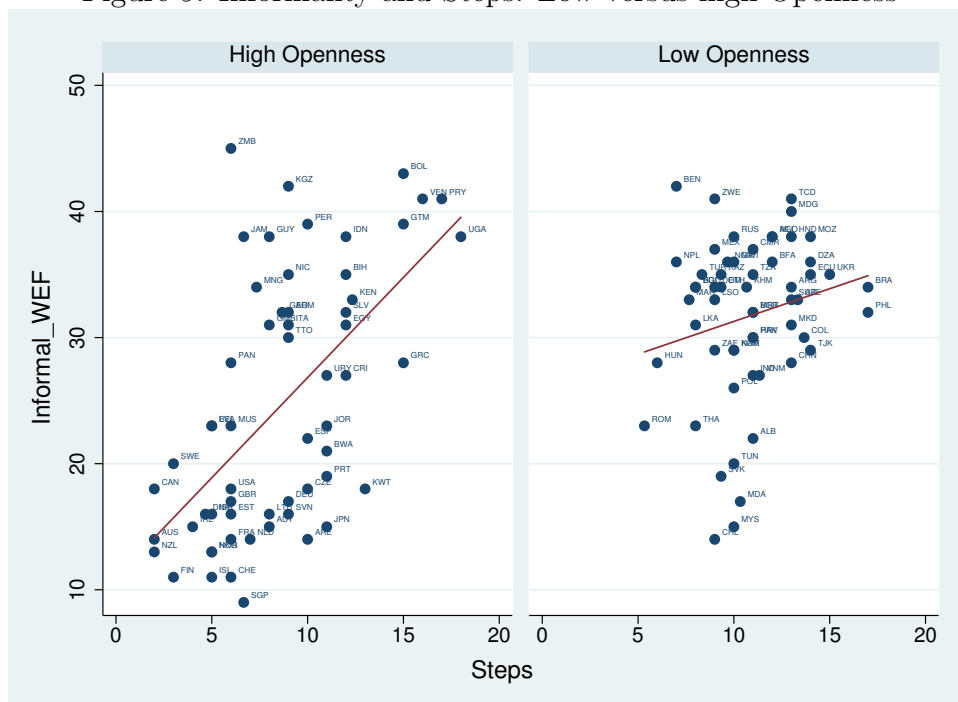


Figure 10: Informality and Formalism: Low versus high Openness

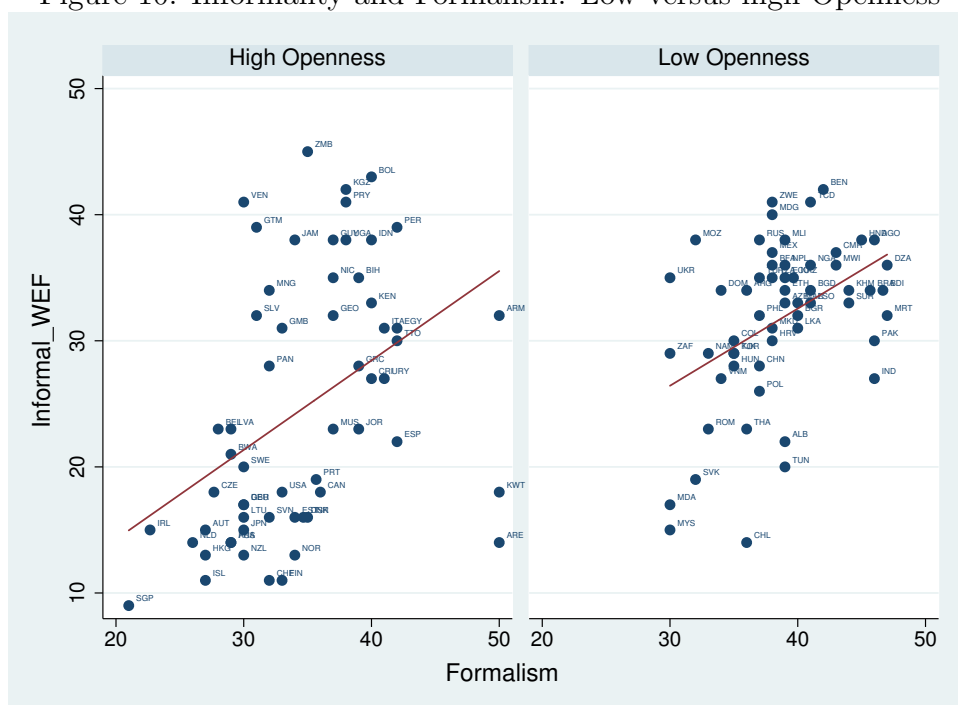


Figure 11: Informality and Steps: Low versus high Spread

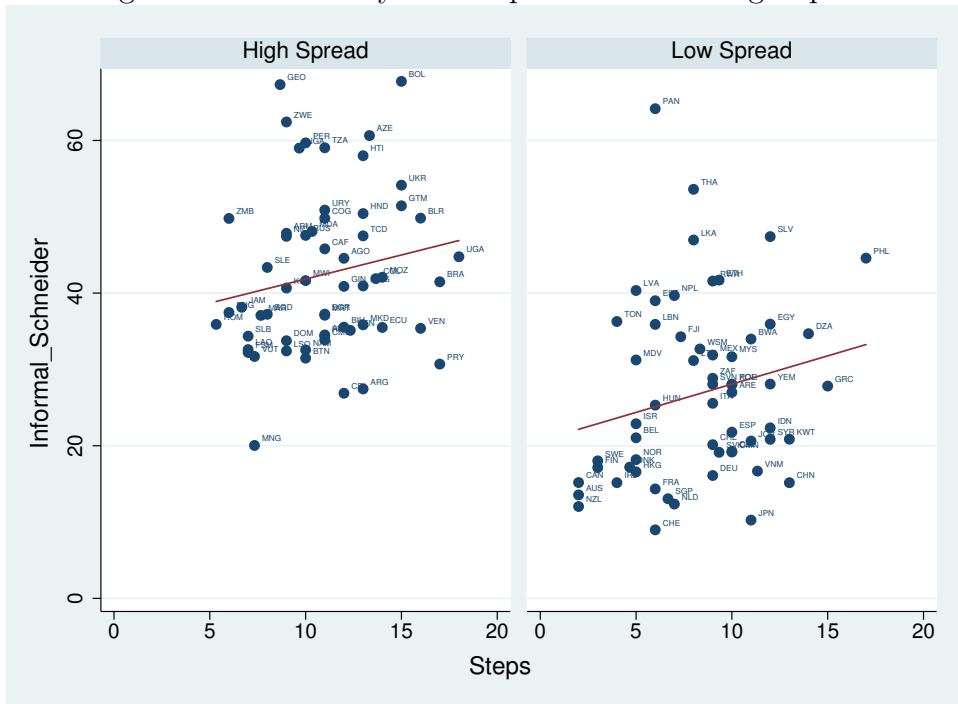


Figure 12: Informality and Formalism: Low versus high Spread

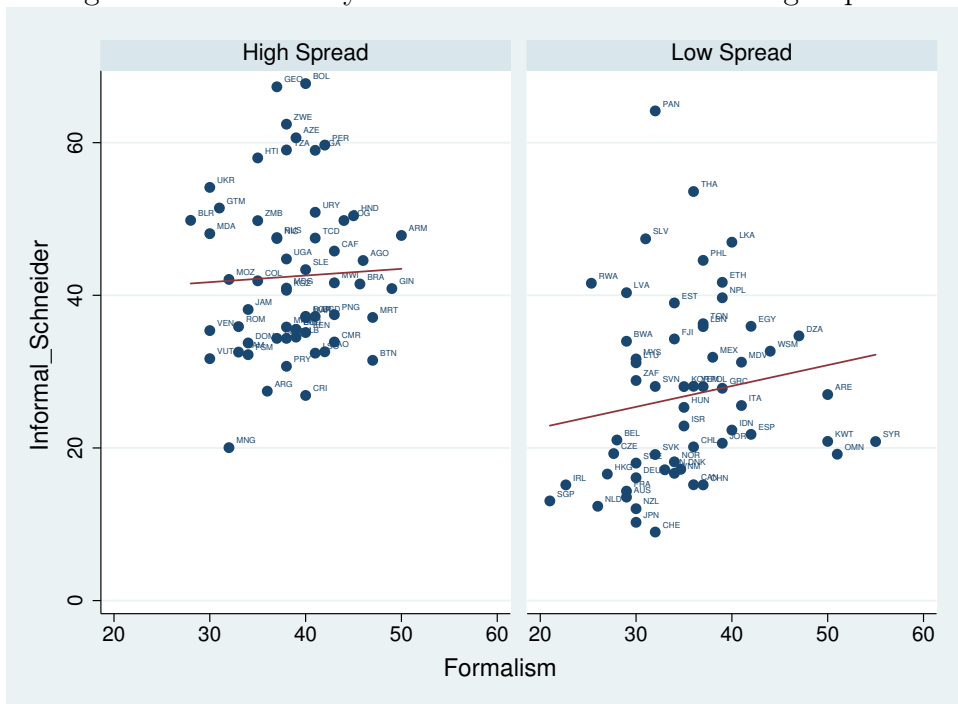


Figure 13: Informality and Steps: Low versus high Openness

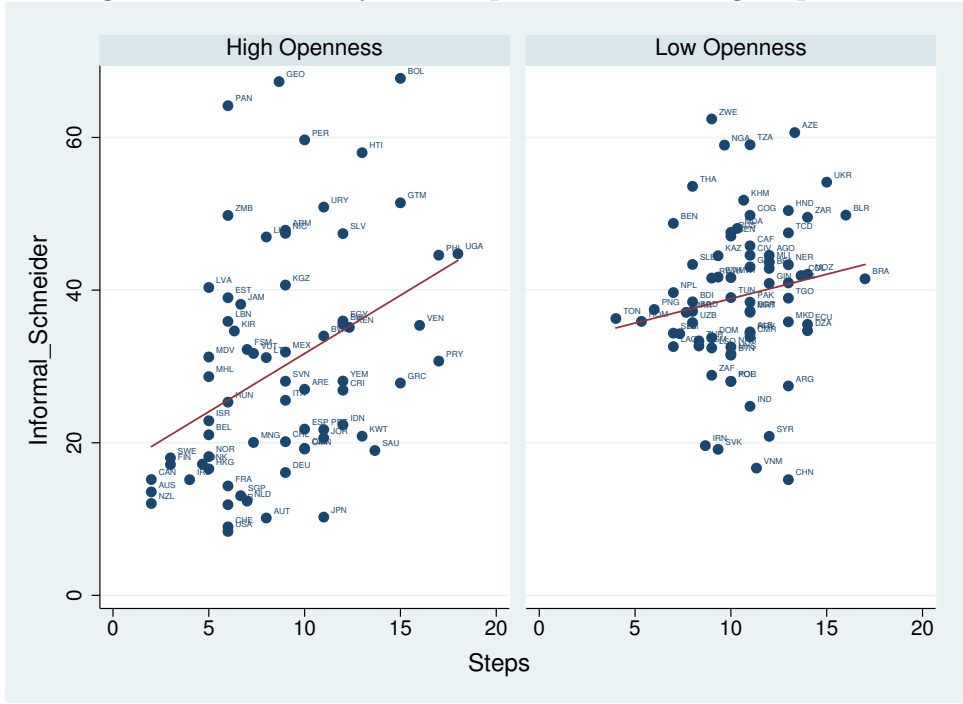


Figure 14: Informality and Formalism: Low versus high Openness

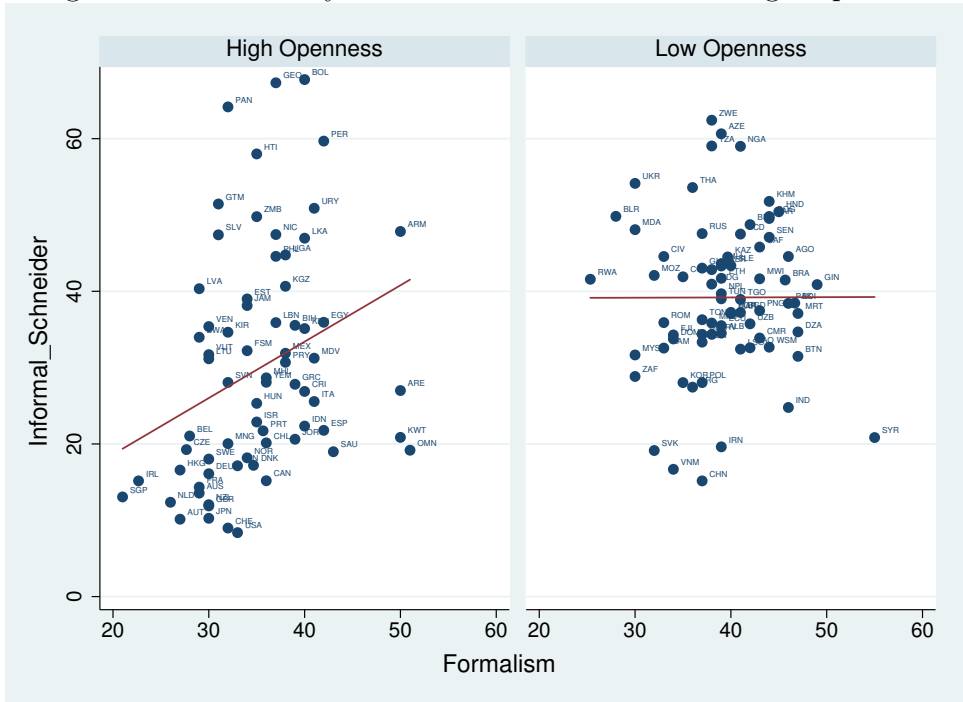


Table 1: The impact of Steps on informality and credit

	(1)	(2)	(3)	(4)	(5)	(6)
	Credit	Informal_WEF	Informal_Schneider	Credit	Informal_WEF	Informal_Schneider
GDP	0.000*** (0.000)	-0.000 (0.343)	-0.000*** (0.000)	0.000*** (0.000)	-0.000* (0.095)	-0.000*** (0.004)
Steps	-9.028*** (0.000)	1.979*** (0.000)	1.784*** (0.000)	-3.976*** (0.000)	0.854*** (0.000)	1.020*** (0.000)
Spread	-7.015*** (0.000)	1.439*** (0.000)	1.512*** (0.001)			
Steps*Spread	0.471*** (0.000)	-0.093*** (0.000)	-0.078** (0.020)			
Openness				18.773*** (0.000)	-4.426*** (0.001)	-3.850** (0.020)
Steps*Openness				-1.017** (0.019)	0.298** (0.012)	0.188 (0.249)
Constant	147.199*** (0.000)	4.737* (0.053)	12.180*** (0.003)	73.908*** (0.000)	21.769*** (0.000)	27.127*** (0.000)
<i>N</i>	137	101	115	163	115	140
adj. <i>R</i> ²	0.545	0.489	0.367	0.496	0.364	0.278

p-values in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2: The impact of Formalism on informality and credit

	(1)	(2)	(3)	(4)	(5)	(6)
	Credit	Informal_WEF	Informal_Schneider	Credit	Informal_WEF	Informal_Schneider
GDP	0.000*** (0.003)	0.000 (0.730)	-0.000*** (0.000)	0.000*** (0.000)	-0.000** (0.011)	-0.000*** (0.001)
Formalism	-4.009*** (0.000)	1.053*** (0.000)	0.800*** (0.003)	-1.488*** (0.001)	0.573*** (0.000)	0.184 (0.299)
Spread	-14.192*** (0.000)	3.175*** (0.000)	3.987*** (0.001)			
Formalism*Spread	0.295*** (0.000)	-0.067*** (0.000)	-0.079*** (0.005)			
Openness				37.935*** (0.000)	-3.754 (0.207)	-12.189*** (0.001)
Formalism*Openness				-0.765*** (0.001)	0.057 (0.482)	0.266*** (0.008)
Constant	218.587*** (0.000)	-16.134** (0.030)	-3.008 (0.771)	90.423*** (0.000)	8.790 (0.138)	30.841*** (0.000)
<i>N</i>	137	101	115	163	115	140
adj. <i>R</i> ²	0.466	0.425	0.340	0.452	0.310	0.249

p-values in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Robustness of the impact of Steps on informality and credit

	(1)	(2)	(3)	(4)	(5)	(6)
	Credit	Informal_WEF	Informal_Schneider	Credit	Informal_WEF	Informal_Schneider
GDP	0.000*** (0.001)	0.000 (0.742)	-0.000*** (0.000)	0.000*** (0.000)	-0.000 (0.277)	-0.000*** (0.000)
Government spending	0.677 (0.189)	-0.082 (0.568)	-0.412** (0.023)	0.757* (0.071)	-0.100 (0.435)	-0.445** (0.015)
Fractionalization	-8.198 (0.464)	9.605*** (0.002)	4.979 (0.304)	-28.845*** (0.005)	11.955*** (0.000)	9.671** (0.045)
Religion	0.354 (0.976)	-3.443 (0.218)	1.453 (0.779)	6.850 (0.518)	-2.568 (0.341)	4.006 (0.361)
Inflation	-0.390 (0.347)	-0.026 (0.816)	-0.219 (0.163)	-1.030*** (0.002)	0.163* (0.051)	0.087 (0.388)
Steps	-8.186*** (0.000)	1.730*** (0.000)	1.516*** (0.001)	-2.656*** (0.000)	0.606*** (0.003)	0.772** (0.012)
Spread	-6.287*** (0.000)	1.273*** (0.000)	1.416*** (0.008)			
Steps*Spread	0.425*** (0.000)	-0.081*** (0.000)	-0.063* (0.094)			
Openness				18.328*** (0.000)	-3.913*** (0.004)	-3.075* (0.094)
Steps*Openness				-1.076** (0.014)	0.283** (0.017)	0.192 (0.277)
Constant	133.783*** (0.000)	6.025 (0.181)	19.204*** (0.006)	68.639*** (0.000)	19.979*** (0.000)	29.200*** (0.000)
<i>N</i>	129	99	109	153	113	132
adj. <i>R</i> ²	0.559	0.536	0.401	0.583	0.494	0.345

p-values in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Robustness of the impact of Formalism on informality and credit

	(1)	(2)	(3)	(4)	(5)	(6)
	Credit	Informal_WEF	Informal_Schneider	Credit	Informal_WEF	Informal_Schneider
GDP	0.000*** (0.003)	0.000* (0.062)	-0.000*** (0.001)	0.000*** (0.000)	-0.000 (0.170)	-0.000*** (0.000)
Government spending	1.008* (0.062)	-0.195 (0.162)	-0.521*** (0.003)	0.964** (0.026)	-0.193 (0.147)	-0.517*** (0.006)
Fractionalization	-14.333 (0.208)	8.829*** (0.006)	7.082 (0.140)	-29.191*** (0.003)	11.512*** (0.000)	10.675* (0.026)
Religion	6.569 (0.569)	-2.155 (0.451)	0.391 (0.945)	11.892 (0.247)	-2.685 (0.329)	2.504 (0.586)
Inflation	-0.948*** (0.008)	0.097 (0.449)	-0.149 (0.253)	-1.224*** (0.001)	0.186* (0.087)	0.111 (0.261)
Formalism	-3.566*** (0.000)	0.846*** (0.001)	0.603** (0.028)	-1.138** (0.011)	0.411** (0.012)	0.061 (0.739)
Spread	-12.012*** (0.000)	2.544*** (0.000)	3.697*** (0.003)			
Formalism *Spread	0.257*** (0.000)	-0.054*** (0.000)	-0.071*** (0.010)			
Openness				28.259*** (0.002)	-2.223 (0.488)	-10.250*** (0.007)
Formalism *Openness				-0.547** (0.019)	0.027 (0.758)	0.238** (0.019)
Constant	190.546*** (0.000)	-8.105 (0.395)	10.083 (0.400)	81.604*** (0.000)	11.981* (0.085)	36.191*** (0.000)
<i>N</i>	129	99	109	153	113	132
adj. <i>R</i> ²	0.516	0.478	0.393	0.562	0.442	0.333

p-values in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Robustness of the impact of Formalism on credit at the industry level (country fixed effects)

	(1)	(2)	(3)	(4)	(5)	(6)
	Access to finance	Working capital	New investments	Access to finance	Working capital	New investments
Panel A						
Steps*Openness*FinDep	-0.006 (0.246)	0.006 (0.922)	0.002 (0.977)			
Steps*Spread*FinDep				-0.000*** (0.008)	-0.008* (0.089)	-0.011*** (0.001)
Constant	-1.370*** (0.000)	89.074*** (0.000)	68.842*** (0.000)	-1.355*** (0.000)	89.296*** (0.000)	69.174*** (0.000)
<i>N</i>	21605	21299	15500	19701	19494	14296
adj. <i>R</i> ²		0.190	0.152		0.181	0.149
Panel B						
Formalism*Openness*FinDep	-0.001 (0.508)	0.005 (0.796)	-0.005 (0.851)			
Formalism*Spread*FinDep				-0.000** (0.049)	-0.003 (0.100)	-0.004*** (0.003)
Constant	-1.369*** (0.000)	89.077*** (0.000)	68.836*** (0.000)	-1.353*** (0.000)	89.348*** (0.000)	69.281*** (0.000)
<i>N</i>	21605	21299	15500	19701	19494	14296
adj. <i>R</i> ²		0.190	0.152		0.181	0.150

Notes: All estimations include cross-country fixed effects.

Columns 1 and 4 give results from a logit model, while columns 2, 3, 5 and 6 report results from OLS regressions.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: The impact of Formalism on credit at the industry level (country fixed effects and financial dependence of mature industries)

	(1)	(2)	(3)	(4)	(5)	(6)
	Access to finance	Working capital	New investments	Access to finance	Working capital	New investments
Panel A						
Formalism*Openness*FinDep	-0.000 (0.001)	0.005 (0.017)	0.028 (0.030)			
Formalism*Spread*FinDep				-0.000 (0.000)**	-0.001 (0.001)	-0.001 (0.001)
Constant	-1.368 (0.000)***	89.071 (0.005)***	68.834 (0.008)***	-1.370 (0.001)***	89.052 (0.016)***	68.813 (0.022)***
Panel B						
Steps*Openness*FinDep	0.001 (0.004)	0.004 (0.063)	0.097 (0.091)			
Steps*Spread*FinDep				-0.000 (0.000)**	-0.003 (0.001)**	-0.003 (0.002)**
Constant	-1.368 (0.000)***	89.072 (0.005)***	68.834 (0.007)***	-1.369 (0.000)***	89.052 (0.009)***	68.817 (0.013)***
R2		0.19	0.16		0.18	0.15
N	21,605	21,299	15,500	19,701	19,494	14,296

Notes: All estimations include cross-country fixed effects.

Columns 1 and 4 give results from a logit model, while columns 2, 3, 5 and 6 report results from OLS regressions.

Robust p-values in parentheses * p<0.10, ** p<0.05, *** p<0.01.

Table 7: Robustness of the impact of Formalism on credit at the industry level (industry fixed effects)

	(1)	(2)	(3)	(4)	(5)	(6)
	Access to finance	Working capital	New investments	Access to finance	Working capital	New investments
Panel A						
Steps*Openness*FinDep	-0.006 (0.172)	0.027 (0.717)	0.070 (0.550)			
Steps*Spread*FinDep				-0.000 (0.323)	-0.014** (0.019)	-0.008 (0.164)
Constant	-1.138*** (0.000)	89.952*** (0.000)	66.741*** (0.000)	-1.177*** (0.000)	88.526*** (0.000)	65.785*** (0.000)
<i>N</i>	21605	21299	15500	19701	19494	14296
adj. <i>R</i> ²		0.190	0.156		0.181	0.152
Panel B						
Formalism*Openness*FinDep	-0.001 (0.553)	0.011 (0.610)	0.011 (0.765)			
Formalism*Spread*FinDep				-0.000 (0.336)	-0.005** (0.029)	-0.003 (0.120)
Constant	-1.138*** (0.000)	89.957*** (0.000)	66.776*** (0.000)	-1.174*** (0.000)	88.578*** (0.000)	65.748*** (0.000)
<i>N</i>	21605	21299	15500	19701	19494	14296
adj. <i>R</i> ²		0.190	0.156		0.181	0.153

Notes: All estimations include cross-country and industry fixed effects.

Columns 1 and 4 give results from a logit model, while columns 2, 3, 5 and 6 report results from OLS regressions.

Robust p-values in parentheses * p<0.10, ** p<0.05, *** p<0.01.

Table 8: The impact of Formalism on credit (IV estimates)

	(1)	(2)	(3)	(4)
	Access to finance	Working capital	Access to finance	Working capital
Panel A				
Formalism*Openness*FinDep	0.000 (0.455)	-0.021 (0.352)		
Formalism*Spread*FinDep			-0.000 (0.030)**	-0.001 (0.002)***
Constant	0.282 (0.056)***	88.200 (2.819)***	0.289 (0.026)***	95.771 (2.433)***
R2	0.13	0.20	0.15	0.20
N	17,214	16,955	15,310	15,150
Panel B				
Steps*Openness*FinDep	0.001 (0.356)	-0.033 (0.371)		
Steps*Spread*FinDep			-0.000 (0.143)	-0.007 (0.044)*
Constant	0.257 (0.027)***	90.527 (1.781)***	0.411 (0.103)***	114.401 (11.034)***
R2	0.12	0.20	0.15	0.18
N	17,157	16,900	15,262	15,104

Notes: All estimations include cross-country and industry fixed effects.

Columns 1 and 3 give results from a logit model, while columns 2 and 4 report results from OLS regressions

Robust p-values in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Recent Issues

No. 105	Vilen Lipatov, Alfons J. Weichenrieder	A Decentralization Theorem of Taxation
No. 104	Sascha Baghestanian, Baptiste Massenet	Predictably Irrational: Gambling for Resurrection in Experimental Asset Markets?
No. 103	Massimiliano Caporin, Loriana Pelizzon, Francesco Ravazzolo, Roberto Rigobon	Measuring Sovereign Contagion in Europe
No. 102	Iñaki Aldasoro, Iván Alves	Multiplex interbank networks and systemic importance: An application to European data
No. 101	Marcel Grupp	On the Impact of Leveraged Buyouts on Bank Systemic Risk
No. 100	Marcel Grupp	Taking the Lead: When Non-Banks Arrange Syndicated Loans
No. 99	Marcel Grupp, Christian Rauch, Marc Ueber, Uwe Walz	The Influence of Leveraged Buyouts on Target Firms' Competitors
No. 98	Tobias Niedrig, Helmut Gründl	The Effects of Contingent Convertible (CoCo) Bonds on Insurers' Capital Requirements Under Solvency II
No. 97	Tobias Niedrig	Optimal Asset Allocation for interconnected Life Insurers in the Low Interest Rate Environment under Solvency Regulation
No. 96	Jens-Hinrich Binder	Banking Union and the Governance of Credit Institutions – A Legal Perspective
No. 95	Loriana Pelizzon, Marti G. Subrahmanyam, Davide Tomio, Jun Uno	Sovereign Credit Risk, Liquidity, and ECB Intervention: Deus Ex Machina?
No. 94	Claudia Lambert, Felix Noth, Ulrich Schüwer	How Do Banks React to Catastrophic Events? Evidence from Hurricane Katrina
No. 93	Shafik Hebous, Tom Zimmermann	Revisiting the Narrative Approach of Estimating Tax Multipliers
No. 92	Christoph Hambel, Holger Kraft, Eduardo S. Schwartz	Optimal Carbon Abatement in a Stochastic Equilibrium Model with Climate Change