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Informality among Formal Firms:

Firm-level, Cross-country Evidence on Tax Compliance and Access to Credit

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Abstract

The authors use firm-level, cross-county data from Investment Climate surveys in 49 developing countries to investigate an important channel through which informality can affect productivity: access to credit and external finance. Informality is measured as self-reported lack of tax compliance in a sample of registered firms that also answered questions on a large set of other characteristics. The authors find that more tax compliance is significantly associated with more access to credit both in OLS and in country fixed effects estimates. In particular, the link between credit and formality is stronger in high-formality countries. This suggests that firms' balance sheets are relatively more informative for financial institutions in environments where signal extraction is a less noisy process. The authors' results are robust to the inclusion of a wide array of correlates and to two-stage estimation.

This paper—a product of the Growth and the Macroeconomics Team, Development Research Group—is part of a larger effort in the department to examine the causes and consequences of informality. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The authors may be contacted at rgatti@worldbank.org and mhonorati@worldbank.org.

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Produced by the Research Support Team

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I. Introduction

Informality has been drawing increasing attention from academics and policymakers alike because of its important implications for government revenues, firm performance and overall private sector development.

In this paper we use firm-level, cross-country data from Investment Climate (IC) surveys in 49 developing countries to investigate the relationship between informality – as proxied by firms' self reported tax compliance – and an important correlate of productivity: access to credit and external finance.

There are many angles to the concept of informality. Informality is the product of firms, workers, or/ and tax payers who decide, voluntarily or not, if and to what extent to enter the formal sector (see World Bank, 2007). This choice occurs across multiple margins. For example, firms might choose not to register their activity and thus operate completely outside the formal system, or to register their business but evade, completely or partially, social security contributions or taxation. In this work, we focus on a direct, albeit partial, measure of informality: firms' self reported tax compliance, which can be interpreted as a proxy for informality among otherwise formal (registered) firms.

When deciding how much to comply with taxation, firms trade off taxes outlays and "legality" on one side, against the possibility of retaining more profits at the risk of being found out and fined. A firm's decision not to comply with tax and regulations can have important consequences at the aggregate level. Informality is said to likely decrease aggregate productivity by reducing average firm size. Informal firms also impose a negative externality on competitors because they can under-price their products, so that informal, less productive firms are more likely to survive. Finally, informality is said to affect firm productivity negatively (see World Bank, 2007).

Notwithstanding a wealth of anecdotal literature on the topic, rigorous evidence on the channels through which informality affects productivity is scant.[2] This paper sheds light on one of the potential mechanisms through which informality can affect productivity: lack of tax compliance limits the extent to which balance sheets are informative for banks' lending and effectively restricts firms' access to credit and to external finance.

Thanks to the richness of our data, we are able to relate firms' self-reported tax compliance with a number of proxies for the extent of firms' access to external finance. In

[2] See, however, recent evidence in Fajnzylber et al. (2006), Kenyon (2006); and World Bank "Informality: Exit and Exclusion", (2007);

particular, we regress these credit measures on a variable – FORMALITY – which captures the share of sales that is reported for tax purposes (see below for a detailed discussion) and on a wide range of firm-level correlates for more than 11,000 firms across 49 countries. Although OLS estimates provide a useful benchmark in this context, we focus our discussion on the results of the fixed effects specifications, to rule out that the inevitably large cross-country differences in compliance and financial market development drive our results.

Fixed effects estimates indicate that higher compliance is associated with higher access to formal credit and external finance, however measured. Complying firms also resort less to credit from informal sources, such as family, friends and money lenders. Moreover, tax complying firms are less likely to report access to finance to be an obstacle. We interpret this finding as an indication that the association between credit and compliance reflects, at least in part, credit constraints and not simply a higher demand for credit from firms that – because of their tax compliance – have less funds available.

We find that the association between formality and credit is stronger in countries with a higher level of average formality. These findings are consistent with banks relying on firms' balance sheets as a signal of firm soundness in countries where official balance sheets are a less noisy measure of firms' true quality. Conversely, in countries where informality is diffused, choosing to evade taxation is less likely to signal firm quality and banks might tend to develop alternative ways to assess credit worthiness, for example through relationship banking.[3]

Our estimates could potentially reflect reverse causation from access to credit to tax compliance or capture unobserved omitted firm-level characteristics. In particular, one could be concerned that (low quality) firms that are denied credit have an incentive not to pay taxes so as to use the extra cash flow to finance their activities. Similarly, low tax compliance and lower reliance on credit from informal sources could both be driven by unobservable managerial preference for informality or "cutting corners". In order to address these concerns, we subject our estimates to a large battery of robustness checks. We first augment our basic specification with a number of firm-specific variables, including (log) sales and past growth (which we interpret as indicators of firm quality); and asset value (to capture collateralizable assets). Our results are robust to the inclusion of these additional regressors.

Moreover, in order to attenuate the concern that unobserved characteristics drive the association between tax compliance and access to external finance, we employ a two-step estimation that exploits country-location-size averages of the extent of tax compliance to

[3] A vast literature has developed on relationship banking. See for example Petersen and Rajan (1994) and Dell'Ariccia and Bonaccorsi (2004).

instrument for firm-level formality.[4] Average formality is strongly associated to individual formality but is unlikely to affect individual credit access through channels other than the individual incentive to pay taxes, especially since the potential direct channels of impact (firm size and location) are controlled for in the specification. Our estimates are robust to instrumentation.

The paper is organized as follows. Section II briefly reviews the related literature. Section III describes the data, section IV presents some stylized facts, sections V and VI discuss the empirical methodology and estimation results, and section VII concludes.

II. Literature review

Our paper is related to two distinct strands of literature: (i) the increasingly large body of work that investigates estimation and determinants of informality; and (ii) the literature that identifies access to credit as an important engine of growth.

Informality is a multi-dimensional concept. Existing studies mainly differ in the way informality is defined and in the way it is measured. Two alternative definitions of informality are usually adopted. According to a legalistic definition, firms, workers, and tax-payers are "forced" to evade taxes or payroll contributions to social securities because otherwise they wouldn't survive (for instance start-up firms that can't bear the cost of compliance, or informal workers who would prefer a formal job but can't find it because of labor market segmentation or heavy labor legislations). A "production" definition instead stresses the voluntary aspect of informality, which is seen as the outcome of an optimal individual or firm choice, given state enforcement and business environment (for example, registered firms that decide to evade taxation or workers who prefer to be self-employed or to start a micro business without registration because of a greater flexibility and lower tax burden – see World Bank, 2007 for a detailed review of these concepts).

By now, a large literature on informality has developed (see, amongst others, contributions by De Soto, 1989; Loayza, 1996; Enste and Schneider, 2000; Johnston et al., 1999; Cunningham and Maloney, 2001; Azuma and Grossman, 2002; Schneider, 2002; Straub, 2005; Maloney, 2004; De Paula and Sheinkman, 2006; Dabla-Norris et al., 2007; World Bank, 2007).

[4] Fisman and Svensson (2007) use a similar methodology to correct for omitted variable bias in regressions of firm growth on self-reported corruption. See also Dollar et al. (2005) and (2006); and Honorati and Mengistae (2007) on the use of locality/industry averages.

An important focus of these works is how best to estimate the size of the informal sector. Methodologies include using demand for cash (Tanzi, 1980), electricity inputs (see Johnston et al., 1998), and the MIMIC method (see Schneider, 2002 and World Bank, 2007 for comprehensive reviews).

In parallel, many of these contributions investigate the determinants of informality. There is consensus that unevenly enforced and burdensome regulations (De Soto, 1989; Djankov et al., 2002; Loayza et al, 2005; Loayza and Rigolini, 2006), corruption[5] (Friedman et al., 2000), financial development and entry costs (Straub, 2005) are significantly associated with informality.[6] In parallel, Loayza and Rigolini (2006) provide convincing evidence that the informal sector – as proxied by the share of self-employed workers in the labor force – is counter-cyclical.

In this paper we focus on a specific definition of informality – tax compliance (or lack thereof) by registered, formal firms – and, amongst others, we provide evidence of how this variable correlates with countries characteristics. In this sense, our paper contributes to this literature by proposing an alternative measure, albeit partial, of the size of the informal sector.

Our main focus, however, is studying the link between informality and access to credit. In particular, we aim at providing systematic empirical content to the claims that informality affects productivity and its determinants in significant ways so as to inform on the channels through which these effects operate. This work is thus linked to the vast literature that identifies access to credit as an important engine for firm growth (see for example Claessens and Leaven, 2005 and Levine, 2005). In many of these models, access to credit affects productivity by alleviating information and transaction costs and making the longer-gestation, higher-return projects more attractive (see, for example, King and Levine, 1993; and Bencivenga et al., 1995). Using data for Bulgarian firms, Gatti and Love (2006) show that access to credit is robustly and significantly associated with TFP. In turn, Easterly and Levine (2001) provide macroeconomic evidence that total factor productivity (TFP) accounts for most of the variation in the cross-country differences in economic development and growth.

Finally, the recent availability of firm-level data has spurred new interesting empirical work that is closely related to ours. Using Mexican micro firm surveys, Fajnzylber et al. (2006a)

[5] In a companion paper (Gatti and Honorati, 2007) we investigate the relationship between formality and corruption at the firm level. Preliminary findings indicate that tax compliance is consistently negatively associated with bribe paying.

[6] A related literature addresses specific issues of tax compliance (see the review in Andreoni et al., 1998). However, because of data restrictions, empirical work on tax compliance focuses mostly on individuals.

find a positive causal link between formality – as proxied by tax compliance – and firm performance: they find that more formal firms have higher levels of profits and that their owners are less likely to go out of business. Kenyon (2006) uses data from the Brazil IC survey to study the link between tax compliance, equity issuance and foreign licensing. He finds a positive association between compliance and both of these variables. Using the same data for Brazil, Almeida and Carneiro (2006) investigate the impact of enforcement of labor regulation on firm-level use of informal labor and productivity. Using firm-level, cross-country data, Almeida and Fernandes (2006) investigate the extent to which majority and minority foreign ownership affect innovation; and Ayyagari et al. (2007) analyze the determinants of firm innovation in emerging economies. They identify the characteristics of innovative firms and then focus on the role of access to finance, competition, and governance in facilitating firms' ability to innovate.

III. Data description

We use a rich database from the World Bank Investment Climate surveys project. These are firm-level surveys conducted in a large number of developing countries between 1999 and 2005. The surveys share a similar sampling design involving the selection of a stratified random sample of firms from each country based on location and industry. Once we exclude countries for which variables of interest are missing, we are left with a sample of 49 countries and about 11,000 firms.[7]

The IC surveys contain detailed information on firms' characteristics such as size, firm age, industry, ownership structure, firms' performance, innovation, as well as perception-based and objective measures of the investment climate, including access to finance, the efficiency of infrastructure services, labor market relations, and corruption. Moreover, in the productivity section, firms are also asked to report accounting variables for the current year and up to two years before.

The number of firms surveyed in each country varies from the largest samples in Egypt (1,973 observations) to the smallest sample (47 observations) in Cape Verde. In order to take into account this asymmetry, we weight our regressions according to the country sample size. All countries cover the manufacturing sector; only some countries include firms operating in services and construction. We focus our analysis only on the manufacturing sector to limit heterogeneity and to maximize the number of countries in our sample. Similarly, we limit the analysis to fully

[7] Although in some countries more than one survey has been conducted, we limit our analysis to the cross-sectional dimension of the data as longitudinal information is still limited.

privately owned companies, since publicly owned companies are likely to face structurally different credit/informality trade offs.

One of the critiques often raised to the IC surveys is that they are not fully representative of the country firms' size distribution. In particular, since in most countries firms' distribution is heavily skewed towards micro and small firms, large firms were over-sampled to allow meaningful analysis for all firm categories. This is a potential concern for our analysis: if smaller firms are more informal than large firms, (i.e. they report lower share of sales for tax purposes) we are likely to underestimate aggregate tax compliance. As most surveys do not report weights, we address this concern by weighing tax compliance in each firm category (micro, small, medium, large, and very large) using data from the International Financial Corporation (IFC) SME database as well as other individual census data on the actual distribution of firms by size in each country (see discussion further on).

To proxy for informality, we use the percentage of sales that firms report to declare for tax purpose (FORMALITY). The distinct advantage of using this variable is that, unlike most indirect estimates of informality, FORMALITY captures a well defined concept: tax compliance. Clearly, the complementary drawback is that we measure only a portion of the informal economy. Although it is likely that FORMALITY suffers from measurement error, the lack of alternative audit-based measures of tax compliance that can be compared homogenously across a large number of developing countries makes this variable a particularly useful starting point to address these issues.

Descriptive statistics reported in tables 1-3 indicate that the degree of tax compliance increases linearly with firm size, ranging from an average of 72% of sales declared in micro firms to an average of 86% in very large firms. Tax compliance is higher in high-tech technology industries, particularly in "metals and machinery" and "chemicals and pharmaceuticals", and lower in more traditional, labor intensive sectors such as "leather" and "wood and furniture". [8] There is substantial variation across world regions, with lowest average tax compliance in Sub-Saharan Africa and highest in OECD countries.[9]

As for our outcome variables, we measure access to credit with a binary indicator of whether or not the establishment has an overdraft facility or line of credit (CREDIT), and also by

[8] In the definition of high and low tech firms, we follow Parisi et al. (2006) Low-tech firms are those operating in food, beverages, garments, leather, textiles, wood and furniture, non-metallic and plastic materials, paper, other manufacture, and agro-industry. High-tech firms are those operating in metal and machinery, electronics, chemicals and pharmaceutics, auto components and other transport equipment.
[9] OECD countries in the ICS are: Germany, Greece, Ireland, Portugal, South Korea, and Spain.

using alternative measures of reliance on external or informal financial sources. These are indicator variables taking value 1 if firms report obtaining financing for their working capital or new investment from external sources such as banks, leasing arrangements, and credit cards; or informal sources such as family loans, money lenders, and trade credit. Tables 1-5 report sample statistics.

IV. Some stylized facts

In this section, we briefly describe how our measure of formality covaries in the aggregate with income and other measures of the size of the informal sector that have been used in the literature. In particular, we compare the average country percentage of sales not reported for tax purpose with Schneider's (2005) estimates of the shadow economy, and Loayza and Rigolini's (2006) self-employment ratio.

Simple cross-country correlations indicate a moderate positive correlation between FORMALITY_AVG and (log) per capita income (0.29), and a low correlation with Schneider's (-0.12) and Loayza and Rigolini's (-0.06) estimates of the shadow economy.[10] The partial overlap between tax compliance and the existing measures of informality reflects different measurement methodologies as well as different angles of the concept of informality. In particular, unlike estimated informality from money demand equation or MIMIC models, tax compliance is a direct measure of informality. Thus, self-reported tax compliance is probably a more precise measure of a partial concept of informality, as turnover of non-registered (i.e. fully informal) companies or income of self-employed workers is not captured by our measure. As such, our measure of informality is an important complement to the existing ones.

Interestingly, we find little correlation between FORMALITY_AVG and countries' corporate tax rate, indicating that differences in tax rates are more likely to affect firms' choices on the margin between formality and informality rather than the extent of tax compliance for registered firms. Not surprisingly, we find that in the aggregate formality is highly correlated with access to credit as measured by the share of firms with a credit line (fig.1-5).

As previously noted, the IC surveys have a bias toward large and mature firms, so that we might be concerned about the representativeness of simple averages. To gauge the extent of the potential gap, we use data on firm distribution by size to compute weighted averages of formality within countries. In particular, we use the percentage of establishments by size class from Kozak

[10] See also World Bank (2007).

(2007) to construct weighted country averages.[11] Disaggregated data on firm size and weight by classes are available only for 37 countries. When compared with actual firm distribution by size, we find that weighted and unweighted tax-compliance covary well (correlation of 0.93). The simple average overestimates formality by 1 percentage point across the 37 countries. Weighted and unweighted averages are plotted in figure 6. Correlations between the aggregate measure of formality and a number of countrywide indicators for financial markets are reported in table 6.

V. Empirical methodology and basic estimation

In this section, we present the results of OLS and FE estimation for our main variables of interest.

For all of the regressions, we use a simple specification of the type

$$credit_{ikj} = \alpha_j + \delta_k + \beta * formality_{ikj} + \gamma * X_{ikj} + \varepsilon_{ikj}$$

where we regress different measures of access to credit on formality and a large number of basic controls (X) that include categorical dummies for firms size; firm's age; whether the firm exports (0/1 indicator); whether the firm is foreign owned (more precisely, an indicator taking value of 1 if at least 10% of the firm is owned by foreigners); within country location dummies; industry dummies; and a dummy for whether the manager has some years of college education or more. Note that subscripts *i*, *k* and *j* index respectively firms, industry, and countries. α_j and δ_k capture country and industry specific intercepts in the fixed effects (FE) estimation.[12]

We first measure access to credit as a 0/1 dummy indicating whether the firm has a credit or overdraft line (CREDIT). We report results from OLS and probit to provide benchmark estimates (table 7). However, since OLS and probit estimate coefficients from a combination of within- and between-country variation, these results could be driven by the correlation between better tax compliance and credit availability at the country level. This, in turn, could be the result of the level of institutional development in different countries. To make sure that country-specific

[11]Kozak (2007) compiles data from original census sources and reports shares of micro, small, medium and large enterprises for each country.

[12] An alternative empirical approach to gauge the impact of informality would be to estimate reduced forms where the TFP productivity residual is regressed on FORMALITY. Although this would provide a more comprehensive assessment of the effects of informality on firms' performance, using an outcome measure that is based on reported sales (as productivity is) could introduce built-in biases, especially if firms sales reports to the interviewer pattern what is reported for tax purposes (and, hence, FORMALITY).

effects do not drive our results, we present country fixed-effects estimation and random-effects probit estimates.[13] We find that formality is positively and significantly associated with the chance of having a credit line under all of the estimation methodologies. When country effects are not explicitly accounted for, a 10 percentage point increase in formality is associated with a 1.5 percentage points increase in the chance of obtaining credit (probit) or a 2.6% increase in credit measured at the mean (OLS). With country effects, a 10 percentage point increase in formality is associated with effects about half the size of those obtained with OLS. This finding is not surprising, given the positive country-level association between formality and financial development that we documented in the previous section.

Although informative, the variable CREDIT indicates whether a firm has a line of credit but does not discriminate between firms that would like to obtain credit but are denied loans, and firms that do not have credit because they do not need it. We use subjective information on obstacles to access to credit to obtain some indirect evidence on this issue. In particular, firms were asked to indicate whether access to finance was "no obstacle (0); minor (1); moderate (2); or major obstacle (3)". We find that formality is associated with less of a perception of obstacles in access to finance. We interpret these results as indicative that official balance sheets are an important basis for lenders' decision-making and that partial tax compliance can result in limited access to rather than demand for credit (table 7, column 5).

Firms' official balance sheets are an important – although not the sole – source of information in banks' decision process. Moreover, firms' officially declared turnover size might represent an effective constraint/ceiling for loan sizes. The extent to which balance sheets can provide reliable information is itself a function of formality. In particular, we expect balance sheets to be relatively more informative for financial institutions in environments where signal extraction is a less noisy process, such as in countries where tax compliance is higher on average. We thus interact the average level of formality at the country level with firm-level formality. As expected, the link between credit and formality is stronger in high-formality countries (table 8, column 1). To make sure that this relationship does not capture other spurious effects, we include in the regression an interaction of firm-level formality and average level of financial development as well as an interaction with (log) per capita GDP. The significance and size of the coefficient on

[13] Probit random effects are estimated with quadrature, which is based on approximating the integral in the probability calculation with a polynomial. The quadrature formula tends to produce worse approximations in large panels (as in our case). However, when we experiment with different quadrature points, we find the estimated coefficient on formality to be stable.

the interaction between individual and average formality are unchanged. We also use interaction with industry-level formality, and find that out results are robust to this alternative measure. These findings lend support to the hypothesis that tax compliance matters for access to credit through an "information channel". They are also consistent with the evidence in de la Torre et al. (2007) who, using data from recently fielded banking surveys, find that informality and low quality of balance sheets are the foremost constraint to SMEs lending in Argentina and Chile.

To provide a more nuanced understanding of how formality relates to credit, we use alternative dependent variables, such as indicators taking value 1 if firms report to finance their working capital or new investment with external (EXTFIN) or informal sources (INFFIN). External sources include financing from banks, leasing arrangements, and credit cards while informal finance sources include financing from family and friends, and money lenders.[14] Consistent with the results estimated for CREDIT, firms with better compliance rely more heavily on external financing. Coefficients are significant both in OLS and FE. Estimated effects with FE are small, indicating that a one-standard deviation increase in formality is associated with about 2% of a standard deviation increase in the probability of obtaining external finance.

More formal firms appear also to resort less to informal ways of financing. FE estimates are in this case larger than OLS, reflecting the likely negative correlation between development of informal credit networks and enforcement/tax compliance at the country-level (table 8). Note that formal and informal finance appear to be substitutes to some degree. In particular, reliance on informal (external) finance decreases (increases) linearly with size. For example, informal sources might fulfill completely the financing needs of smaller firms but as scale increases they might not satisfy credit demand. Informal, larger firms that lack proper documentation might then find themselves credit constrained.

VI. Robustness checks

In our context, FE estimation provides an important robustness checks to the coefficients estimated with OLS, since they correct the bias driven by the correlations between country-level enforcement and development of financial markets. However, even after the country-effect is accounted for, a causal interpretation of the impact would be misplaced if the estimates still

[14] Results are unchanged if we include trade financing in the definition of informal finance.

reflect unobserved firm-level effects. In particular, we could be concerned about omitted variable bias – in this case, the estimated coefficient would pick up a spurious correlation between an unobserved factor, which is correlated with formality and credit, and erroneously attribute this effect to formality; and reverse causation – if the correlation between formality and credit reflects a feedback mechanism from credit to formality. Finally, we could be concerned that tax compliance is reported with a substantial amount of noise.

To deal with these as well as more basic concerns about the specification, we subject our results to a battery of robustness checks.

First, we explore whether results are driven by specific industries or country groups. In particular, we run our FE specifications for the sub-samples of high- and low-tech industries. We find no significant differences in the relationship between formality and credit access. We then run the same specification separately for the different regions of the world that are represented in our sample – East Asia and Pacific, Latin America and the Caribbean, Middle East and North Africa, and Sub-Saharan Africa. Although the main relationship is not significant in the four East Asian countries, it is strong across Latin America and the Caribbean, and the whole of Africa (table 9).

Second, we show that some basic modifications to our specification do not significantly affect our results. Because of the bunched distribution of formality (about 50% of firms report 100% tax compliance), including formality linearly in the specification might not be appropriate. However, when we use indicator variables for formality equal or below specified cutoffs, results are unchanged. Moreover, as size is recognized to be an important determinant of both informality and credit, we experiment with alternative ways of controlling for it, by using (log) total employment, or including (log) firm sales in the specification. Results are robust to these changes (table 10).

We now turn to the more worrisome issues of reverse causation and omitted variable bias. Reverse causation and omitted variable bias are potentially problematic issues in a cross sectional context. One could for example claim that firms that cannot obtain credit are more likely to reduce their tax compliance and use unpaid taxes to finance their operations. The correlation between compliance and access to credit could reflect unobserved firm “quality” – low quality firms might be shut out of the credit market and, as a result, have to “go informal”. These concerns can be in part mitigated by extending the (already quite exhaustive) list of covariates. In particular, we replicate the basic regression results for the three main credit dependent variables

including new correlates that might help control for specific omitted factors. Past firm performance is a good proxy for whether firms might be likely to obtain credit independently of the quality of balance sheets. When we include firm sales growth in the regression significance and magnitude of the coefficient of interest are unchanged (Table 11, col. 1-3). The share of the work force with more than secondary education (an alternative measure of firm quality) also does not seem to affect the results. Finally, categorical variables for whether the firm is at operating at 50%, 70%, or at full capacity do not affect the credit coefficients substantially.

It could also be argued that the size of a firm's fixed assets are an important determinant of the likelihood of obtaining credit (because they represent collateral) as well as the propensity of a firms to pay taxes (because of the visibility associated with fixed assets). When we include in the regression the (log) net gross value of assets, results are unchanged. Likewise, controlling for the share of profits that are reinvested in the firm could account for the fact that non-complying firms have effectively higher profits and potentially lower demand for credit. We also include a number of ownership and behavioral measures to control in a more refined way for firm structure and ownership, and capture some further managerial preferences. To rule out the possibility that formality is just a proxy for whether a firm is incorporated (incorporated firms are usually subject to more stringent reporting mechanisms, which might make getting credit easier and evading taxes harder) we include a dummy for whether a firm is a privately held, limited company. Moreover, managerial preferences are more likely to be reflected in both tax compliance and credit if ownership is more concentrated. To rule out that this factor drives our results, we include the percentage of shares owned by the largest shareholder. We should note that, although the coefficient on credit remains virtually unchanged, firms with a more concentrated ownership are significantly less likely to have a credit line. We also include a proxy for how geographically dispersed is production (number of establishments) which does not affect the results. Following Almeida and Fernandes (2006), we also control for a more refined measure of foreign ownership, to capture differential impact of majority and minority control rights (not reported). Finally, as a proxy for managerial preferences for informality, we include the share of sales that firms report to pay in bribes. Although this is positively and strongly correlated with the share of informal finance, the coefficients on tax compliance is unaffected.

VI.1 Instrumental approach

Although these robustness checks are reassuring, in the absence of longitudinal data on firm characteristics, the possibility that unobserved managerial preferences for informality drive the association of interest cannot be completely ruled out. To address this concern, we adopt a two-stage estimation approach. In particular, we use average formality in firms with similar location and size as an instrument for individual tax compliance. Within each country, location and size seem to be particularly relevant in determining firms' incentives for tax compliance – firms in the same location are likely to deal with similar levels of enforcement and, thus, incentives to evade taxes. Also, firms of comparable size face similar incentives to comply with taxes, as the degree to which they can hide their turnover differ by size classes.[15] In a first-stage regression, location-size averages of formality are good predictors of individual compliance. More importantly, there is no reason to expect that these variables would affect access to credit through channels other than individual compliance, especially since the specification controls directly for country, location and size dummies. In this context, location dummies account for average local institutional development, simultaneously controlling for credit availability and enforcement of tax compliance. Size dummies capture firm-specific incentives to compliance and the direct effect of size on access to credit.

In line with the related literature where these methodologies are employed, we compute averages retaining only groups with more than 5 observations and we attribute to each firm an average that excludes the individual firm value from the computation (AVG_FORMALITY_CLS_J).[16] Thus we estimate a specification of the type

$$credit_{ikj} = \alpha_j + \delta_k + \beta * formality_{ikj} + \gamma * X_{ikj} + \varepsilon_{ikj}$$

$$formality_{ikj} = \alpha'_j + \delta'_k + \beta' * avg_formality_cls_{-i} + \gamma' * X_{ikj} + u_{ikj}$$

where X_{ikj} includes categorical controls for size and location. In the two-step estimation, we find average formality to be significantly and consistently associated with credit. On average, coefficients are higher than when estimated with individual formality with FE. This indicates that

[15] The location indicator that is available form the "core" dataset identifies capital city; cities with more than one million inhabitants; cities with population between 200,000 and 50,000 inhabitants; and cities with less than 50,000 inhabitants.

[16] See Hallward-Driemeier et al. (2002) and Mengistae and Honorati (2007).

using averages might correct the attenuation bias due to substantial noise in firm-level formality data (table 12).

VII. Conclusions

We use firm-level, cross-county data from Investment Climate surveys in 49 countries to investigate the relationship between tax compliance and access to credit. Access to credit has long been recognized as an important engine of growth, while informality has increasingly attracted attention from academics and policymakers alike, especially because of its potential impact on firm performance.

In this work, we focus on a well-defined concept of informality: tax compliance. Our sample of firms thus includes registered businesses which decide the extent of their tax compliance. Although tax compliance captures only a part of a much wider concept of informality, we provide aggregate evidence that this informality measure correlates in the expected direction with per-capita income and other accepted measures of informality across countries.

We consistently find that more tax compliance is robustly and significantly associated with more access to credit, in OLS as well as in FE estimates. More importantly, we find that the link between credit and formality is stronger in high-formality countries. This suggests that firms' balance sheets are relatively more informative for financial institutions in environments where signal extraction is a less noisy process. As widespread informality weakens, the perceived informational content of balance sheets, effectively a firm's choice not to comply with taxes provides its competitors a further incentive to choose informality. From a policy perspective, this underscores the fact that policies directed at improving the functioning of capital markets are unlikely to be fully successful unless they are complemented by policies – such as increased enforcement and simplification of tax codes – aimed at decreasing the level of informality and improving transparency.

Although our results are robust to a large battery of checks, including controlling for an extensive list of correlates, using different measures of access to credit, and two-stage estimation, we cannot completely rule out that unobserved firm-specific effects might bias the estimated relationship between formality and credit access. The progressive availability of new rounds of surveys with a panel component will make it possible to address this issue in a fully satisfactory manner as well as it will allow estimating reduced forms to investigate the overall impact of informality on subsequent firm growth.

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Appendix: Variable Description

Formality	Percentage of sales reported for tax purposes.
Avgforma_cls_j	Average level of formality at the country-location-size excluding the reporting firm. Only averages for cells with more than 5 firms are retained.
Credit	Dummy taking value of 1 if a firm has a credit line or an overdraft
EXT	Dummy taking value of 1 if a firm relies on external sources (local and foreign banks, leasing and credit cards) to finance either working capital or new investment.
INF	Dummy taking value of 1 if a firm relies on informal sources (family and friends, money lenders, and trade credit) to finance either working capital or new investment.
Obstacles to finance	Categorical variable taking values: 0 if the firm reports no obstacles to access to financing, 1 (minor obstacles) 2 (moderate obstacles) 3 (major or very severe obstacles).
Size	Categorical variable taking values: 1 (micro: 1-9 employees); 2 (small: 10-49); 3 (medium: 50-99); 4 (large:100-249); 5 (very large: 250+).
Log total employment	Logarithm of the sum of permanent and temporary workers.
Fowned	Dummy taking value of 1 if more than 10% of the firm's capital is foreign owned.
Age	Business age calculated as the difference between the year of the survey minus the year when the firm started operations.
Exporter	Dummy taking value of 1 if the firm exports more than 10% of total sales.
Manager's education	Dummy taking value of 1 if the manager has some university degree or more.
Location	Categorical variable taking values: 1 (if the headquarter is located in the capital city); 2 (other large city with over 1 million population); 3 (city of 250,000-1 million); 4 (city of 50,000-250,000); 5 (town with less than 50,000 inhabitants).
Log sales	Logarithm of total sales.
Log fixed assets	Logarithm of net book value of machinery and equipment.
Sales growth	Sales growth (from retrospective information).
Corporation	Dummy taking value of 1 if a firm is publicly listed company or private held, limited company.
Concentration	Percentage of shares owned by largest shareholder.
Reinvested earnings	Share of net profits reinvested (not distributed to owners).
Establishments	Logarithm of number of establishments in the country.
Workforce education	Percentage of firm's work force with secondary school degree or higher.
Bribes	Percentage of sales in bribes.
Capacity	Categorical variable taking values: 1 if the firm's capacity utilization is less than 50%; 2 if it is between 50 and 80%, 3 if it is above 80%.
Log GDP per capita	Log of GDP per capita is in US$ at constant 2000 prices, WDI.
Financial Development	Private Credit By Deposit Money Banks over GDP, Beck et al. 2001.
Time with tax inspectors	Total days spent in inspections, required meetings with officials.

Fig.1: Average Formality and GDP per capita

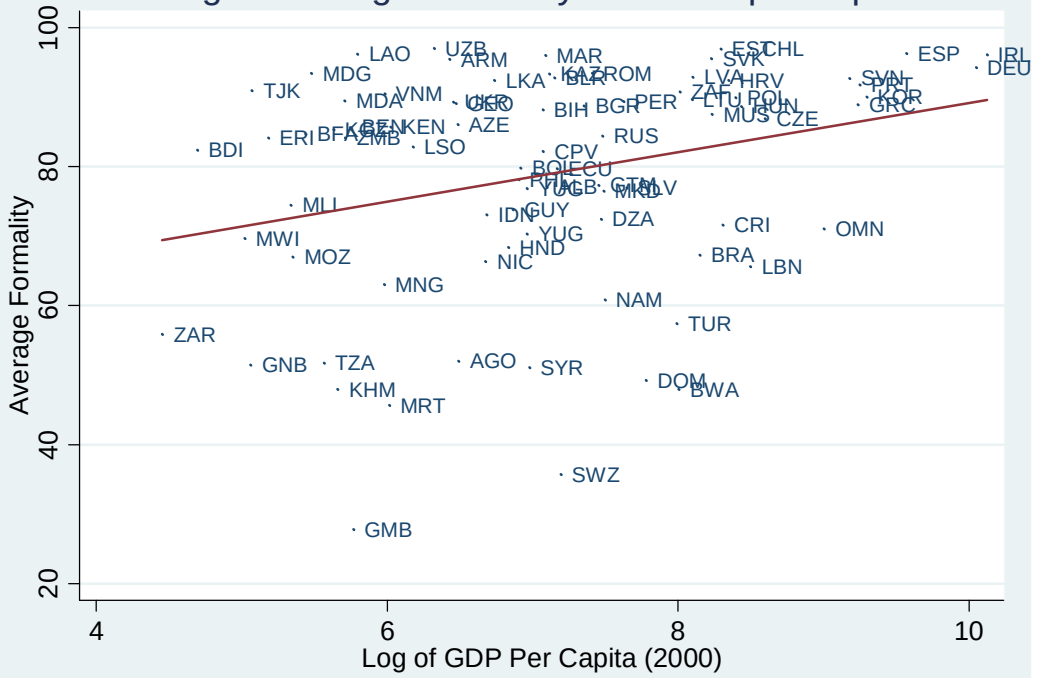


Fig.2 Average Formality and Schneider's Estimates

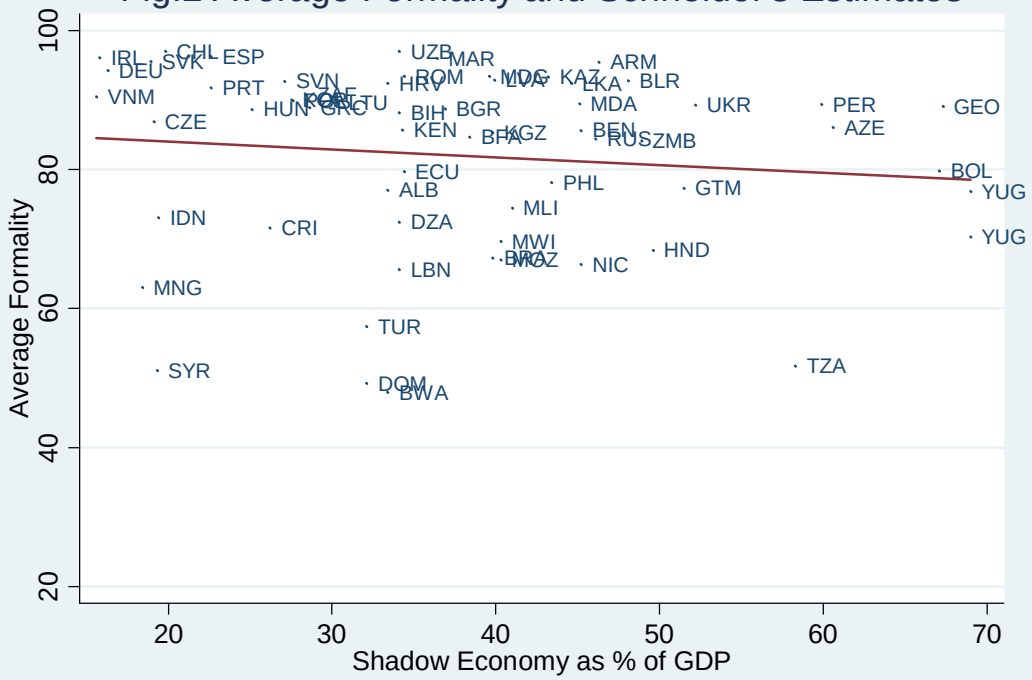


Fig.3: Average Formality and Self-Employment Ratio

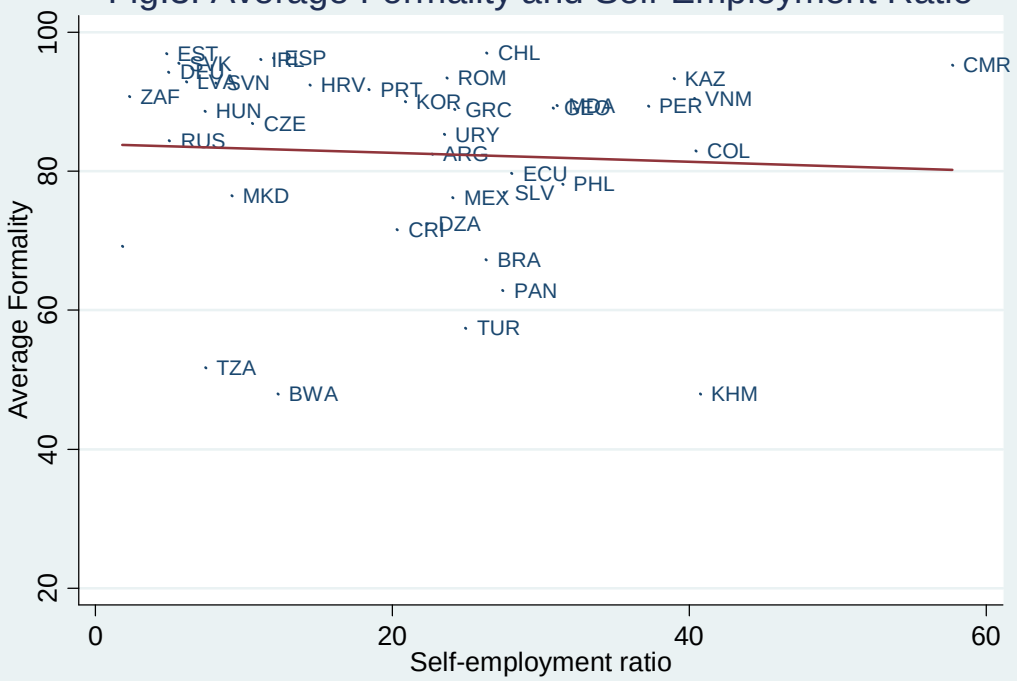
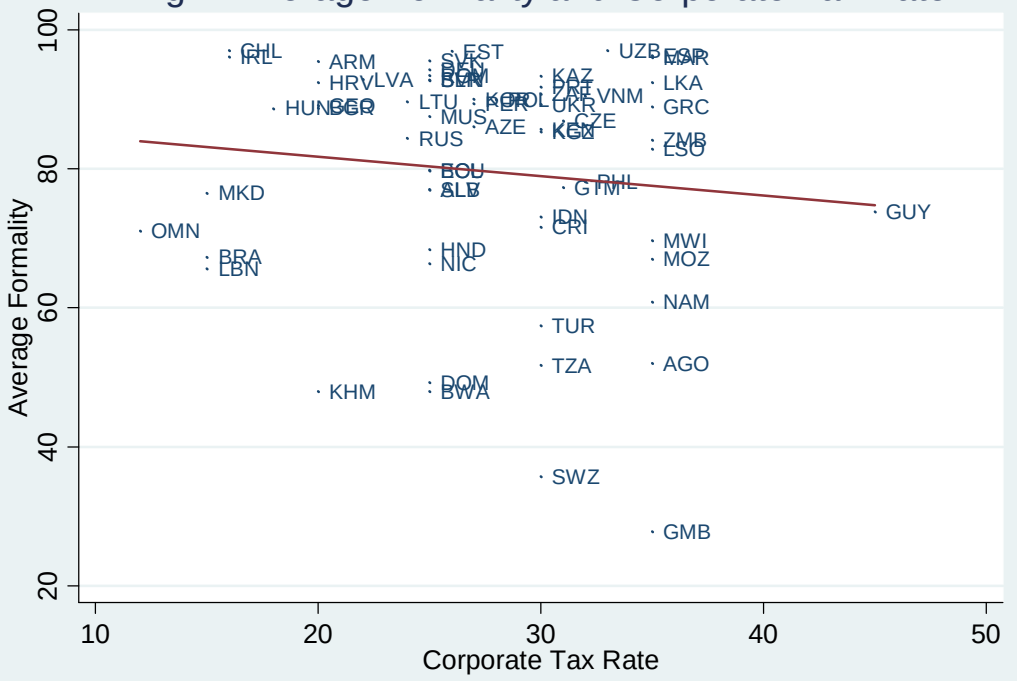
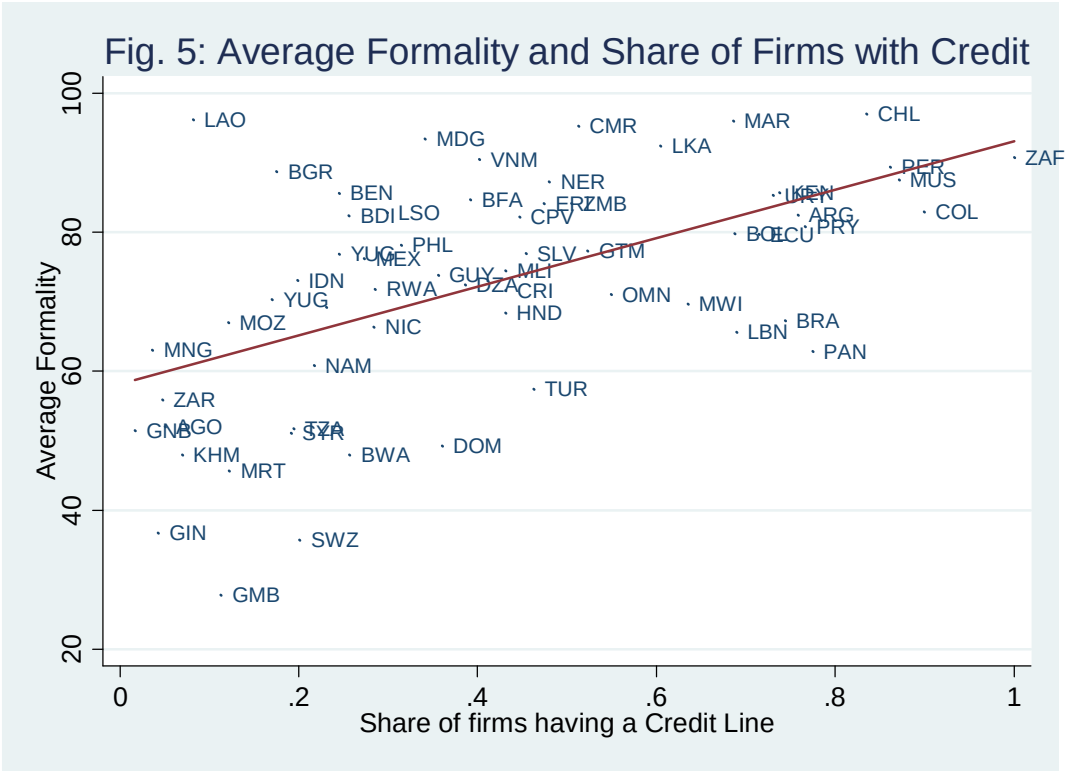


Fig.4: Average Formality and Corporate Tax Rate




Fig. 5: Average Formality and Share of Firms with Credit
Average Formality
Share of firms having a Credit Line
20
40
60
80
100
0
.2
.4
.6
.8
1
LAO
MDG
CMR
MAR
CHL
LKA
VNM
BGR
ZAF
PER
NER
MUS
BEN
BFA
ZMB
BDI
LSO
CPV
COL
ARG
PRY
PHL
SLV
GTM
IDN
MEX
GUY
MLI
RWA
DZA
CRI
OMN
MWI
YUG
HND
MOZ
NIC
BRA
LBN
MNG
PAN
NAM
TUR
ZAR
AGO
BWA
DOM
KHM
MRT
GIN
SWZ
GMB

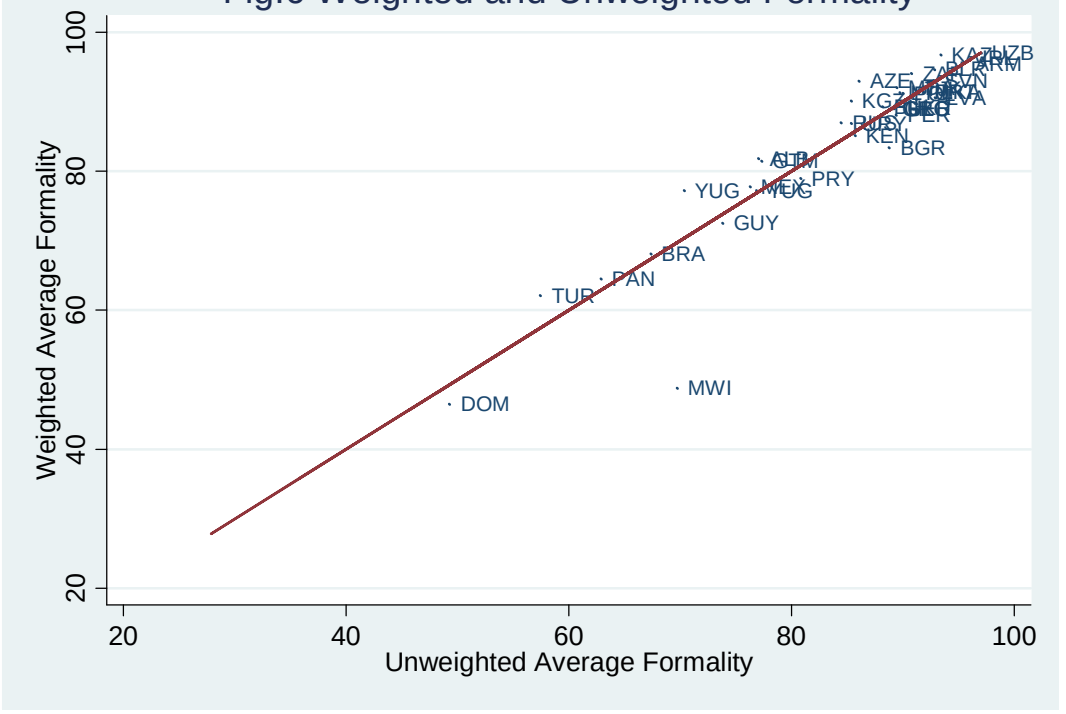

Fig.6 Weighted and Unweighted Formality
Weighted Average Formality
Unweighted Average Formality
20
40
60
80
100
BGR
PRY
YUG
GUY
BRA
PAN
TUR
DOM
MWI

Table 1.a Tax Compliance by Region and Income

Region	Mean	Share of Firms	N. Countries
Sub-Saharan Africa	0.685	18%	29
Latin America & Caribbean	0.769	36%	18
Europe & Central Asia	0.795	20%	27
East Asia & Pacific	0.814	11%	6
Middle East & North Africa	0.833	9%	6
South Asia	0.921	1%	1
OECD	0.948	4%	7
Low income	0.739	21%	31
Upper middle income	0.770	28%	35
Lower middle income	0.789	46%	21
High income: non OECD	0.942	0%	1
High income: OECD	0.948	4%	6
Total	0.780		94

Table 1.b Tax Compliance by Industry

Industry	Mean	N	Share of Firms
Wood and furniture	0.713	2443	10%
Leather	0.722	594	3%
Garments	0.742	3911	17%
Food	0.768	3779	16%
Non-metallic and plastic	0.781	1770	8%
Textiles	0.797	1898	8%
Paper	0.854	358	2%
Beverages	0.877	1193	5%
Low-Tech	0.770	17033	73%
Other transport	0.735	48	0%
Auto and auto components	0.737	322	1%
Metals and machine	0.803	3696	16%
Chemicals and pharmaceutics	0.822	1830	8%
Other manufacturing	0.828	1087	5%
Electronics	0.840	356	2%
High-Tech	0.807	6252	27%
Total	0.780	23285	

Table 2. Distribution of Firms by Formality Degree

	Average Tax Compliance	Share of Firms			
		Degree of Tax Compliance			
		<0.50	0.50-0.75	0.76-0.99	1
Size:					
Micro (1-9)	0.713	22%	18%	19%	40%
Small (10-49)	0.767	17%	18%	18%	47%
Medium (50-99)	0.817	13%	14%	19%	55%
Large (100-249)	0.825	12%	12%	17%	58%
Very large (250+)	0.873	10%	7%	15%	69%
Tax rate perceived as an obstacle to firm's activity	0.752	18%	19%	18%	45%
Tax administration perceived as an obstacle to firm's activity	0.746	18%	20%	19%	43%
Access to finance perceived as an obstacle to firm's activity	0.743	19%	19%	17%	45%
Have a line of credit	0.799	14%	16%	17%	53%
External finance>50%	0.811	17%	14%	15%	55%
Informal Finance> 50%	0.699	29%	17%	17%	36%

Table 3. Access to Finance Variables

Size	**Formality**	**Credit**	**External Finance**	**Informal Finance**	**Local bank**	**Foreign bank**	**Banks**
	(mean)	(mean)	(mean)	(mean)	(mean)	(mean)	(mean)
Micro (1-9)	0.58	0.21	0.23	0.19	0.19	0.01	0.19
Small (10-49)	0.71	0.44	0.40	0.17	0.35	0.02	0.36
Medium (50-99)	0.77	0.63	0.55	0.12	0.48	0.05	0.50
Large (100-249)	0.78	0.64	0.53	0.08	0.48	0.07	0.50
Very large (>250)	0.84	0.64	0.55	0.07	0.47	0.11	0.50
Total	0.72	0.48	0.43	0.14	0.37	0.05	0.39

Sample restricted to "Credit" regression.

Table 4: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Formality	11923	0.724	0.332	0	1
Finance Indicators					
Credit	11923	0.480	0.500	0	1
Obstacle to Finance	30516	1.534	1.262	0	3
EXT	11708	0.429	0.495	0	1
INF	11708	0.140	0.347	0	1
Local Banks	11708	0.152	0.259	0	1
Foreign Banks	9586	0.013	0.077	0	1
Banks	11708	0.163	0.268	0	1
Controls					
Log sales	10779	5.232	4.397	-13.18	21.64
Log fixed assets	9096	3.612	4.253	-15.50	19.95
Reinvested earnings	6674	56.632	41.684	0	100
Sales growth	8346	0.036	0.732	-14.53	11.45
Capacity	11450	2.293	0.679	1	3
Fowned	11923	0.133	0.340	0	1
Corporation	11923	0.601	0.490	0	1
Concentration	11222	71.611	27.940	0	100
Age	11923	18.580	16.703	0	155
Exporter	11923	0.257	0.437	0	1
Manager education	11923	0.660	0.474	0	1
Workforce Education	7270	44.752	30.926	0	100
Log Total Employment	11923	3.721	1.515	0	19.76
Industry	11923	7.044	4.692	1	27
Location	11923	2.378	1.401	1	5
Establishments	9222	1.985	7.828	0	302
Bribes	8251	0.021	0.065	0	1
Log GDP per capita	10353	7.203	1.032	4.45	9.00

Sample restricted to "Credit" regression.

Table 5: Correlations at the Firm Level

	Formality	Credit	EXT	INF	Banks	Size	Age	Fowned	Exporter	Manager's education
Formality	1.000									
Credit	0.136	1.000								
EXT	0.087	0.430	1.000							
INF	-0.080	-0.079	0.027	1.000						
Banks	0.071	0.326	0.703	-0.057	1.000					
Size	0.198	0.243	0.194	-0.105	0.156	1.000				
Age	0.089	0.157	0.089	-0.072	0.083	0.203	1.000			
Fowned	0.093	0.029	-0.029	-0.088	-0.011	0.280	-0.025	1.000		
Exporter	0.109	0.129	0.123	-0.082	0.106	0.467	0.043	0.244	1.000	
Manager's education	0.156	0.182	0.146	-0.033	0.098	0.350	0.121	0.165	0.207	1.000

Sample restricted to "Credit" regression.

Table 6: Correlations at the Country Level

	Formality	Weighted Formality	Schneider	Self-employment	Share of Firms with Credit	% Needs Financed with External Finance	Private Credit/GDP	Getting Credit	Corruption	Corporate Tax	Ln GDP per capita
Formality	1										
Weighted Formality	0.9349	1									
Schneider	-0.1178	-0.0436	1								
Self-employment	-0.0619	-0.241	0.318	1							
Share of Firms with Credit	0.5533	0.2471	-0.0014	0.0835	1						
% Needs Financed with External Finance	0.3837	-0.0746	-0.2839	0.0763	0.7156	1					
Private Credit/GDP	0.3085	0.1075	-0.4552	-0.2855	0.6088	0.4507	1				
Getting Credit	-0.0537	0.13	0.3042	0.5693	-0.3621	-0.3128	-0.3755	1			
Absence of corruption	0.2151	-0.0327	-0.3596	-0.3388	0.2338	0.2391	0.4041	-0.28	1		
Corporate Tax	-0.1115	-0.1478	0.0355	0.101	-0.2793	-0.2559	-0.0275	0.2056	0.0635	1	
Log GDP per capita	0.2868	0.1201	-0.4799	-0.51	0.5054	0.432	0.6968	-0.5929	0.5061	-0.3798	1

Schneider is the informal production as percentage of GDP, Schneider, (2002). *Self-employment* is the percentage of self employed workers with respect to total active population, ILO, Loayza and Rigolini, (2006). *Private credit/GDP* is Private Credit By Deposit Money Banks over GDP, Beck et al., (2001). *Corruption*: ICRG index of absence of corruption. *Corporate tax rate*: Top corporate Tax Rate for All Fund Member Countries, IMF 2006. *Getting Credit* is a rank index based 4 indexes: strength of legal rights index, depth of credit information index, public credit registry coverage, private credit bureau coverage, Doing Business. *Log of GDP per capita* is in US$ at constant 2000 prices, WDI.

Table 7. Access to Credit: Probit Marginal Effects, OLS and Fixed Effects Estimates

Dependent Variable	Credit				Obstacle to Finance
	(1)	(2)	(3)	(4)	(5)
Estimation	DPROBIT	OLS	FE	XTPROBIT	FE
Formality	0.144*	0.120*	0.051*	0.183*	-0.107*
	(2.923)	(2.936)	(3.767)	(3.885)	(-2.717)
Fowned	-0.090*	-0.086*	-0.029**	-0.105**	-0.295*
	(-3.085)	(-3.137)	(-2.295)	(-2.451)	(-8.155)
Age	0.002*	0.002*	0.000***	0.002**	-0.003*
	(3.100)	(3.190)	(1.856)	(2.049)	(-4.146)
Exporter	0.107*	0.098*	0.025**	0.080**	0.013
	(3.353)	(3.258)	(2.435)	(2.285)	(0.424)
Manager's education	0.106*	0.093*	0.059*	0.201*	0.050***
	(3.452)	(3.273)	(6.312)	(6.378)	(1.845)
Size dummies: Small	0.207*	0.159*	0.105*	0.374*	-0.087**
	(6.975)	(6.406)	(8.485)	(8.562)	(-2.433)
Medium	0.314*	0.264*	0.207*	0.692*	-0.120*
	(7.593)	(7.282)	(12.892)	(12.545)	(-2.593)
Large	0.325*	0.276*	0.247*	0.832*	-0.178*
	(6.344)	(6.061)	(14.890)	(14.500)	(-3.691)
Very Large	0.307*	0.253*	0.274*	0.939*	-0.303*
	(5.389)	(4.775)	(14.927)	(14.710)	(-5.676)
Location dummies: City pop> 1mil	0.093	0.089	0.006	0.038	-0.030
	(0.948)	(1.006)	(0.419)	(0.817)	(-0.734)
250,000<Pop<1,000,000	0.000	0.004	0.027**	0.105**	0.046
	(0.000)	(0.113)	(2.051)	(2.381)	(1.199)
50,000<Pop<250,000	0.022	0.021	0.025***	0.092**	-0.058
	(0.465)	(0.528)	(1.916)	(2.108)	(-1.532)
Pop<250,000	0.080**	0.073**	0.011	0.060	-0.052
	(2.108)	(2.156)	(0.635)	(1.098)	(-1.068)
Cons		0.045	0.227*	-0.999*	2.036*
		(0.713)	(10.696)	(-10.712)	(33.048)
Number of observations	11923	11923	11923	11923	11396
Number of countries	49	49	49	49	48
Adjusted R2	0.1354	0.1673	0.1089		0.0444

Notes: t-statistics in parenthesis. In Probit and OLS estimations errors are clustered at the country level. Significance: 01 - ***; .05 - **; .1 - *; Size dummies: reference category: micro firms; location dummies: reference category: capital city. Industry dummies included

Table 8. Access to Credit: Interactions, OLS Estimates

Dependent Variable	Credit			
	(1)	**(2)**	**(3)**	**(4)**
Formality	-0.453**	-0.816*	-0.329***	-0.251*
	(-2.251)	(-2.993)	(-2.018)	(-3.033)
Fowned	-0.072*	-0.069**	-0.054**	-0.077*
	(-2.709)	(-2.651)	(-2.051)	(-2.984)
Age	0.002**	0.002**	0.001	0.002**
	(2.327)	(2.312)	(1.616)	(2.677)
Exporter	0.067**	0.065**	0.064**	0.069**
	(2.454)	(2.420)	(2.421)	(2.250)
Manager's education	0.069**	0.070**	0.069**	0.063**
	(2.533)	(2.559)	(2.434)	(2.301)
Size dummies: Small	0.151*	0.151*	0.154*	0.150*
	(6.018)	(6.052)	(5.832)	(6.325)
Medium	0.236*	0.236*	0.237*	0.235*
	(6.717)	(6.644)	(6.270)	(6.752)
Large	0.264*	0.264*	0.274*	0.266*
	(5.714)	(5.768)	(5.542)	(5.775)
Very Large	0.246*	0.243*	0.255*	0.248*
	(4.795)	(4.686)	(5.026)	(4.931)
Log GDP per capita	0.076*	0.036***	0.042	0.076*
	(4.786)	(1.967)	(1.628)	(4.631)
Interaction: firm formality*country formality	0.776**	0.755**	0.652**	
	(2.607)	(2.598)	(2.381)	
Average country formality	-0.203	-0.179	-0.303	
	(-0.686)	(-0.627)	(-1.118)	
Interaction: formality*Log GDP pc		0.056**		
		(2.533)		
Interaction: formality*financial dev.			-0.220	
			(-0.928)	
Financial development			0.647**	
			(2.353)	
Interaction: formality*country-industry formality				0.446*
				(3.443)
Location dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Cons	-0.256	-0.002	-0.095	-0.368*
	(-1.069)	(-0.006)	(-0.391)	(-2.802)
Number of observations	10353	10353	9993	10353
Number of countries	43	43	40	43
Adjusted R2	0.201	0.2031	0.2068	0.1968

Notes: t-statistics in parenthesis. Significance: 01 - ***; .05 - **; .1 - *; Size dummies: reference category: micro firms.

Table 9. Financing from External and Informal Sources, OLS and FE estimates

Dependent Variable	**EXT**	**EXT**	**INF**	**INF**
Estimation	**OLS**	**FE**	**OLS**	**FE**
	(1)	**(2)**	**(3)**	**(4)**
Formality	0.066**	0.033**	-0.048***	-0.057*
	(2.508)	(2.224)	(-1.708)	(-5.163)
Fowned	-0.101*	-0.087*	-0.048*	-0.050*
	(-3.472)	(-6.455)	(-2.895)	(-4.992)
Age	0.002*	0.000	-0.001*	-0.001*
	(2.795)	(0.780)	(-3.397)	(-2.765)
Exporter	0.086*	0.053*	-0.007	-0.014***
	(3.555)	(4.648)	(-0.460)	(-1.729)
Manager's education	0.105*	0.052*	0.028***	0.023*
	(4.268)	(5.127)	(1.887)	(3.019)
Size dummies: Small	0.120*	0.092*	-0.021	-0.018***
	(4.687)	(6.840)	(-1.172)	(-1.773)
Medium	0.224*	0.180*	-0.037	-0.058*
	(7.643)	(10.324)	(-1.637)	(-4.484)
Large	0.198*	0.183*	-0.038	-0.081*
	(5.164)	(10.159)	(-1.270)	(-6.102)
Very Large	0.208*	0.219*	-0.031	-0.101*
	(5.723)	(10.964)	(-0.589)	(-6.880)
Location dummies: City pop> 1mil	0.071***	0.018	0.024	-0.009
	(1.784)	(1.216)	(0.557)	(-0.768)
250,000<Pop<1,000,000	-0.014	0.023	-0.019	-0.026**
	(-0.489)	(1.594)	(-0.750)	(-2.483)
50,000<Pop<250,000	0.062	0.042*	-0.025	-0.032*
	(1.581)	(2.995)	(-1.188)	(-3.051)
Pop<250,000	0.111*	-0.016	-0.030	0.004
	(2.959)	(-0.880)	(-1.179)	(0.295)
Industry dummies	Yes	Yes	Yes	Yes
Cons	0.120**	0.258*	0.218*	0.250*
	(2.290)	(11.125)	(7.351)	(14.659)
Number of observations	11889	11889	11889	11889
Number of countries	49	49	49	49
Adjusted R2	0.116	0.0648	0.0245	0.0293

Notes: t-statistics in parenthesis. Significance: 01 - ***; .05 - **; .1 - *; Size dummies: reference category: micro firms; location dummies: reference category: capital city.

Table 10. Robustness Checks: High/Low Tech Industries and Regions of the World. Estimation: Fixed Effects. Dependent Variable: Credit.

Sample	**HighTech**	**LowTech**	**EAP**	**ECA**	**LAC**	**MENA**	**SSA**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Formality	0.058**	0.050***	0.008	0.041	0.048***	0.119*	0.052**
	(2.103)	(3.207)	(0.165)	(0.917)	(1.884)	(2.975)	(2.571)
Fowned	-0.020	-0.033**	-0.036	-0.020	-0.057**	-0.009	-0.013
	(-0.855)	(-2.207)	(-0.859)	(-0.230)	(-2.263)	(-0.294)	(-0.708)
Age	-0.000	0.001**	0.000	0.001	-0.000	0.001**	0.001***
	(-0.060)	(2.026)	(0.132)	(1.156)	(-0.380)	(2.239)	(1.765)
Exporter	0.034*	0.027**	0.011	-0.010	0.024	0.039***	0.043**
	(1.665)	(2.183)	(0.286)	(-0.272)	(1.306)	(1.684)	(2.148)
Manager's education	0.025	0.069***	0.010	0.052	0.059*	0.092*	0.049*
	(1.270)	(6.546)	(0.294)	(1.461)	(3.706)	(3.925)	(3.212)
Size dummies: Small	0.122***	0.098***	-0.010	0.153*	0.112*	0.108**	0.102*
	(4.830)	(6.890)	(-0.187)	(3.199)	(5.302)	(2.169)	(6.022)
Medium	0.211***	0.204***	0.133**	0.299*	0.220*	0.176*	0.191*
	(6.554)	(11.007)	(2.072)	(5.170)	(8.164)	(3.137)	(7.189)
Large	0.240***	0.248***	0.271*	0.326*	0.226*	0.198*	0.263*
	(7.254)	(12.844)	(4.045)	(5.594)	(7.800)	(3.608)	(9.252)
Very Large	0.311***	0.261***	0.277*	0.299*	0.258*	0.288*	0.244*
	(8.255)	(12.290)	(4.013)	(4.617)	(7.738)	(5.028)	(7.483)
Location dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cons	0.175	0.213***	0.185**	0.129***	0.370*	0.006	0.168*
	(1.349)	(9.255)	(1.989)	(1.873)	(8.554)	(0.088)	(4.356)
Number of observations	2,957	8,966	1070	1066	4418	1884	3264
Number of countries	46	49	4	1	10	4	28
Adjusted R2	0.082	0.108	0.135	0.064	0.105	0.053	0.294

Notes: t-statistics in parenthesis. Significance: 01 - ***; .05 - **; .1 - *; Size dummies: reference category: micro firms.
EAP: Cambodia, Mongolia, Philippines and Vietnam; ECA: Turkey. LAC: Brazil, Chile, Costa Rica, Dominica Republic, Ecuador, , El Salvador, Guatemala, Guyana, Honduras, Nicaragua; MENA: Egypt, Lebanon, Morocco, Oman; SSA: Angola, Burundi, Benin, Burkina Faso, Botswana, Cameroon, Cape Verde, Eritrea, Guinea, Guinea-Bissau, Gambia, Kenya, Lesotho, Madagascar, Mali, Mozambique, Mauritania, Mauritius, Malawi, Namibia, Rwanda, Swaziland, Tanzania, Uganda, South Africa, Congo, Zambia.

Table 11. Robustness Checks. Estimation: Fixed Effects

	Credit	EXT	INF	Credit	EXT	INF	Credit	EXT	INF	Credit	EXT	INF
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Formality				0.049*	0.031**	-0.057*	0.030**	0.021	-0.058*	0.032***	0.007	-0.071*
				(3.607)	(2.091)	(-5.173)	(2.088)	(1.339)	(-5.050)	(1.848)	(0.336)	(-5.255)
Formality indicators: .5<Formality< =.75	0.031**	0.017	0.009									
	(2.380)	(1.174)	(0.840)									
.75<Formality< 1	0.041*	0.048*	-0.019***									
	(3.026)	(3.227)	(-1.770)									
Formality==1	0.040*	0.019	-0.050*									
	(3.394)	(1.464)	(-5.249)									
Log tot employment				0.062*	0.050*	-0.020*						
				(17.967)	(13.337)	(-7.109)						
Log Sales							0.036*	0.026*	-0.010*			
							(12.100)	(8.195)	(-4.021)			
Sales growth										0.008	0.005	-0.001
										(1.190)	(0.645)	(-0.186)
Size dummies	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Location dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	11923	11889	11889	11925	11891	11891	10779	10804	10804	8346	8373	8373
Number of countries	49	49	49	49	49	49	47	47	47	32	32	32
Adjusted R2	0.109	0.067	0.033	0.103	0.064	0.027	0.097	0.033	0.031	0.061	0.024	0.044

Notes: t-statistics in parenthesis. Significance: 01 - ***; .05 - **; .1 - *; Size dummies: reference category: micro firms; location dummies: reference category: capital city. Regressions include a constant term and additional controls as in the basic specification (age, exporting status, foreign ownership, manager education).

Table 11. Robustness Checks (continued). Estimation: Fixed Effects.

	Credit	EXT	INF	Credit	EXT	INF	Credit	EXT	INF	Credit	EXT	INF
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Formality	0.060*	0.040***	-0.073*	0.052*	0.031**	-0.056*	0.035**	0.025	-0.054*	0.056*	0.032	-0.059*
	(3.042)	(1.811)	(-4.898)	(3.648)	(2.011)	(-4.977)	(2.181)	(1.419)	(-4.188)	(2.726)	(1.405)	(-3.801)
Workforce education	0.001*	0.001*	-0.000***									
	(4.872)	(3.114)	(-1.903)									
50%<Capacity<80%				0.008	0.016	-0.024**						
				(0.645)	(1.153)	(-2.395)						
Capacity>80%				0.023***	0.007	-0.041*						
				(1.782)	(0.480)	(-3.914)						
Log fixed assets							0.018*	0.020*	-0.005**			
							(7.006)	(7.206)	(-2.555)			
Reinvested earnings										0.001*	0.001*	-0.000
										(4.397)	(3.795)	(-0.349)
Number of observations	7270	7272	7272	11450	11425	11425	9096	9142	9142	6674	6735	6735
Number of countries	29	29	29	49	49	49	42	42	42	29	29	29
Adjusted R2	0.045	0.024	0.036	0.095	0.052	0.032	0.097	0.035	0.038	0.094	0.035	0.032
Formality	0.050*	0.031**	-0.056*	0.055*	0.033**	-0.053*	0.053*	0.026	-0.064*	0.051*	0.028***	-0.042*
	(3.677)	(2.107)	(-5.090)	(3.924)	(2.156)	(-4.682)	(2.953)	(1.291)	(-4.502)	(3.310)	(1.677)	(-3.300)
Corporation	0.046*	0.059*	-0.027*									
	(4.160)	(4.894)	(-3.000)									
Concentration				-0.001*	-0.001*	-0.000						
				(-5.165)	(-3.840)	(-0.223)						
Establishments							-0.015***	-0.002	-0.004			
							(-1.821)	(-0.259)	(-0.673)			
Bribes										0.029	0.150***	0.233*
										(0.403)	(1.949)	(3.969)
Number of observations	11923	11889	11889	11222	11210	11210	8211	8227	8227	8251	8256	8256
Number of countries	49	49	49	48	48	48	33	33	33	46	46	46
Adjusted R2	0.127	0.075	0.031	0.114	0.067	0.029	0.065	0.027	0.041	0.110	0.078	0.029

Notes: t-statistics in parenthesis. Significance: 01 - ***; .05 - **; .1 - *. Regressions include a constant term and additional controls as in the basic specification (age, exporting status, foreign ownership, manager education) and size, location and industry dummies.

Table 12. Instrumenting Using Formality Averages (country-location-size), 2SLS

Dependent Variable	**Formality**	**Credit**	**EXT**	**INF**
Estimation	**FE**	**IV**	**IV**	**IV**
	(1)	**(2)**	**(3)**	**(4)**
Formality		0.143	0.209**	-0.211*
		(1.6)	(2.125)	(-2.889)
Avgforma_cls_j	0.505*			
	(16.770)			
Fowned	0.025*	-0.034**	-0.095*	-0.046*
	(2.850)	(-2.546)	(-6.644)	(-4.359)
Age	0.000	0.000	0.000	-0.001*
	(1.130)	(1.364)	(0.401)	(-2.787)
Exporter	0.019*	0.029*	0.053*	-0.010
	(2.668)	(2.656)	(4.469)	(-1.197)
Manager's education	0.025*	0.056*	0.044*	0.027*
	(3.940)	(5.756)	(4.095)	(3.414)
Size dummies: Small	0.016***	0.096*	0.083*	-0.009
	(1.917)	(7.281)	(5.747)	(-0.888)
Medium	0.028**	0.196*	0.165*	-0.048*
	(2.490)	(11.016)	(8.561)	(-3.344)
Large	0.025**	0.227*	0.163*	-0.075*
	(2.090)	(12.366)	(8.131)	(-5.016)
Very Large	0.037*	0.256*	0.197*	-0.090*
	(2.770)	(12.044)	(8.598)	(-5.273)
Location dummies: City pop> 1mil	0.015***	-0.002	0.019	-0.007
	(1.665)	(-0.110)	(1.201)	(-0.616)
250,000<Pop<1,000,000	0.023**	0.019	0.020	-0.023**
	(2.550)	(1.378)	(1.299)	(-2.035)
50,000<Pop<250,000	0.026*	0.017	0.036**	-0.033*
	(2.975)	(1.227)	(2.368)	(-2.925)
Pop<250,000	0.026**	0.003	-0.032	0.014
	(2.160)	(0.147)	(-1.614)	(0.938)
Industry dummies	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes
Number of observations	11477	11477	11477	11477
Number of countries	49	49	49	49
Adjusted R2	0.2855	0.0527	0.0245	0.0114

Notes: t-statistics in parenthesis significance: 01 - ***; .05 - **; .1 - *. Size dummies: reference category: micro firms; location dummies: reference category: capital city.