

# The Cross-Country Magnitude and Determinants of Collateral Borrowing

*Ha Nguyen*  
*Rong Qian*

The World Bank  
Development Research Group  
Macroeconomics and Growth Team  
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## Abstract

Using the World Bank Enterprise Survey covering 6,800 firms across 43 developing countries, this paper investigates the prevalence and determinants of collateralized borrowing. It focuses on the following two aspects: (1) whether firms' loans from financial institutions require collateral (the extensive margin) and (2) the collateral value relative to the loan value (the intensive margin). On the first aspect, it finds that collateral borrowing is prevalent. On average, 73 percent of loans from financial institutions require collateral. Firms that are small or sell domestically are significantly less likely to pledge collateral. Shorter loans and loans

from non-bank financial institutions are also less often associated with collateral. On the second aspect, it finds that on average the loan value is at least 72 percent of the collateral value. The only robust and significant determinants of the collateral value are the type of assets used for collateral. The analysis also checks whether countries' income and institutions affect collateralized borrowing. It finds that firms in countries with higher income and better institutions and credit information are significantly less likely to pledge collateral. These factors, however, have little impact on collateral values.

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# The Cross-Country Magnitude and Determinants of Collateral Borrowing

Ha Nguyen  
The World Bank

Rong Qian<sup>1</sup>  
The World Bank

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## 1 Introduction

Collateralized borrowing (secured borrowing) is widely perceived as a common practice both for households and firms. Early evidence suggests that for U.S domestic bank lending, nearly 70% of commercial and industrial loans are made in a secured basis (Berger and Udell, 1990). Collateralized borrowing is designed to overcome the market friction of information asymmetry: banks cannot identify “good” from “bad” borrowers (i.e. as in Stiglitz and Weiss, 1981), and it allows creditors to recover at least partially, a loan made to debtors.

Collateralized borrowing, on the other hand, has also been pointed out as central in a mechanism that can transform relatively small shocks into large fluctuations in output and investment. Furthermore, it can help transmit shocks across sectors and countries. A seminal paper by Kiyotaki and Moore (1997) explains how the mechanism works theoretically. It shows that if debts need to be collateralized by the value of a firm's productive assets, a small shock that reduces the firm's asset value also reduces its borrowing capacity. As a result, the firm's investment declines, and this further depresses the firm's asset value and tightens its credit constraint. The mutual reinforcement between the decline of asset prices and the collapses of investment and output explains how a small shock can be amplified.

After Kiyotaki and Moore (1997), there has been an enormous literature that links the collateral constraint to the amplification and transmission of negative shocks across sectors and countries. Notable examples include: Paasche (2001), Iacoviello (2005), Pavlova and Rigobon (2008), Mendoza (2010). The literature is further motivated by the 2008-2009 global crisis and has been growing substantially. Examples are Bianchi (2011), Devereux and Yetman (2010), Jeanne and Korinek (2011), Nguyen (2011) and more recently Gorton and Ordonez (2012). The majority of the papers are theoretical, although some have tried to test the mechanism with firm level data (Gan 2007, Duchin, Ozbas and Sensoy 2010, Tong and Wei 2010).

Despite a potentially important role of collateralized borrowing in corporate finance and in amplifying and transmitting negative shocks, there has been little empirical research that systematically documents the prevalence and determinants of collateral borrowing in the data across countries.<sup>2</sup> For example, there has been no information regarding the maximum loan value that firms can borrow as percentage of the collateral value. Let us refer to this as  $\varphi$ . The value of  $\varphi$  is important to theoretical studies because it dictates how large the amplification is and how often and persistent

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<sup>2</sup> There are however some country-specific studies regarding the probability of collateral (e.g. Berger and Udell, 1995 and Klapper, 2001 with U.S. data; Jimenez et al (2006) with Spanish data).

the effects of the shocks can be on the real economy. *Ceteris paribus*, when  $\varphi$  is larger, crises are less frequent, but more severe. Without an empirical-based measurement of  $\varphi$ , the theoretical literature has to resort to calibrating  $\varphi$  to match some business cycle moments. As a result, the value of  $\varphi$  is model-specific and data-specific, and not surprisingly it varies markedly across studies (for example 15%-30% in Mendoza 2010, 5% in Korinek and Jeanne 2010, 22% in Bianchi 2011, 50% in Devereux and Yetman, 2010). An estimate of  $\varphi$  will provide the literature an empirical measure to serve as a benchmark value. More broadly, documenting and understanding the magnitude and the determinants of collateral's extensive and intensive margins are crucial for both firms and governments to mitigate the negative aspects of collateralized borrowing.

Our paper is an attempt to fill the gap. It has two parts. In the first part, we use the World Bank's Enterprise Survey (WBES) to document the existence and prevalence of collateralized borrowing. We show that collateralized borrowing is widespread. On average, 73% of loans from financial institutions require collateral, and among loans with collateral, collateral value is about 139% of the loan value (i.e. the loan value is about 72% of the collateral value). When a particular type of asset is pledged as collateral<sup>3</sup>, the collateral value is about 111% of the loan value. We will argue that this is probably the closest to the collateral requirement for firms when they borrow from financial institutions. This implies that the value of  $\varphi$  is 90%. Either at 72% or 90%, the value is much larger than those commonly used in the theoretical literature.

In the second part, we run cross-section regressions to find significant associations between firm characteristics, bank characteristics and loan characteristics to collateral requirement. We focus on two questions of collateral requirement (1) whether an existing loan requires collateral (i.e. the extensive margin) and (2) if the loan does require collateral, what the collateral value relative to the loan value is (i.e. the intensive margin).

On the extensive margin, we find that more reputable firms (more precisely, those that have international management certifications, or an overdraft facility, or higher capacity utilization) are less likely to pledge collateral when they borrow. This result is not new. Berger and Udell (1995) with U.S. data and Jimenez et al (2006) with Spanish data have similarly found that loans to low-risk borrowers are less likely to be collateralized.

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<sup>3</sup> We conjecture that this type of assets includes stocks, bonds and other financial assets, a point to which we will return later.

What is new and much more interesting is that small firms or firms that sell domestically are found to be significantly less likely to pledge collateral. Shorter loans and loans from non-bank financial institutions are also associated with a higher frequency of no collateral. These two results are related, because small firms are significantly more likely to borrow from non-bank financial institutions, rather than from formal banks. On the other hand, empirical evidence has established that small firms are significantly more likely to report obstacles in access to finance than large firms (Beck et al, 2008).<sup>4</sup> These findings suggest small firms-- presumably due to their informality and lack of collateral assets-- have to maneuver around the collateral requirement. They probably have to rely on their local reputation and connections to less formal financial institutions.

On the intensive margin of collateral borrowing, we find that the most robust and significant determinants for the collateral value are the types of assets used for collateral. In particular, when more illiquid and more indivisible assets such as land and buildings are pledged as collateral, a higher collateral value is required.<sup>5</sup> Other firm characteristics and bank characteristics that are found to affect the extensive margin such as firm size, export orientation or capacity utilization have little impact on the requirement of collateral value.

We also explore whether countries' income and institutions matter for collateralized borrowing. We find that firms in countries with higher income, better institutions (i.e. rule of law and regulatory quality) and financial development (proxied by the depth of credit information) are less likely to pledge collateral for their loans. However, these factors have little impact on the intensive margin (i.e. the collateral values). Other different commonly used proxies for financial development- credit to private sector, domestic credit and interest rate spread- do not have robust impact on both aspects of collateralized borrowing.

The significant impact of credit information on collateral likelihood implies potentially helpful roles for gathering and publicizing credit information. As firms in countries with better credit information system are significantly less likely to pledge collateral, better credit information might help alleviate firms' credit constraints and reduce the cost of financing. This is particularly true for small firms, who lack collateral assets and tend to resort to other potentially costly channels to get around the collateral requirement.

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<sup>4</sup> We also see a similar result from our dataset.

<sup>5</sup> Benmelech and Bergman (2008) find similar results in the U.S.'s airline industry. They find that better redeployability of aircrafts (which are used of collateral) helps increase credit ratings and loan-to-value ratio.

Overall, the results show a higher degree of heterogeneity across countries and firms with regards to the extensive margins of collateralized borrowing. Within a country, small and informal firms are more likely to borrow without pledging collateral. Across countries, financial institutions in countries that have better institutions and better credit information seem less inclined to require firms to pledge collateral. However, when a firm is required to pledge collateral, the requirement about collateral value is quite uniform across firms and across countries.

Our paper is related to a large literature on access to finance. At the firm-level, early empirical studies have identified dividend payouts (Fazzari, Hubbard and Petersen, 1988), business group affiliation (Hoshi, Kashyap, and Scharfstein 1991), size and age (Devereux and Schiantarelli 1990), the presence of bond ratings (Whited 1992), the degree of shareholder concentration, or the pattern of insider trading (Oliner and Rudebusch 1992) as potential characteristics that affect firms' financial constraints (inferred from the firm's investment Bellman equation). Beck et al (2006), using the same World Bank Enterprise Survey as we do, follow a different approach by looking at firms' self-reporting financial obstacles. They show that older, larger and foreign-owned firms report lower financing obstacles. In addition, firms in countries with higher levels of financial intermediary development, stock market development, legal system efficiency and higher GDP per capita report lower financing obstacles. In another paper with the same dataset (Beck et al, 2008), they examine the disadvantages of small firms in the access to a broad spectrum of financing sources, including leasing, supplier, development and informal finance.

The remainder of the paper is organized as follows. Section 2 describes the data and presents summary statistics. Section 3 explores factors that affect the likelihood of having to put collateral when borrowing. Section 4 studies determinants of the required amount of collateral. Section 5 concludes.

## **2 Data and descriptive analysis**

We use the World Bank's Enterprise Survey (WBES), a rich firm-level survey database that provides information about firms' characteristics such as ownership, size, sector, region in which it is located, annual sales, capacity utilization, employment, length in operation, whether it has loans, in case that it has, whether collateral was required, what type of assets were used as collateral and how much collateral was needed. The database also contains information about lenders such as the type of lending institutions: private commercial banks, state banks or non-bank institutions which include microfinance institutions, credit cooperatives, credit unions or finance companies. The database

covers a large number of small and medium size firms, therefore allowing us to study the issue of collateralized borrowing across countries and across firm characteristics. There are 43 countries (the list of countries is given in Table A1). Each firm was surveyed once between 2005 and 2008. Although the dataset covers 4 years, it is effectively a cross-sectional dataset because the firms and the countries do not repeat, i.e. each firm only appears once in the dataset. The dataset includes countries from four regions of the world (the regional distribution of the countries in the dataset is presented in Table A2). The summary statistics of all the variables are presented in Table A3.

The questions of interest center on firms' most recent lines of credit or loans from financial institutions, which can be banks or non-bank institutions (such as microfinance institutions, credit cooperatives, credit unions or finance companies). Essentially, this reflects more formal access to credit. We do not have information about informal borrowing of firms.

Although the WBES has data until 2010, we decided not to include observations in 2009 and 2010. Ideally one would desire to separate loans granted before and after the crisis started to see how the crisis affect the credit market. However, this is not possible because of the data limitation. In the 2009 and 2010 surveys, information on the year the loans were granted is very spotty. For an overwhelming majority of existing loans reported in 2009 and 2010 we do not know if they were granted before or after the crisis had started.<sup>6</sup> Therefore, we decide not to include them and focus only on the collateral condition in normal times (i.e. from 2005-2008).

These lines of credit or loans could be granted in the same year of the survey, or in the past. In the data, some existing loans were granted as far back as 1930s. We decided to drop loans that were granted more than three years from the time of the survey on the ground that they are too far back to be determined by firms' current characteristics. All in all, after removing loans in 2009 and 2010 and loans that were granted three years before the survey, all of the firms (6,799 of them) had existing loans from financial institutions at the time of the survey.

The first question of interest is if the existing loan requires collateral. The question in the survey (K13) states as the following: "*Referring only to this most recent line of credit or loan, did the financing require collateral?*" This is the extensive margin of collateral. We look at the averages across regions, firm size, firm ages, ownership, sectors and types of lending institutions that extended the loan. Table A4 reports the share of loans that are secured with collateral. For the whole sample, 73% of the loans require collateral. Comparing regional averages, the region with the highest

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<sup>6</sup> For a few exceptions that report the year the loans were granted, all of the loans were granted before 2009.

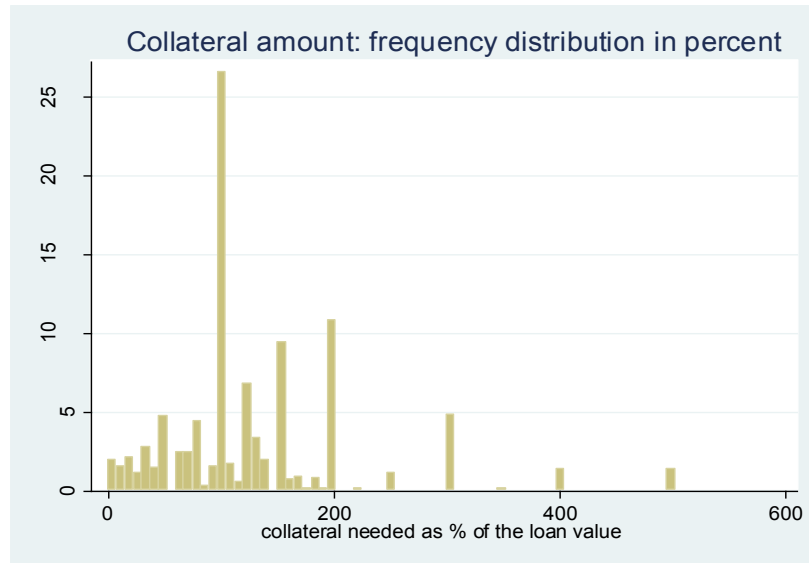


share of loans requiring collateral is Sub-Sahara Africa (0.84) and the region with the lowest is Latin America (0.67). The shares of collateralized loans are not significantly different among firms of different length of operation and ownership. In term of lending institutions, loans given by state banks are more likely to be collateralized (0.78) than private banks (0.72) and non-bank institutions (0.67). This will be further discussed in the econometric analysis.

The second question of interest is if the loan requires collateral, how much the value of collateral relative to the loan value is (i.e. the intensive margin of collateral). The question in the survey (K15) is the following “*Referring only to this most recent line of credit or loan, what was the approximate value of the collateral required as a percentage of the value of the loan or line of credit*”. Figure 1 shows the distribution of collateral needed when the loan requires collateral. The most reported collateral value is 100%: about 26% of loans require so. The next common collateral value is 200% with more than 10% of the loans. Collateral values up to 300%, 400% or even 500% of the loan value are not uncommon. For the whole sample, loans are collateralized at 138.06% in average. Table A5 summarizes how much firms need to pledge as collateral. In the dataset, there are 4661 firms that report having collateralized loans. Small and medium size firms pledge slightly larger collateral for their loans than large firms: the figures are 139.94%, 143.31% and 130.79% respectively. Sector-wise, firms in manufacturing need to collateralize their loans at 141.66% in average, while firms in service collateralize at 134.44%. Years in operation and ownership do not seem to matter for the amount of the collateral. Finally, loans given by private banks require less collateral (about 138%) than state banks and non-banks (152%-153%).

We should note that we do not equate the *observed* collateral values to the *minimum* collateral values that firms are required to pledge when they borrow. In practice, there are reasons for firms to put a higher collateral value than the minimum required by banks. For example, some assets such as land, buildings, or houses are indivisible. Firms and individuals, perhaps due to the lack of alternative assets, may decide to pledge these valuable assets as collateral, for a relatively smaller amount of loan. This can be seen clearly in the data. When more illiquid and more indivisible assets such as land, buildings, and owners’ personal assets such as their houses are pledged as collateral, the collateral value (as % of the loan value) is higher.

**Figure 1: Distribution of collateral amount**



In the data, firms can use any (or in combination) of the following types of asset as collateral: i) land, buildings; ii) machinery and equipment including movables; iii) accounts receivable and inventories; iv) personal assets of owner (e.g. houses etc.); and v) others. Although the question does not specify exactly what types of assets are included in last categories “others”, our best guess is firms’ financial assets (stocks, equities, bonds and deposits). The reason is that these financial assets, along with other assets in the first four categories, are the most common types of assets used for collateral (see for example, Liberti and Mian, 2010). As table A5 indicates, the collateral value varies with the type of assets: land and buildings requires the highest amount (152%) and others (which we guess as stocks, bonds and other financial assets) the lowest (111%). Besides the issue of land and buildings’ indivisibility, their high collateral requirement could be also due to the fact that land and buildings are the most illiquid type of assets among the five; hence lenders require a higher amount to cover the potential higher liquidation cost. Given that stocks, bonds and other financial assets are the most liquid and probably the most divisible, the collateral requirement for them (111%) is probably the closest to the minimum collateral requirement for firms when they borrow from financial institutions. This implies that the maximum loan value is 90% of the collateral value.

### **3 When does borrowing need collateral?**

This section examines econometrically the first question: “*Referred to the most recent line of credit or loan, did the financing require collateral?*” The section starts with an empirical model and

a detailed description of potential explanatory variables as well as their expected signs. We then proceed to present the results.

### 3.1 Empirical model

Conceptually, there are potentially two main reasons for firms not to pledge collateral when they borrow: the first one is because they are unable to, and the second is because they do not have to. For example, small and informal firms in developing countries who operate in service sector are less likely to have assets for collateral and as a result, they potentially have to rely on other means such as their reputation or managers' or owners' personal connections to substitute for the formal collateral. On the other hand, more reputable firms, or firms in developed economies, could potentially also borrow without collateral, for different reasons. For example, developed countries with high levels of financial development could allow banks to track firms' history of payments and defaults (similar to credit scores for individuals in the U.S.). In this case banks are more likely to know the types of firms: defaults for firms are more costly. Therefore firms are less likely required collateral when borrowing.

In our sample, there are 6,799 firms, and all of them have existing loans. We run a pooled-OLS regression and an OLS regression with country fixed effect.<sup>7</sup> In both regressions we correct for clustered errors at the country level. The reduced forms of the two equations are the following:

**Pooled-OLS:**       $Required_i = \alpha + \beta X_i + \varepsilon_i$

**OLS-FE:**          $Required_{ik} = \alpha + \beta X_{ik} + \gamma C_k + \varepsilon_{ik}$

We denote  $i$  for firms and  $k$  for countries. *Required* takes the value of 100 if firm  $i$ 's loan was collateralized and 0 otherwise.  $X$  is a vector of variables that includes firm, lender and loan characteristics.  $C$  is a vector of country dummies that allow us to control for unobserved country-specific factors that might affect likelihood of collateralized borrowing. In both specifications we allow for clustered error terms because it is possible that country characteristics might cause the error terms to be correlated for firms within the same country. Later we will explore whether countries' income levels, financial development and other institutional variables affect the probability of collateralized borrowing. We then replace the country dummies with country-level variables.

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<sup>7</sup> Alternatively, we also run a logit regression, and the results are qualitatively similar. (Table A7) Note that when the mean of dependent variable is not close to 1 or 0, thus it is not nonlinear, OLS gives qualitatively similar results than logit with the advantage of easier interpretation of the coefficients of the explanatory variables.

Explanatory variables include:

Firm characteristics:

- *Size*: small (less than 19 employees); medium (between 20 and 99 employees); large (more than 100 employees). The impact of firm size on collateral requirement is ambiguous. On the one hand, we expect that small firms-- which are more likely to be informal—are less likely required collateral because small firms simply might not have collateralizable assets. On the other hand, larger firms are more reputable, hence they might not need to pledge collateral either.
- *Years in operation*: We expect that loans to older firms are less likely to be secured with collateral.
- *Ownership*: whether the firm is a domestic private firm, foreign private firm, a joint venture between a private and a foreign firm, or a state-owned firm. In the regression, being a state-owned firm is the default dummy. We have no prior regarding how firm's ownership would affect the likelihood of collateralized borrowing
- *Sector*: service or manufacture. We expect loans to service firms less likely to be secured with collateral because they tend to be more informal and have few assets.
- *Exporter*: a dummy variable that takes value 1 if the main market for the firm's production is abroad and 0 otherwise. Here we are also not sure about the impact. An exporter is usually larger; on the other hand, firms that serve the domestic market are less formal but more connected.
- *International management certification*: a dummy variable that takes value 1 if the firm has an internationally-recognized quality certification and 0 otherwise. Examples of certification are ISO 9000, 9002 or 14000. We would expect that firms with certifications show higher repayment capability, therefore less likely need collateral when borrowing.
- *Capacity utilization*: this is used as proxy for firm's current performance. Higher capacity utilization is expected to be associated with lower probability of collateralized borrowing.
- *Audited*: a dummy variable that takes value 1 if the firm has its annual financial statement checked and certified by an external auditor and 0 otherwise. Since firms in general are not required to be audited, this variable can have ambiguous effect. On the one hand, an audited firm is more transparent and therefore more reliable. On the other hand, an unaudited one is less formal. Both can lead to no collateral requirement, for different reasons.

- *Overdraft*: a dummy variable that takes value 1 if the firm has overdraft facility. We expect a negative coefficient because lenders are less likely to require collateral to a firm that has already been granted overdraft facility with the lender.
- *Manager experience*: years working in firm's sector of the top manager. The more experienced is the manager, the more likely the firm performs well. Also, it is possible that experienced managers have good relationships with lending institutions, which reduces the need for collateral when borrowing.

Loan characteristics:

- *Loan's duration in months*: we expect that the duration of the loan is positively correlated with the likelihood of collateralized borrowing because the risk of no repayment would be higher.

Lender's characteristics:

- *Lender types*: if the lender is a state bank, a private bank or a non-bank institution (which include microfinance institutions, credit cooperative, credit unions or finance companies). The expectation is that a non-bank institution would be less likely to require collateral because it is less formal and more likely to operate on trust and reputation.

Country characteristics:

- *GDP per capita*: this is to capture the overall economic development of countries. The measure is GDP per capital in real international dollar (PPP). The data are from the World Development Indicator.
- *Institutional variables*: We use *Regulatory Quality* and *Rule of law*.<sup>8</sup> The data are from The World Bank's Governance Indicators.
- *Financial development measures*: Our focus is on the availability of credit information, and our proxy is the *Depth of Credit Information*<sup>9</sup> (which takes the value of 1 to 6), taken from the World Bank's Doing Business Survey. We also use two commonly used financial

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<sup>8</sup> Other commonly used variables such as Government Effectiveness or Control for Corruption yield similar results.

<sup>9</sup> Depth of credit information index is part of Doing Business Report of the World Bank. It measure rules and practices affecting the coverage, scope and accessibility of credit information available through either a public credit registry or a private credit bureau. The index ranges from 0 to 6, with higher values indicating the availability of more credit information to facilitate lending decisions.

development measures. The first one is domestic credit to private sector, as % of GDP.<sup>10</sup> This proxy is widely used in the access to finance literature (for example, see Beck et al, 2006). The second measure is interest rate spread, to capture the efficiency of the banking sector.<sup>11</sup>

### 3.2 Findings

The first column in Table 1 presents the pooled-OLS regressions with the dependent variable *k13* that takes the value 100 when the loan was collateralized and zero otherwise. Relevant *cross-country* predictors of collateralized borrowing are years in operation, firm size, industry, having international management certification, export orientation, firm's ownership, top manager's experience, having overdraft facility, capacity utilization and loan length. However, it is reasonable to think that countries have different lending practice that might be unrelated to firms. Hence, next we do the same analysis controlling for country fixed effect, essentially we look for *within-country variations across firms* (column 2 of Table 1). Coefficients for firm size, export orientation, having international management certification and overdraft facilities, capacity utilization as well as loan duration continues to be significant and with the expected sign. The detailed results are as follows:

- Small firms are 7.3% less likely to pledge collateral than large firms. One could also expect the opposite sign. However, if we consider the borrowing decision not from the lens of lending institution but from the borrower's, then it is easier to understand the result. It is likely that small firms do not have assets for collateral, and therefore have to rely on reputation, personal relationships or loans from less formal lending institutions as substitutes for collateral, a point to which we will return shortly.
- Non-exporters are about 8% less likely to pledge collateral.
- Firms with higher current capacity utilization are less likely to pledge collateral. 10% capacity utilization is associated with about 0.66% less likelihood.
- Having international management certifications is associated with 6% less likelihood of collateral requirement. Reputation matters.
- Firms having overdraft accounts are about 2.2% less likely to put collateral when borrowing.
- Ten months shorter in loan duration is associated with 1.6% less likelihood.

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<sup>10</sup> Domestic credit to private sector refers to financial resources provided to the private sector, such as through loans, purchases of non-equity securities, and trade credits and other accounts receivable, that establish a claim for repayment. For some countries these claims include credit to public enterprises.

<sup>11</sup> Interest rate spread is the interest rate charged by banks on loans to prime customers minus the interest rate paid by commercial or similar banks for demand, time, or savings deposits.

**Table 1: Likelihood of collateralized borrowing**

Dependent variable: Collateralized borrowing=100 0 otherwise	2005-2008					
	pooled-OL	OLS-FE	pooled-OLS with country characteristics			
	(1)	(2)	(3)	(4)	(5)	(6)
Years in operation	<b>-0.147**</b> (0.0595)	-0.0848 (0.0585)	<b>-0.125**</b> (0.0581)	<b>-0.130*</b> (0.0730)	<b>-0.146*</b> (0.0771)	<b>-0.115*</b> (0.0567)
small (D)	<b>-8.585***</b> (2.599)	<b>-7.306***</b> (2.331)	<b>-8.521***</b> (2.471)	<b>-8.751***</b> (2.513)	<b>-8.803***</b> (2.542)	<b>-7.751***</b> (2.689)
medium (D)	-2.803 (2.083)	-2.624 (1.963)	-2.864 (2.056)	-2.805 (2.063)	-2.985 (2.043)	-2.502 (2.163)
manufacture (D)	<b>-14.31***</b> (4.605)	-3.468 (3.128)	<b>-18.19***</b> (6.524)	<b>-15.40***</b> (4.468)	<b>-18.70***</b> (4.628)	<b>-18.10***</b> (4.427)
International certification (D)	<b>-5.465*</b> (2.974)	<b>-5.842***</b> (2.142)	-3.835 (2.676)	-4.589 (2.805)	-4.350 (2.976)	<b>-5.863*</b> (2.981)
Export oriented (D)	<b>7.712**</b> (3.324)	<b>8.120**</b> (3.055)	<b>8.919**</b> (3.293)	<b>7.297**</b> (3.109)	<b>7.637**</b> (3.197)	<b>8.951***</b> (3.237)
Audited (D)	2.564 (2.258)	0.716 (1.726)	1.785 (2.155)	2.178 (2.415)	1.684 (2.415)	2.505 (2.076)
Private bank (D)	3.461 (6.410)	<b>7.246*</b> (3.846)	7.362 (6.283)	5.390 (6.786)	7.138 (6.594)	4.856 (5.746)
State bank (D)	9.114 (7.160)	<b>14.86**</b> (5.819)	<b>14.09*</b> (7.139)	11.82 (7.235)	11.53 (7.395)	7.313 (6.872)
Capacity of utilization	<b>-0.0874**</b> (0.0378)	<b>-0.0669*</b> (0.0392)	<b>-0.0629*</b> (0.0349)	<b>-0.0805**</b> (0.0375)	<b>-0.0752*</b> (0.0387)	<b>-0.0818**</b> (0.0370)
Domestic private (D)	<b>-14.93***</b> (5.285)	-3.470 (4.289)	<b>-15.18**</b> (6.254)	<b>-14.74***</b> (5.066)	<b>-13.80**</b> (5.372)	<b>-8.984*</b> (5.013)
Foreign private (D)	<b>-12.29**</b> (5.184)	-7.238 (4.693)	<b>-14.74**</b> (6.304)	<b>-12.56**</b> (5.276)	<b>-13.35**</b> (5.733)	<b>-9.672**</b> (4.752)
Joint domestic and foreign private (D)	<b>-13.61***</b> (4.991)	-7.453 (5.273)	<b>-14.83**</b> (5.868)	<b>-13.95***</b> (4.779)	<b>-13.59**</b> (5.209)	<b>-9.642*</b> (5.063)
Overdraft (D)	<b>-11.86***</b> (3.412)	<b>-2.272*</b> (1.284)	<b>-10.84***</b> (3.206)	<b>-11.05***</b> (3.395)	<b>-10.82***</b> (2.997)	<b>-10.72***</b> (3.337)
Manager experience	<b>-0.153*</b> (0.0836)	-0.0184 (0.0799)	-0.108 (0.0903)	-0.144 (0.0938)	-0.139 (0.101)	-0.0834 (0.0817)
Loan duration in months	<b>0.218***</b> (0.0336)	<b>0.163***</b> (0.0312)	<b>0.227***</b> (0.0356)	<b>0.222***</b> (0.0357)	<b>0.229***</b> (0.0339)	<b>0.227***</b> (0.0305)
GDP per capita			<b>-0.00139*</b> (0.000800)			
Rule of law				<b>-7.358**</b> (3.144)		
Regulatory quality					<b>-9.990***</b> (3.597)	
Depth of credit information						<b>-3.465***</b> (0.958)
Constant	112.7*** (11.87)	77.64*** (7.375)	119.6*** (13.01)	107.4*** (12.10)	111.0*** (11.75)	122.3*** (12.10)
Observations	3,415	3,415	3,415	3,415	3,415	3,413
R-squared	0.065	0.032	0.080	0.076	0.085	0.082
Number of country		38				

Interestingly, controlled for country fixed effect, the coefficients for private banks and state banks become significant. This means that *in a given country*, borrowing from bank institutions, either private or public banks, is more likely to be secured with collateral than borrowing from non-bank institutions. In particular, private banks are 7% more likely to require collateral than non-bank institutions (which is the default dummy). State banks are almost 15 % more likely to require collateral than non-bank institutions. This makes sense when we think which types of firms would borrow from non-bank institutions. It is likely that only firms that cannot borrow from formal banks (due to the lack of collateralizable assets for example) would go to non-bank institutions. Therefore in average, borrowing from non-bank institutions is less likely collateralized. This intuition is confirmed in separate regressions (which are presented in table A6 in the Appendix). We regress the types of financial institutions that gave the loans against standard firm characteristics in two regressions: the first one is pooled-OLS, the second one is OLS with country fixed effects to take into account country-level unobserved characteristics. We find that within *a given country*, firms that are small, or unaudited, or not having an overdraft facility (i.e. those that are less formal) are more likely to borrow from non-bank financial institutions.

Why do the coefficients for banks become significant in the regression with country fixed effects, and not in the pooled-OLS? The reason has to do with the cross-country differences. In particular, non-banks in some countries require collateral whereas banks in some *other* countries do not require collateral. Therefore the *between-country* variations and the *within-country* variations cancel each other out in the pooled-OLS, causing the insignificance of banks' coefficients.

To sum up, we can group the significant factors into two groups: firms' informality (small, non-exporters, shorter loans, loans from non-bank institutions) and firms' reputation (having international management certifications, having an overdraft facility and higher capacity utilization). Both groups help firms avoid collateral requirement, for different reasons.

So far we have studied firm-level characteristics, type of lending institutions and loan characteristics. Previous work has also identified determinants of financing constraint at the country-level (for example Demirgüç-Kunt and Maksimovic 1998, Love 2003, Beck et al 2006). Following the literature, we include GDP per capita and two institutional variables: rule of law and regulatory quality. Since the institutional variables are highly correlated with one another and with GDP per capita, we include them one at the time. We find that GDP per capita and all measures of institutional quality are highly significant and negative. This is consistent with the view that better legal and regulatory institutions allow better contract monitoring and enforcement, and hence less



need for collateral. Other common institutional variables such as government effectiveness and control of corruption give similar results.

We also include a proxy of financial development that we think is the most relevant variable for collateralization likelihood: depth of credit information. The argument is that in a country with deeper credit information, banks can better access individuals and firms' historical transactions and therefore better evaluate their credit worthiness. As a result, "good" firms might be less likely to pledge collateral for their loans than they would have to in an environment riddled with severe information asymmetries. The empirical result confirms our expectation: better credit information is strongly associated with a lower probability of collateral. The result suggests important roles of gathering and publicizing credit information in alleviating firms' credit constraints and reducing the cost of financing. This is also true for small firms, who currently have to resort to other (potentially more costly) channels to get around the collateral requirement.

We include two commonly used measures of financial development: credit to private sector (as % of GDP) and interest rate spread between lending and deposit.<sup>12</sup> We only find that credit to private sector has some significant impact on the likelihood of collateral, but the result is not robust. In particular, for the whole sample, we find that credit to private sector is not significantly correlated to the likelihood of collateralized borrowing. However, when we exclude Chile and South Africa, who seem to be outliers in the sample, the coefficient becomes positive and significant. Interest rate spread, on the other hand, is not found significantly correlated to the likelihood of collateralized borrowing. We decide not to include them in Table 1.

#### **4 How much collateral is required?**

The second question is given that a loan requires collateral, what factors are more likely to be associated with the collateral value relative to the loan value. The question in the survey (K15) is the following "*Referring only to this most recent line of credit or loan, what was the approximate value of the collateral required as a percentage of the value of the loan or line of credit?*". We will follow a similar approach to the first question: we first start with a description of the empirical model and the variables. Then we will proceed to discuss the results.

##### **4.1 Empirical model**

###### **a. OLS regressions**

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<sup>12</sup> These proxies are widely used in the access to finance literature (for example, see Beck et al, 2006).

We run a pooled-OLS regression and an OLS regression with country fixed effect. In both regressions we correct for clustered errors at the country level. The reduced forms of the two equations are the following:

$$\begin{aligned} \text{Pooled-OLS:} \quad & \text{Percent}_i = \alpha + \beta X_i + \varepsilon_i \\ \text{OLS-FE:} \quad & \text{Percent}_{ik} = \alpha + \beta X_{ik} + \gamma C_k + \varepsilon_{ik} \end{aligned}$$

Similar to section 3, we denote  $i$  for firms and  $k$  for countries. *Percent* represents the value of collateral value as a percentage of the loan value. As in section 3,  $X$  is a vector of variables that includes firm, lender and loan characteristics.  $C$  is a vector of country dummies. Later we will explore whether countries' income levels, financial development and other institutional variables affect the probability of collateralized borrowing.

The set of explanatory variables are almost the same as those in section 3. The additional explanatory variables are the five types of assets used for collateral (note that multiple types of assets can be used at the same time).

- Land and building : if land and building under ownership of the establishment are used as collateral
- Machinery and equipment: if machinery and equipment including movables are used as collateral
- Account receivable and inventories: if account receivable and inventories are used as collateral
- Personal assets of owner: if personal assets of owner (house etc) are used as collateral
- Others (bonds, stocks and other financial assets): if other assets, most likely stocks and bonds and other financial assets, are used as collateral

We would also like to ideally include a measure of ex-ante default risk of the firms. Unfortunately our dataset does not provide any measure of firms' risk.

#### **b. Heckman two-step regression**

In our sample, all 6799 firms have existing loans, and 4661 of which have to pledge collateral for their loans and 2138 firms do not. A concern is that the sample of firms pledging collateral might suffers from sample selection bias. Specifically, there can be unmeasured characteristics of firms that affect both the likelihood of collateral (called the first stage equation) and the requirement of collateral value (second stage equation). In other words, the error terms of the

two equations are correlated. This would bias the estimates for the second stage equation. In particular, it is likely that informal firms do not pledge collateral. Informal firms, due to the lack of assets, might resort to personal connections with financial institutions to bypass the collateral requirement. If this is the case, there will be disproportionately more formal firms in the 4661 firms pledging collateral than in the general population of 6,799 firms. If formality correlates with variables of interest such as capacity utilization, being an exporter, having an international certificate, or the type of financial institutions offering for the loan, the OLS estimates of these variables will be biased.

We correct for the potential bias by adopting the Heckman two-step approach. The instrumental variable we use is firm size. The argument is that firm size is a good proxy for formality: informal firms tend to be small. Small firms, as shown in section 3, are significantly less likely to pledge collateral, and they tend to borrow from non-bank financial institutions. On the other hand, conditional on a firm having to pledge collateral, there is no reason why small firms or large firms pledge more or less collateral. Rather, the collateral value should depend on the probability of default or delayed payments.

We do the Heckman two-step as follows: the first step is a probit regression. We regress the likelihood of collateral on firm, lender and loan characteristics. The set of variables is exactly like the one in section 3.1. The second step is an OLS regression. We regress the collateral value (as % of loan value) on almost the same set of variables, with two exceptions. First, firm size is not included because firm size is the “instrument” variables. Hence, firm size variables appear only in the first-stage equation, and not on the second-stage equation. Second, we include types of assets used for collateral.

Table A8 in the appendix shows various specifications of the Heckman two-step regression. The selection bias does not seem severe: the inverse mill ratio is not significant and most of the coefficients of the second-stage Heckman two-step procedure are similar to those of the standard OLS regression. For this reason, we opt for the standard OLS regression and we analyze the results below.

## **4.2 Findings**

Table 2 presents the result of the OLS regression. Column 1 shows the results of the pooled-OLS; column 2 shows those with country dummies; and the remaining ones show pooled-OLS with country specific characteristics.

*Across countries*, only the types of assets for collateral, loan duration and private banks are relevant for the size of the collateral. We do the same analysis controlling for country fixed effect to account for unobservable country characteristics (column 2). Only the types of collateral assets are significant and robust. The *within-country* coefficients for the types of collateral assets do not change much compared to the *across-country* coefficients. The coefficients are large, very significant and consistent, indicating that the effects of collateral assets on the collateral value requirement are clear, robust and very substantial. The detailed results are as follows:

*Within-countries*:

- Having land and building as collateral assets is associated with a 33.6% increase in the relative value of collateral.
- Having personal asset as collateral is associated with 15.9% increase in the relative value of collateral.
- Having other assets (which we conjecture stocks, bonds and other financial assets) as collateral is associated with a 16.7% decrease in the relative value of collateral.

Surprisingly, variables that are significantly related to whether the loan requires collateral (k13) such as industry, export orientation and ownership, are not found significant here. The only strongly and robustly significant variables are the types of collateral used. As discussed in the introduction, potential reasons for such a higher collateral value of land and buildings and personal assets (mostly houses) are their indivisibility and illiquidity. Other types of assets (which we speculate most likely financial assets) required significantly smaller collateral value. Another possible reason is that the type of assets used as collateral can be related to firms' default risk. Liberti and Mian (2010) show that when firms' default risk increases, they have to pledge firm non-specific assets as collateral, and this includes land and other real estate properties.

The impact of income, institutions and financial development on collateral value is largely muted: per capita GDP, rule of law and depth of credit information have no association with collateral value. Only regulatory quality has a marginal association.

**Table 2: Collateral as percent of the loan**

Dependent variable: Collateral amount as % of loan value	2005-2008					
	OLS					
	(1)	(2)	(3)	(4)	(5)	(6)
Manufacture (D)	-4.683 (17.89)	-7.850 (20.59)	-5.594 (17.89)	-5.511 (17.76)	-11.83 (18.26)	-6.175 (19.46)
Years in operation	-0.144 (0.106)	-0.183 (0.119)	-0.140 (0.106)	-0.134 (0.106)	-0.137 (0.115)	-0.134 (0.112)
International certification (D)	-8.147 (5.960)	-6.878 (5.257)	-7.616 (5.864)	-7.655 (5.848)	-6.403 (5.694)	-8.244 (5.904)
Export oriented (D)	-5.654 (5.564)	-7.392 (5.767)	-5.301 (5.609)	-5.664 (5.648)	-4.778 (5.938)	-5.304 (5.556)
Audited (D)	2.826 (6.129)	4.566 (5.964)	2.627 (6.238)	2.613 (5.990)	2.049 (5.565)	2.949 (6.061)
Capacity of utilization	-0.125 (0.138)	-0.00323 (0.116)	-0.120 (0.131)	-0.123 (0.135)	-0.112 (0.128)	-0.123 (0.140)
Domestic private (D)	5.358 (17.51)	2.779 (16.01)	5.286 (17.26)	5.159 (17.33)	6.263 (16.53)	7.143 (17.11)
Foreign private (D)	-3.227 (19.46)	-7.981 (17.75)	-3.824 (19.58)	-3.701 (19.50)	-4.990 (18.88)	-2.531 (19.63)
Joint domestic and foreign private (D)	-2.423 (18.53)	-6.006 (18.09)	-2.526 (18.43)	-2.693 (18.48)	-2.031 (17.96)	-1.256 (18.67)
Overdraft (D)	4.078 (5.638)	2.337 (5.216)	3.852 (5.582)	3.744 (5.566)	3.004 (5.759)	3.754 (6.010)
Private bank (D)	<b>-18.58*</b> (10.75)	-14.49 (8.790)	<b>-17.82*</b> (10.18)	-17.57 (10.49)	-14.54 (10.08)	<b>-18.29*</b> (10.48)
State bank (D)	-17.31 (19.15)	-21.66 (17.11)	-16.21 (18.31)	-15.86 (18.32)	-14.68 (19.17)	-17.87 (19.51)
Land and buildings (D)	<b>34.22***</b> (7.460)	<b>33.58***</b> (6.824)	<b>33.98***</b> (7.269)	<b>34.08***</b> (7.392)	<b>33.12***</b> (7.039)	<b>33.88***</b> (7.824)
Machinery and equipment (D)	6.624 (6.685)	6.555 (4.950)	6.273 (6.766)	6.303 (6.794)	5.096 (6.551)	6.357 (6.959)
Accounts receivable and inventories (D)	12.23 (10.67)	11.76 (8.519)	12.12 (10.64)	12.53 (10.55)	12.17 (10.24)	11.81 (10.65)
Personal assets of owner (D)	<b>16.73**</b> (6.729)	<b>15.95**</b> (6.361)	<b>16.69**</b> (6.746)	<b>16.58**</b> (6.718)	<b>15.63**</b> (6.551)	<b>17.06**</b> (6.509)
Other (bonds, stocks) (D)	<b>-14.16**</b> (6.480)	<b>-16.70***</b> (6.049)	<b>-13.97**</b> (6.608)	<b>-14.25**</b> (6.589)	<b>-14.33**</b> (6.648)	<b>-13.87**</b> (6.362)
Manager experience	0.134 (0.169)	0.228 (0.158)	0.144 (0.168)	0.141 (0.170)	0.156 (0.168)	0.154 (0.175)
Loan duration in months	<b>-0.0894*</b> (0.0522)	-0.0561 (0.0549)	-0.0858 (0.0599)	-0.0850 (0.0572)	-0.0656 (0.0600)	-0.0843 (0.0511)
GDP per capita			-0.000309 (0.00101)			
Rule of law				-4.500 (7.073)		
Regulatory quality					<b>-14.23*</b> (8.388)	
Depth of credit information						-1.044 (2.622)
Constant	141.8*** (30.23)	135.6*** (27.44)	144.0*** (32.55)	140.0*** (29.76)	144.1*** (30.18)	145.8*** (35.89)
Country fixed effect	no	yes	no	no	no	no
Observations	2,316	2,316	2,316	2,316	2,316	2,316
R-squared	0.031	0.029	0.031	0.032	0.036	0.032

We also check if the two common measures of financial development have significant association with the amount of required collateral. We find no robust associations and therefore do not include them here. The details are as follows:

- Credit to private sector: for the whole sample we find that it is negatively correlated with the amount of collateral. But when we exclude Afghanistan and South Africa, outliers in this case, the coefficients lose most of their significance.
- Interest rate spread is not significantly related to collateral value.

The results imply that there seem to be a high degree of homogeneity across countries and firms with regard to collateral value. Income and institutional and financial development do not seem to affect how much firms are required to pledge as collateral.

## **5. Conclusion**

Collateralized borrowing (secured borrowing) is widely perceived as a common practice both for households and firms around the world. It has been pointed out as a central element in a mechanism that can transform relatively small shocks into large fluctuations in output and investment, and can help transmit shocks across sectors and countries. Despite the potentially important role of collateralized borrowing in amplifying and transmitting negative shocks, there has been no empirical study, as far as we know, that systematically documents the existence, prevalence and determinants of collateralized borrowing in the data. In this paper, we show that collateralized borrowing is widespread. On average, 73% of loans from financial institutions require collateral, and among loans with collateral, collateral value is about 139% of the loan value. We argue that the collateral value for other assets (most likely stocks, bonds and other financial assets), 111%, is probably the closest to the minimum collateral requirement for firms when they borrow from financial institutions. This implies that the maximum loan value is probably about 90% of the collateral value.

We find that reputable firms (those that have international management certifications, an overdraft account, or have higher capacity utilization) are less likely to pledge collateral. More interestingly, we also find that informal firms (those that are small, non-exporters, borrow short-term loans and borrow from non-bank institutions) are significantly less likely to pledge collateral. Our hypothesis is that informal firms, who tend to have less collateral assets and more difficulties accessing to finance, probably have to resort to local reputation and connections to more local,

informal lenders to circumvent the collateral requirement. These maneuvers are potentially very costly for small firms.

While we find great heterogeneity for the extensive margin, we do not find that for the intensive margin. The only robust and significant determinants for the intensive margin are the types of assets used for collateral. Similarly, country aggregate factors such as income, institutions (rule of law and regulatory quality) and depth of credit information strongly affect the extensive margin but have little impacts on the intensive margin.

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## Appendix

**Table A1: list of countries**

<b>Table 1: list of countries</b>		
1	Afghanistan	40 Tanzania
2	Albania	41 Uganda
3	Angola	42 Uruguay
4	Argentina	43 Zambia
5	Bolivia	
6	Botswana	
7	Bulgaria	
8	BurkinaFaso	
9	Burundi	
10	Cameroon	
11	CapeVerde	
12	Chile	
13	Colombia	
14	Croatia	
15	DRC	
16	Ecuador	
17	ElSalvador	
18	Gambia	
19	Ghana	
20	Guatemala	
21	Guinea	
22	GuineaBissau	
23	Honduras	
24	Kenya	
25	Mali	
26	Mauritania	
27	Mexico	
28	Mozambique	
29	Namibia	
30	Nicaragua	
31	Niger	
32	Nigeria	
33	Panama	
34	Paraguay	
35	Peru	
36	Rwanda	
37	Senegal	
38	SouthAfrica	
39	Swaziland	

**Table A2: regional distribution of countries**

Region	Number of countries
Europe & Central Asia	3
Latin America & Carib.	14
South Asia	1
Sub-Saharan Africa	25
Total	43

**Table A3: Summary Statistics**

Variable	#	Mean	SD	Min	Max
Collateral borrowing	6799	0.73	0.44	0	1
Collateral amount as % of the loan	4661	139.22	125.53	0	3000
<b><i>firm characteristic</i></b>					
years in operation	6834	20.23	18.42	0	310
small	7713	0.33	0.47	0	1
medium	7713	0.35	0.48	0	1
large	2439	1.00	0.00	1	1
manufacturing	7713	0.59	0.49	0	1
service	7713	0.41	0.49	0	1
international certificate	6625	0.21	0.41	0	1
export oriented	7713	0.06	0.24	0	1
audited	6780	0.58	0.49	0	1
capacity of utilization	4057	72.07	20.73	0	100
domestic private	7713	0.78	0.42	0	1
foreign private	7713	0.05	0.22	0	1
joint domestic and foreign private	7713	0.05	0.21	0	1
state	7713	0.00	0.02	0	1
manager experience	6823	19.00	11.31	0	70
overdraft	6803	0.74	0.44	0	1
<b><i>lender characteristic</i></b>					
private bank	7713	0.74	0.44	0	1
state bank	7713	0.05	0.21	0	1
non bank	7713	0.21	0.41	0	1
<b><i>loan and collateral characteristic</i></b>					
loan duration in months	6131	35.14	36.58	0	480
land, buildings	4955	0.56	0.50	0	1
machinery and equipment including movables	4947	0.29	0.45	0	1
account receivable and inventories	4939	0.13	0.34	0	1
personal assets of owner	4944	0.29	0.45	0	1
other	4938	0.16	0.37	0	1

**Table A4: Percent of loans that require collateral**

	<b>#</b>	<b>Mean</b>	<b>SD</b>	<b>Min</b>	<b>Max</b>
Whole sample	6799	0.73	0.44	0	1
<b>By region</b>					
LAC	4351	0.67	0.47	0	1
ECA	966	0.85	0.36	0	1
AFR	1465	0.84	0.36	0	1
SAR	17	0.82	0.39	0	1
<b>By firm size</b>					
small >=5 and <=19	2522	0.73	0.45	0	1
medium =20 and <=99	2713	0.74	0.44	0	1
large >=100	1564	0.73	0.45	0	1
<b>By firm length of operation</b>					
<25 years	4928	0.75	0.44	0	1
25-50 years	1323	0.70	0.46	0	1
50-100 years	495	0.67	0.47	0	1
>100 years	53	0.51	0.50	0	1
<b>By firm ownership</b>					
domestic private	5940	0.73	0.44	0	1
foregin private	382	0.72	0.45	0	1
joint domestic and foreign private	366	0.73	0.45	0	1
state	68	0.87	0.34	0	1
<b>By sector</b>					
Manufacturing	4530	0.72	0.45	0	1
Service	2269	0.74	0.44	0	1
<b>Loan given by</b>					
state bank	369	0.78	0.42	0	1
private bank	5676	0.72	0.45	0	1
non-bank institution	438	0.68	0.47	0	100

**Table A5: Collateral value as percentage of the loan value**

	<b>#</b>	<b>Mean</b>	<b>SD</b>	<b>Min</b>	<b>Max</b>
Whole sample	4661	139.22	125.53	0	3000
<b>By region</b>					
LAC	2757	139.90	137.92	0	3000
ECA	713	134.31	67.25	0	543
AFR	1178	137.20	106.00	0	999
SAR	13	445.31	525.87	111	2000
<b>By firm size</b>					
small $\geq 5$ and $\leq 19$	1711	139.94	119.65	0	1000
medium $=20$ and $\leq 99$	1886	143.31	143.88	0	3000
large $\geq 100$	1064	130.79	96.10	0	1000
<b>By firm length of operation</b>					
<25 years	3459	138.78	115.67	0	2000
25-50 years	877	143.60	159.09	0	3000
50-100 years	302	128.60	106.36	0	900
>100 years	23	177.52	261.52	0	999
<b>By firm ownership</b>					
domestic private	4078	140.67	128.99	0	3000
foreign private	251	120.87	92.31	0	999
joint domestic and foreign private	248	135.79	99.42	0	833
state	55	125.38	87.47	0	600
<b>By sector</b>					
Manufacturing	3085	141.66	124.70	0	3000
Service	1576	134.44	127.05	0	2000
<b>Loan given by</b>					
state bank	261	152.16	135.13	0	1000
private bank	3849	138.49	126.45	0	3000
non-bank institution	279	153.83	143.72	0	999
<b>Type of collateral</b>					
land, buildings	2632	151.99	130.38	0	2000
machinery and equipment including movables	1367	140.39	99.10	0	999
account receivable and inventories	636	140.00	117.39	1	999
personal assets of owner	1346	149.54	147.85	0	3000
other (bonds, stocks)	712	111.30	115.81	0	2000

**Table A6: Bank choice of firms**

<b>Dependent:</b> <b>Bank=1, non bank=0</b>	2005-2008	
	pooled-OLS	OLS-FE
Years in operation	<b>0.000342*</b> (0.000173)	<b>0.000454**</b> (0.000184)
small (D)	<b>-0.0575**</b> (0.0235)	<b>-0.0447**</b> (0.0196)
medium (D)	0.00259 (0.00884)	0.0112 (0.00882)
manufacture (D)	<b>-0.0816**</b> (0.0308)	-0.0189 (0.0261)
International certification (D)	-0.00514 (0.0127)	-0.0164 (0.0102)
Export oriented (D)	0.0122 (0.0120)	0.00818 (0.0134)
Audited (D)	0.0317 (0.0214)	<b>0.0199*</b> (0.0102)
Capacity of utilization	0.000160 (0.000277)	9.50e-05 (0.000199)
Domestic private (D)	-0.00423 (0.0310)	-0.0294 (0.0263)
Foreign private (D)	-0.0104 (0.0368)	-0.0196 (0.0285)
Joint domestic and foreign private (D)	-0.0242 (0.0362)	-0.0306 (0.0305)
Overdraft (D)	<b>0.0982***</b> (0.0231)	<b>0.0801***</b> (0.0212)
Manager experience	0.000116 (0.000396)	-2.15e-05 (0.000312)
Constant	0.918*** (0.0529)	0.899*** (0.0456)
Observations	3,634	3,634
R-squared	0.057	0.039
Number of country		39
Robust standard errors in parentheses		
*** p<0.01, ** p<0.05, * p<0.1		

**Table A7: Likelihood of collateralized borrowing - Logit**

Dependent variable: Collateralized borrowing=100 0 otherwise	2005-2008					
	pooled-logit	logit-FE	pooled-logit with country characteristics			
	(1)	(2)	(3)	(4)	(5)	(6)
Years in operation	<b>-0.00681**</b> (0.00284)	<b>-0.00454*</b> (0.00244)	<b>-0.00565*</b> (0.00292)	<b>-0.00584</b> (0.00362)	<b>-0.00668*</b> (0.00393)	<b>-0.00525*</b> (0.00272)
small (D)	<b>-0.455***</b> (0.121)	<b>-0.463***</b> (0.143)	<b>-0.465***</b> (0.118)	<b>-0.469***</b> (0.115)	<b>-0.478***</b> (0.117)	<b>-0.434***</b> (0.127)
medium (D)	-0.152 (0.107)	-0.184 (0.125)	-0.163 (0.109)	-0.154 (0.106)	-0.166 (0.105)	-0.153 (0.113)
manufacture (D)	<b>-0.862***</b> (0.265)	-0.214 (0.493)	<b>-1.069***</b> (0.348)	<b>-0.906***</b> (0.259)	<b>-1.066***</b> (0.264)	<b>-1.059***</b> (0.250)
International certification (D)	<b>-0.280*</b> (0.154)	<b>-0.345***</b> (0.114)	-0.211 (0.145)	-0.246 (0.150)	-0.235 (0.157)	<b>-0.312*</b> (0.161)
Export oriented (D)	<b>0.458**</b> (0.220)	<b>0.511***</b> (0.152)	<b>0.516**</b> (0.224)	<b>0.430**</b> (0.208)	<b>0.447**</b> (0.214)	<b>0.520**</b> (0.221)
Audited (D)	0.126 (0.117)	0.0278 (0.0974)	0.0914 (0.112)	0.103 (0.127)	0.0727 (0.127)	0.129 (0.110)
Private bank (D)	0.199 (0.307)	<b>0.524***</b> (0.170)	0.432 (0.308)	0.298 (0.329)	0.400 (0.321)	0.291 (0.274)
State bank (D)	0.526 (0.366)	<b>0.966***</b> (0.250)	<b>0.821**</b> (0.371)	<b>0.653*</b> (0.373)	0.640* (0.382)	0.474 (0.372)
Capacity of utilization	<b>-0.00456**</b> (0.00187)	<b>-0.00391*</b> (0.00206)	<b>-0.00328*</b> (0.00175)	<b>-0.00418**</b> (0.00183)	<b>-0.00398**</b> (0.00190)	<b>-0.00422**</b> (0.00187)
Domestic private (D)	<b>-0.864**</b> (0.386)	-0.324 (0.443)	<b>-0.926**</b> (0.452)	<b>-0.851**</b> (0.382)	<b>-0.801**</b> (0.400)	<b>-0.557</b> (0.382)
Foreign private (D)	<b>-0.719*</b> (0.368)	-0.591 (0.479)	<b>-0.890**</b> (0.439)	<b>-0.725*</b> (0.377)	<b>-0.760*</b> (0.404)	<b>-0.581*</b> (0.350)
Joint domestic and foreign private (D)	<b>-0.805**</b> (0.369)	-0.606 (0.480)	<b>-0.925**</b> (0.436)	<b>-0.823**</b> (0.366)	<b>-0.800**</b> (0.392)	<b>-0.601</b> (0.386)
Overdraft (D)	<b>-0.656***</b> (0.172)	<b>-0.138</b> (0.114)	<b>-0.605***</b> (0.166)	<b>-0.614***</b> (0.174)	<b>-0.600***</b> (0.157)	<b>-0.607***</b> (0.172)
Manager experience	<b>-0.00763*</b> (0.00420)	-0.000722 (0.00389)	-0.00523 (0.00463)	-0.00698 (0.00488)	-0.00676 (0.00535)	-0.00429 (0.00414)
Loan duration in months	<b>0.0164***</b> (0.00232)	<b>0.0141***</b> (0.00181)	<b>0.0174***</b> (0.00238)	<b>0.0169***</b> (0.00231)	<b>0.0175***</b> (0.00224)	<b>0.0168***</b> (0.00207)
GDP per capita			<b>-7.67e-05*</b> (4.03e-05)			
Rule of law				<b>-0.357**</b> (0.152)		
Regulatory quality					<b>-0.501***</b> (0.190)	
Depth of credit information						<b>-0.207***</b> (0.0669)
Constant	3.186*** (0.625)		3.619*** (0.716)	2.910*** (0.638)	3.074*** (0.626)	3.853*** (0.703)
country dummies						
Observations	3,415	3,390	3,415	3,415	3,415	3,413
Number of country		36				
Robust standard errors in parentheses						

**Table A8: Heckman two-step**

Dependent variable: Collateral amount as % of loan value	2005-2008											
	Heckman two-step											
	(1)		(2)		(3)		(4)		(5)		(6)	
VARIABLES	2nd stage	1st stage	2nd stage	1st stage	2nd stage	1st stage	2nd stage	1st stage	2nd stage	1st stage	2nd stage	1st stage
Manufacture (D)	1.837 (25.09)	<b>-0.535**</b> (0.258)	2.901 (26.62)	<b>-0.535**</b> (0.258)	1.035 (25.15)	<b>-0.535**</b> (0.258)	1.184 (25.11)	<b>-0.535**</b> (0.258)	-4.760 (25.15)	<b>-0.535**</b> (0.258)	0.354 (25.18)	<b>-0.536**</b> (0.258)
Years in operation	-0.147 (0.153)		-0.164 (0.154)		-0.143 (0.153)		-0.137 (0.153)		-0.141 (0.153)		-0.138 (0.153)	
International certification (D)	-5.870 (7.477)	<b>-0.185***</b> (0.0602)	-2.762 (7.676)	<b>-0.185***</b> (0.0602)	-5.269 (7.571)	<b>-0.185***</b> (0.0602)	-5.309 (7.497)	<b>-0.185***</b> (0.0602)	-3.919 (7.489)	<b>-0.185***</b> (0.0602)	-5.967 (7.475)	<b>-0.184***</b> (0.0602)
Export oriented (D)	-9.370 (9.976)	<b>0.259***</b> (0.0820)	-13.10 (10.06)	<b>0.259***</b> (0.0820)	-9.085 (9.995)	<b>0.259***</b> (0.0820)	-9.484 (9.979)	<b>0.259***</b> (0.0820)	-8.818 (9.968)	<b>0.259***</b> (0.0820)	-8.957 (9.993)	<b>0.259***</b> (0.0820)
Audited (D)	1.331 (5.944)	0.0803 (0.0506)	-0.0498 (6.194)	0.0803 (0.0506)	1.092 (5.964)	0.0803 (0.0506)	1.073 (5.950)	0.0803 (0.0506)	0.419 (5.943)	0.0803 (0.0506)	1.610 (5.954)	0.0812 (0.0506)
Capacity of utilization	-0.0937 (0.134)	<b>-0.00254**</b> (0.00114)	-0.0119 (0.136)	<b>-0.00254**</b> (0.00114)	-0.0872 (0.135)	<b>-0.00254**</b> (0.00114)	-0.0901 (0.134)	<b>-0.00254**</b> (0.00114)	-0.0771 (0.134)	<b>-0.00254**</b> (0.00114)	-0.0925 (0.134)	<b>-0.00254**</b> (0.00114)
Domestic private (D)	10.98 (22.72)	<b>-0.411*</b> (0.224)	9.796 (22.85)	<b>-0.411*</b> (0.224)	11.02 (22.73)	<b>-0.411*</b> (0.224)	10.93 (22.73)	<b>-0.411*</b> (0.224)	12.38 (22.71)	<b>-0.411*</b> (0.224)	12.26 (22.83)	<b>-0.412*</b> (0.224)
Foreign private (D)	1.107 (24.35)	-0.334 (0.245)	0.880 (24.60)	-0.334 (0.245)	0.582 (24.38)	-0.334 (0.245)	0.750 (24.36)	-0.334 (0.245)	-0.280 (24.33)	-0.334 (0.245)	1.607 (24.35)	-0.334 (0.245)
Joint domestic and foreign private (D)	2.201 (24.59)	-0.380 (0.247)	1.017 (24.68)	-0.380 (0.247)	2.195 (24.60)	-0.380 (0.247)	2.057 (24.60)	-0.380 (0.247)	3.001 (24.57)	-0.380 (0.247)	3.061 (24.63)	-0.379 (0.247)
Overdraft (D)	-0.660 (9.398)	<b>0.375***</b> (0.0583)	-1.642 (9.554)	<b>0.375***</b> (0.0583)	-0.998 (9.424)	<b>0.375***</b> (0.0583)	-1.131 (9.410)	<b>0.375***</b> (0.0583)	-2.155 (9.397)	<b>0.375***</b> (0.0583)	-0.707 (9.414)	<b>0.375***</b> (0.0583)
Private bank (D)	<b>-20.67**</b> (10.47)	0.119 (0.0883)	<b>-18.65*</b> (10.52)	0.119 (0.0883)	<b>-19.93*</b> (10.57)	0.119 (0.0883)	<b>-19.70*</b> (10.51)	0.119 (0.0883)	-16.80 (10.51)	0.119 (0.0883)	<b>-20.47*</b> (10.47)	0.119 (0.0883)
State bank (D)	-21.85 (15.52)	<b>0.314**</b> (0.132)	-19.56 (15.88)	<b>0.314**</b> (0.132)	-20.81 (15.66)	<b>0.314**</b> (0.132)	-20.52 (15.57)	<b>0.314**</b> (0.132)	-19.61 (15.52)	<b>0.314**</b> (0.132)	-22.20 (15.52)	<b>0.314**</b> (0.132)
Land and buildings (D)	<b>33.97***</b> (5.957)		<b>32.59***</b> (5.959)		<b>33.72***</b> (5.978)		<b>33.82***</b> (5.957)		<b>32.84***</b> (5.950)		<b>33.59***</b> (5.974)	
Machinery and equipment (D)	6.396 (5.734)		4.959 (5.785)		6.027 (5.780)		6.066 (5.742)		4.843 (5.737)		6.265 (5.746)	
Accounts receivable and inventories (D)	12.51 (8.200)		10.47 (8.184)		12.40 (8.202)		12.82 (8.203)		12.47 (8.178)		12.19 (8.221)	
Personal assets of owner (D)	<b>16.96***</b> (6.110)		<b>15.14**</b> (6.059)		<b>16.92***</b> (6.110)		<b>16.81***</b> (6.110)		<b>15.87***</b> (6.102)		<b>17.31***</b> (6.126)	
Other (bonds, stocks) (D)	<b>-13.88*</b> (7.899)		<b>-14.57*</b> (7.875)		<b>-13.68*</b> (7.909)		<b>-13.96*</b> (7.897)		<b>-14.02*</b> (7.878)		<b>-13.58*</b> (7.907)	
Manager experience	0.223 (0.277)	<b>-0.00639***</b> (0.00206)	0.342 (0.278)	<b>-0.00639***</b> (0.00206)	0.235 (0.278)	<b>-0.00639***</b> (0.00206)	0.232 (0.277)	<b>-0.00639***</b> (0.00206)	0.253 (0.277)	<b>-0.00639***</b> (0.00206)	0.241 (0.278)	<b>-0.00636***</b> (0.00206)
Loan duration in months	-0.188 (0.169)	<b>0.00954***</b> (0.000901)	-0.227 (0.171)	<b>0.00954***</b> (0.000901)	-0.186 (0.169)	<b>0.00954***</b> (0.000901)	-0.186 (0.169)	<b>0.00954***</b> (0.000901)	-0.173 (0.169)	<b>0.00954***</b> (0.000901)	-0.180 (0.169)	<b>0.00955***</b> (0.000901)
Small (D)		<b>-0.172***</b> (0.0541)		<b>-0.172***</b> (0.0541)		<b>-0.172***</b> (0.0541)		<b>-0.172***</b> (0.0541)		<b>-0.172***</b> (0.0541)		<b>-0.171***</b> (0.0542)
GDP per capita					-0.000320 (0.000630)							
Rule of law							-4.549 (4.262)					
Regulatory quality									-14.28*** (4.082)			
Depth of credit information											-0.845 (1.439)	
lambda (inverse mill ratio)	-29.38 (45.79)		-46.42 (45.91)		-30.03 (45.82)		-30.21 (45.80)		-31.97 (45.74)		-28.66 (45.82)	
Constant	152.7*** (39.72)	0.908** (0.380)	151.3*** (41.11)	0.908** (0.380)	155.2*** (40.04)	0.908** (0.380)	151.2*** (39.76)	0.908** (0.380)	156.0*** (39.70)	0.908** (0.380)	155.4*** (40.05)	0.906** (0.380)
Country fixed effect	no		yes		no		no		no		no	
Observations	3,312	3,312	3,312	3,312	3,312	3,312	3,312	3,312	3,312	3,312	3,311	3,311