

# Collateralized Borrowing

Insights from The World Bank Enterprise Surveys

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## Abstract

Using the World Bank Enterprise Surveys, we investigate the prevalence and correlates of collateralized borrowing in 131 countries between 2005–2017. Overall, 77 percent of loans require collateral, and the median loan-to-collateral value is 60 percent. Small firms and

loans from non-bank financial institutions are less often associated with collateral. When collateral is pledged, the type of collateral assets is strongly correlated with the loan-to-value ratio.

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# **Collateralized Borrowing: Insights from The World Bank Enterprise Surveys**

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## 1 Introduction

Collateralized borrowing is a widespread practice for both households and firms. Early evidence suggests that for the 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 market friction that comes from information asymmetry, which is where, banks cannot distinguish good from bad borrowers (i.e. as in Stiglitz and Weiss, 1981). Collateralized borrowing allows creditors to recover, at least partially, loans made to debtors in cases of default.

Collateralized borrowing, on the other hand, has also been identified as central in a mechanism that could transform relatively small shocks into large fluctuations of 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 theoretically works. It shows that if debt needs to be collateralized by the value of a firm's productive assets, then a small shock that reduces the firm's asset value could also reduce its borrowing capacity. Thus, the firm's investment declines, and this further depresses its asset value and tightens its credit constraint. The mutual feedback between the declines of asset prices and the collapses of investment and output, explains how a small shock can be amplified.

After Kiyotaki and Moore (1997) and Bernanke, Gertler and Gilchrist (1999), there has been an enormous set of literature that links collateral constraint-based frictions to the amplification and transmission of negative shocks across sectors and countries. Notable examples include: Paasche (2001), Iacoviello (2005), Pavlova and Rigobon (2008), and Mendoza (2010). The literature is further motivated by the 2008-2009 global crisis and has been growing substantially to address different policy questions on: over-borrowing (Bianchi, 2011), macro-prudential policies, (such as Bianchi and Mendoza, 2010; Bianchi and Mendoza, 2017; Jeanne and Korinek, 2017), and the transmission of negative shocks (Devereux and Yetman, 2010; Nguyen, 2017). Most 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 the 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 correlates of collateral borrowing in the data across countries.<sup>2</sup> Of special importance is the empirical value of *loan-to-value* ratio, which is the maximum loan value that firms could borrow as a 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 the effects

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<sup>2</sup> There are however some studies in advanced countries 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).

of the shocks could be on the real economy. *Ceteris paribus*, when  $\varphi$  is larger, borrowing constraints are less likely to bind, and crises are less frequent. Without an empirical measurement of  $\varphi$ , the theoretical literature must resort to calibrating  $\varphi$  to match some business cycle moments. Thus, the value of  $\varphi$  is model-specific, and not surprisingly, it varies markedly across studies (for example 15%-30% in Mendoza (2010), 5% in Korinek and Jeanne (2010), 32% 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 correlates 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 and it is divided into two parts. In the first part, we use data from 22,263 borrowing firms,<sup>3</sup> across 131 countries, and between 2005-2017 from World Bank's Enterprise Surveys (WBES) to document the existence and prevalence of collateralized borrowing. We show that collateralized borrowing is widespread. On average, 77% of loans from financial institutions require collateral, and among loans with collateral, collateral value is about 167% of the loan value. This implies that for a \$1 loan, the average collateral value is \$1.67. Equivalently, the loan-to-value ratio  $\varphi$  is about 60%. When stocks, bonds and other financial assets are pledged as collateral, the collateral value is about 120% of the loan value. This implies that the value of  $\varphi$  is 83%. Either at 60% or 83%, the value is much larger than those commonly used in the theoretical literature. Our empirical estimate of  $\varphi$  has been cited and used in recent theoretical literature on macro-prudential policy, for example, by Bianchi and Mendoza (2017).

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

On the extensive margin, we find that foreign firms 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.

What is new and more interesting is that small firms are found to be significantly less likely to pledge collateral compared to medium and large firms. Loans from non-bank financial institutions are also more associated with no collateral. These two results are related, because small firms are significantly more

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<sup>3</sup> Among 43,879 firms that provided valid answers to whether collateral was required, 22,263 firms have approval of loans within three years of the interview. These 22,263 firms form the sample for us to analyze the likelihood of collateral requirement.

likely to borrow from non-bank financial institutions, rather than from formal banks. These findings suggest that small firms, presumably due to their informality and lack of collateral assets, must maneuver around the collateral requirement. They probably rely on their local reputation and connections to financial institutions that are less formal.

On the intensive margin of collateral borrowing, the most robust and significant correlates for collateral value are the types of assets used for collateral. When more illiquid and indivisible assets such as land and buildings are pledged as collateral, a higher collateral value is required.<sup>4</sup> By contrast, when more liquid assets are used, a lower collateral value is required. Among firm characteristics, firm size and industry matter. Small firms and service firms pledge a smaller collateral value, probably for the same reason discussed above.

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. collateral value). 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 systems are significantly less likely to pledge collateral, it seems plausible that 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.

Overall, the results show 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 likely 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 et al, 1988), business group affiliation (Hoshi et al, 1991), size and age (Devereux and Schiantarelli, 1990), the presence of bond ratings (Whited, 1992), the degree of shareholder concentration, and the pattern of insider trading (Oliner and Rudebusch, 1992) as potential

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<sup>4</sup> Benmelech and Bergman (2009) 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 ratios.

characteristics that affect firms' financial constraints (inferred from the firm's investment Bellman equation). Beck et al (2006), using the same World Bank Enterprise Surveys as we use, follow a different approach that looks 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. Then, section 3 explores factors that affect the likelihood of having to put collateral when borrowing. Next, section 4 studies determinants of the required amount of collateral and finally, section 5 concludes.

## **2 Data and descriptive analysis**

We use the World Bank's Enterprise Surveys (WBES), a rich, firm-level survey database that provides information about firms' characteristics. These characteristics are: ownership, size, sector, region in which it is located, annual sales, capacity utilization, employment, length in operation, whether it has loans, and in cases that it has, whether collateral was required, type of assets 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 financial companies. The database covers many small and medium size firms, thereby allowing us to study the issue of collateralized borrowing across countries and firm characteristics.

We restrict our analyses to 22,263 firms across 131 countries between 2008 and 2017 (the list of countries is given in Table A1). These 22,263 firms are those that were currently borrowing, and the loan was issued within three years before the survey. For example, if the firm is surveyed in 2009 and the loan was issued earlier than 2006, then, we drop the firm. In the data, some existing loans were granted as far back as 1930s. Loans that were granted more than three years from the time of the survey were dropped because they were too far back to be determined by firms' current characteristics. Effectively, the loan and collateral data are from 2005 to 2017, although the survey years are from 2008 to 2017. The dataset is effectively cross-sectional since the firms do not repeat, i.e. each firm only appears once in the dataset. The dataset includes countries from six regions of the world: Sub-Saharan Africa (SSA), East Asia and Pacific (EAP), Europe and Central Asia (ECA), Latin America and the Caribbean (LAC), Middle East and North Africa (MENA), South Asia (SAR). The summary statistics of all the variables are presented in Table A3.

The main survey questions of interest are 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.

The first question of interest is if the existing loan requires collateral. The question in the survey states, "*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 types, sectors and types of lending institutions that extend the loan. Table A2 reports the share of loans that are secured with collateral. For the whole sample, 77% of the loans require collateral. Comparing regional averages, the region with the highest share of loans requiring collateral is Sub-Saharan Africa (85%) and the region with the lowest share is Latin America (65%). Younger firms are more likely to be collateralized: 81% of firms younger than 5 years required collaterals for their loans, compared to an average of 73% for a firm older than 25 years. In terms of firm's ownership, foreign-owned firms are less likely to be collateralized (69%) compared to domestic private firms (78%). In term of lending institutions, loans given by state banks are more likely to be collateralized (87%) than private banks (75%) and non-bank institutions (70%). These characteristics are further confirmed and discussed in the econometric analysis.

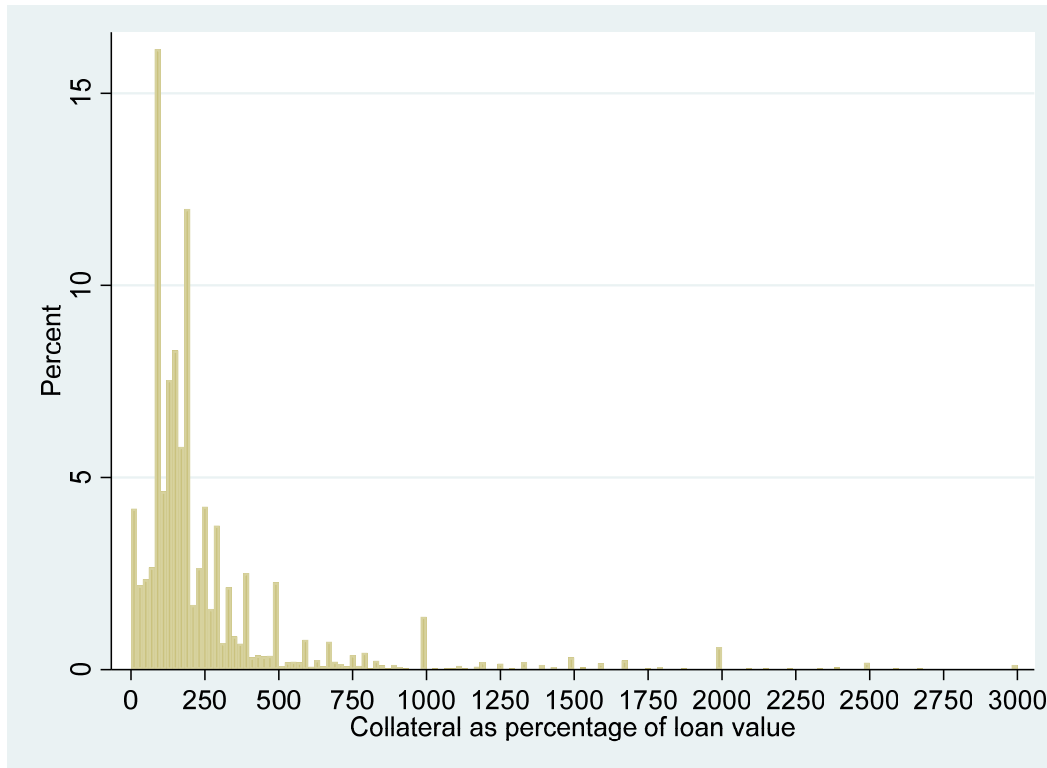
The second question of interest is if the loan requires collateral, how much is the value of collateral relative to the loan value? (i.e. the intensive margin of collateral). The related question in the survey is the following: "*Referring only to this most recent line of credit or loan, what was the approximate value of the collateral required as a percentage of the value of the loan or line of credit?*" We drop loans with collateral values exceeding 3000% of the loan values, which we think are measurement errors (this takes up only 1.7% of the sample<sup>5</sup>). After dropping them, 12,297 firms reported having collateralized loans. Figure 1 shows the distribution of collateral needed when the loan requires collateral. The most reported collateral value is 100% (about 15% of loans require so). The next common collateral value is 200% with 10% of the loans. Collateral values up to 300%, 400% or even 500% of the loan value are not uncommon. For the whole sample, the median collateral value is 167% of the loan value. Table A3 summarizes how much firms need to pledge as collateral. Small and medium size firms pledge slightly larger collateral for their loans than large firms.

### **Figure 1: Distribution of collateral amount**

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<sup>5</sup> Among 43,879 firms that provided valid answers to whether collateral was required, 12,505 firms have had positive values of collateral that were granted within the last three years of the interview. Among them, 12,297 firms provided collateral less than or equal to 3,000 percent of the loan value.





We should note that we do not equate *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 a % of the loan value) is higher.

In the data, firms can use any (or a combination) of the following types of asset as collateral: i) land and buildings; ii) machinery and equipment including movables; iii) accounts receivable and inventories; iv) personal assets of owners (e.g. houses); and v) other types (stocks, equities, bonds and deposits). As table A3 indicates, the collateral value varies with the type of assets: collateral with personal assets of owners (house etc.) forms the highest amount (200%) and other types (stocks, etc.) have the lowest (120%). Land and buildings under ownership of the establishment are also an important type of collateral, and form on average 189% of the loan. Besides the issue of land and buildings' indivisibility, their high collateral requirement could be because 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 (120%) 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 83% of the collateral value.

### 3. When does borrowing require collateral?

This section examines econometrically the first question: “Referring 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, and the second is because they have no need. For example, small and informal firms in developing countries, who operate in service sectors are less likely to have assets for collateral. As a result, they potentially 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 a different reason. For example, in developed countries, high levels of financial development could allow banks to track firms’ history of payments and defaults. In this case, banks are more likely to know the types of firms. Since, defaults for firms are costly, firms are less likely to be required collateral when borrowing.

In our sample, there are 22,263 firms, and all of them have existing loans. We run OLS regressions with country fixed effects. Alternatively, we also run logit regressions, and the results are qualitatively similar (Table A4 in the Appendix). Note that when the mean of a dependent variable is not close to 1 or 0, OLS gives qualitatively similar results to logit with the advantage of easier interpretation of the explanatory variables’ coefficients. In all the regressions, we correct for clustered errors at the country level. The reduced forms of the two equations are the following:

$$\text{Pooled-OLS:} \quad \mathbf{Required}_i = \alpha + \beta \mathbf{X}_i + \varepsilon_i$$

$$\text{OLS-FE:} \quad \mathbf{Required}_{ik} = \alpha + \beta \mathbf{X}_{ik} + \gamma \mathbf{C}_k + \varepsilon_{ik}$$

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.  $\mathbf{X}$  is a vector of variables that includes firm, lender and loan characteristics.  $\mathbf{C}$  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. Explanatory variables include:

Firm characteristics:

- *Size*: small (less than 19 employees), medium (between 20 and 99 employees), and 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 to be required collateral because small firms simply might not have collateralized 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*: whether the firm is from a service or manufacturing industry. We expect that loans to service firms are less likely to be secured with collateral because they tend to be more informal and have few assets.

- *Exporter*: a dummy variable that takes the value of 1 if the main market for the firm's production is abroad, and 0 otherwise. Here we are also not sure about the impact. On the one hand, 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 the value of 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 they borrow.

- *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.

Lender's characteristics:

- *Lender types*: whether 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 measure captures the overall economic development of countries and is in real international dollars (PPP) based on data from the World Economic Outlook.

- *Institutional variables*: We use *Regulatory Quality* and *Rule of law*<sup>6</sup> data 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>7</sup> (which takes a value of 1 to 6), taken from the World Bank's Doing Business Surveys. We also use two common financial development measures. The first one is domestic credit to private sector, as a % of GDP.<sup>8</sup> This proxy is widely used in literature on the access to finance (for example, see Beck et al, 2006). The second measure is interest rate spread, to capture the efficiency of the banking sector<sup>9</sup>.

The first column in Table 1 presents the OLS regressions with country fixed effects. The dependent variable takes the value 100 when the loan is collateralized and zero otherwise. Relevant predictors of collateralized borrowing are years in operation, firm size, industry, having international management certification, export orientation, firm's ownership and having overdraft facility. Essentially, we look for *within-country variations across firms*. Columns 2 to 6 control for country characteristics (and remove country fixed effects). Overall, older firms are less likely to pledge collateral. One more year of operation reduces the chance of pledging collateral by about 0.1%. Small firms are 5-6% less likely to pledge collateral than large firms. One could also expect the opposite sign. However, if we consider the borrowing

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<sup>6</sup> Other commonly used variables such as Government Effectiveness or Control for Corruption yield similar results.

<sup>7</sup> Depth of credit information index is part of Doing Business Report of the World Bank. It measures 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.

<sup>8</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>9</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.

decision, not from the lens of lending institution, but from the borrower's, it might be easier to understand the result. It is likely that small firms do not have assets for collateral, and therefore rely on reputation, personal relationships or loans from less formal lending institutions as substitutes for collateral, a point to which we will return to shortly. The type of lenders matter; this means that within a country, borrowing from bank institutions, either private or public banks, is more likely to be secured with collateral than borrowing from non-bank financial institutions. Non-bank institutions are 6-14% less likely to require collateral than Private banks (the default dummy). State banks are almost 5% to 12% more likely to require collateral than private banks. It is likely that only firms that cannot borrow from formal banks (due to the lack of collateralized assets for example) would go to non-bank institutions. Therefore, on average, borrowing from non-bank institutions is less likely collateralized. Foreign firms are 4% to 24% less likely to pledge for collateral compared to domestic private firms (the default dummy).

To sum up, we can group the significant factors into two groups: firms' informality (small, loans from non-bank institutions) and firms' reputation (foreign firms). Both groups help firms avoid collateral requirements, but for different reasons.

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. GDP per capita and all measures of institutional quality are highly significant and negative (columns 2 to 6 in Table 1). When we put them together, the sign for Rule of Law flips while turning insignificant, due to high correlation with regulatory quality. This is consistent with the view that better legal and regulatory institutions allow better contract monitoring and enforcement, and hence less need for collateral.

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, credit-worthy 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 results confirm our expectation: better credit information is strongly associated with a lower probability of collateral. This result suggests the importance 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 could resort to other (potentially costly) channels to get around the collateral requirement.

**Table 1: Likelihood of collateralized borrowing**

Dependent Variable: Collateral Required=100 otherwise 0	2005-2017					
	OLS-FE	OLS with country characteristics				
	(1)	(2)	(3)	(4)	(5)	(6)
years of operation	-0.0265 (0.0190)	-0.116*** (0.0299)	-0.127*** (0.0324)	-0.115*** (0.0345)	-0.101** (0.0424)	-0.0739** (0.0353)
Small(<20)	-5.518*** (1.425)	-5.723*** (1.483)	-5.921*** (1.538)	-5.241*** (1.538)	-6.826** (2.615)	-4.635** (2.267)
Medium(20-99)	-0.445 (1.046)	-0.652 (0.950)	-0.538 (1.068)	-0.300 (1.024)	-2.754 (1.688)	-1.993 (1.596)
services (D)	-2.369* (1.271)	2.174 (1.626)	1.659 (1.945)	1.495 (1.751)	-2.366 (2.222)	-1.655 (1.923)
loan from a state-owned bank (D)	3.466** (1.612)	8.413*** (1.579)	10.90*** (1.963)	8.077*** (1.645)	12.01*** (3.176)	5.499* (2.791)
loan from a non-bank financial institution (D)	-7.923*** (2.913)	-7.521** (3.409)	-5.900 (3.569)	-7.424** (3.440)	-12.10** (4.634)	-14.74*** (4.460)
loan from others (D)	-22.95*** (4.420)	-22.08*** (4.233)	-20.74*** (4.237)	-22.40*** (4.330)	-36.42*** (8.042)	-38.89*** (8.445)
state-owned firm (D)	-8.127** (4.031)	-1.222 (4.469)	-2.352 (4.126)	-4.353 (4.721)	0.411 (8.646)	-2.821 (10.10)
foreign-owned firm (D)	-8.040*** (1.629)	-7.629*** (1.818)	-6.502*** (1.952)	-6.787*** (1.908)	-4.701 (2.951)	-4.138 (2.651)
other firm (D)	-6.014** (2.826)	-3.038 (4.482)	-2.639 (5.003)	-2.178 (4.751)	-3.905 (8.039)	-1.255 (6.730)
% of sales in export >50%	0.369 (1.127)	1.071 (1.235)	1.206 (1.245)	1.360 (1.183)	-2.176 (2.039)	0.154 (1.926)
an internationally recognized certification	-1.124* (0.677)	-1.167 (0.892)	-1.519 (0.924)	-1.412 (0.960)	-0.0324 (2.108)	0.469 (1.654)
a checking and/or saving account	1.081 (1.586)	1.165 (2.020)	1.237 (2.442)	0.558 (2.034)	-3.289 (2.701)	-2.529 (2.443)
overdraft facility	0.534 (0.903)	-3.952** (1.814)	-3.352 (2.063)	-2.980 (1.950)	-2.945 (3.425)	-2.740 (3.006)
GDP per capita		-0.000822*** (0.000205)				-0.000812* (0.000460)
rule of law			-5.596** (2.515)			7.395 (5.076)
regulatory quality				-9.602*** (2.367)		-12.62** (5.200)
depth of credit information					-1.938*** (0.499)	-0.278 (0.562)
Constant	69.99*** (2.965)	112.3*** (3.954)	106.3*** (4.504)	105.2*** (4.041)	97.83*** (4.361)	95.97*** (6.482)
country dummies	Yes	No	No	No	No	No
year dummies	Yes	Yes	Yes	Yes	Yes	Yes
OLS weighted by	-	-	-	-	-	-
Observations	20352	20318	19811	19811	5466	5382
R-squared	0.163	0.0663	0.0550	0.0680	0.0632	0.0989

Clustered standard errors in parentheses, \*\*\*p<0.01, \*\*p<0.05, \*p<0.1

#### 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 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 proceed to discuss the results.

##### 4.1 Empirical model

We run OLS regressions with country fixed effects, and correct for clustered errors at the country level. The reduced forms of the two equations are the following:

$$\text{Pooled-OLS:} \quad \text{Percent}_i = \alpha + \beta X_i + \varepsilon_i$$

$$\text{OLS-FE:} \quad \text{Percent}_{ik} = \alpha + \beta X_{ik} + \gamma C_k + \varepsilon_{ik}$$

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; machinery and equipment including movables; account receivable and inventories; personal assets of owner; bonds, stocks and other financial assets.

##### 4.2 Findings

Table 2 presents the results of the OLS regressions. Column 1 shows those with country fixed effects; and the remaining ones show pooled-OLS with country specific characteristics. The types of collateral assets are significant and robust. 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. Column 1 reveals that having land and building as collateral assets is associated with a 60% increase in the relative value of collateral. Having personal assets as collateral is associated with a 30% increase in the relative value of collateral, while having other assets (e.g. stocks, bonds and other financial assets) as collateral is associated with a 39% *decrease* in the relative value of collateral. Potential reasons for such a higher collateral value of land, buildings and personal assets (mostly houses) are their

indivisibility and illiquidity. Financial assets required significantly smaller collateral value. Another probable 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 pledge non-firm-specific assets as collateral, and this includes land and other real estate properties.

Small firms are required to pledge a higher collateral, ranging from 24% to 81% more (as a percentage of the loan value) than large firms (the default dummy). Service firms are required to pledge 33% to 119% less (as a percentage of the loan value) than manufacturing firms.

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



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

Dependent Variable	OLS-FE		OLS with country characteristics			
	(1)	(2)	(3)	(4)	(5)	(6)
Collateral amount as % of loan value						
years of operation	0.247 (0.185)	0.247 (0.176)	0.0821 (0.180)	0.139 (0.175)	0.397 (0.421)	0.440 (0.419)
Small(<20)	30.14** (14.73)	25.03* (13.94)	24.79* (14.27)	27.43* (14.05)	45.39** (21.17)	51.31** (21.58)
Medium(20-99)	6.190 (11.40)	5.267 (11.00)	7.813 (10.88)	8.560 (10.88)	8.135 (20.62)	9.855 (21.09)
services (D)	-33.30*** (7.269)	-35.57*** (8.121)	-36.19*** (8.674)	-37.38*** (8.366)	-36.03** (15.74)	-36.34** (14.96)
loan from a state-owned bank (D)	-2.488 (10.97)	7.951 (10.30)	15.27 (13.94)	5.901 (12.37)	12.55 (25.46)	-7.071 (24.39)
loan from a non-bank financial institution (D)	17.97 (17.65)	30.71 (18.82)	31.18* (18.24)	25.59 (17.56)	-1.997 (31.06)	-11.90 (31.64)
loan from others (D)	15.99 (40.43)	15.02 (37.26)	17.49 (38.66)	11.81 (39.14)	-99.07*** (17.26)	-107.7*** (18.36)
state-owned firm (D)	-2.727 (41.85)	-24.81 (33.12)	-31.35 (34.42)	-38.82 (32.67)	8.476 (81.32)	9.713 (80.20)
foreign-owned firm (D)	4.036 (18.09)	-10.82 (17.52)	-7.470 (17.99)	-9.338 (17.81)	13.99 (32.56)	19.06 (32.76)
other firm (D)	-11.79 (35.21)	-36.89 (43.94)	-52.25 (43.41)	-50.59 (44.20)	-89.02** (37.50)	-83.88** (39.13)
% of sales in export >50%	-1.787 (11.11)	-2.127 (12.46)	1.152 (12.80)	1.966 (12.61)	-44.44** (21.25)	-36.33 (22.02)
an internationally recognized certification	-9.393 (14.68)	-6.144 (14.46)	-4.694 (15.63)	-3.936 (15.50)	41.83** (20.80)	43.62** (21.15)
a checking and/or saving account	2.230 (18.20)	-2.838 (17.75)	-10.09 (20.11)	-12.87 (20.88)	3.112 (23.61)	-8.026 (26.48)
overdraft facility	7.356 (8.666)	10.52 (10.04)	8.415 (10.83)	10.34 (11.01)	-3.906 (17.00)	-2.209 (16.36)
type of collateral: land/buildings	60.87*** (8.409)	63.43*** (8.503)	71.50*** (9.073)	69.45*** (9.176)	65.51*** (14.35)	64.32*** (14.41)
type of collateral: machinery and equipment	-33.75*** (6.745)	-35.38*** (6.951)	-31.50*** (7.481)	-34.97*** (7.165)	-36.86** (17.55)	-48.31*** (18.02)
type of collateral: account receivable and inventories	-13.45 (9.085)	-16.26* (8.367)	-11.15 (8.543)	-12.31 (8.392)	0.725 (16.89)	-5.613 (17.42)
type of collateral: personal assets of owner	30.37*** (9.475)	37.36*** (10.06)	40.59*** (10.25)	38.17*** (10.27)	-0.267 (16.84)	-3.163 (18.08)
type of collateral: bonds/stocks/other assets	-39.94*** (10.30)	-46.92*** (11.22)	-49.98*** (11.22)	-47.47*** (11.25)	-61.37*** (18.87)	-57.20*** (19.29)
GDP per capita		-0.00448*** (0.000770)				-0.00265 (0.00217)
rule of law			-21.05* (11.73)			29.76 (31.77)
regulatory quality				-37.57*** (11.30)		-40.46 (30.73)
depth of credit information					-7.312*** (2.770)	-2.175 (2.899)
Constant	235.7*** (33.66)	102.9*** (33.22)	71.57** (33.13)	70.36** (33.26)	303.3*** (35.41)	320.7*** (39.71)
country dummies	Yes	No	No	No	No	No
year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11016	11010	10652	10652	3013	2966
R-squared	0.0658	0.0348	0.0293	0.0319	0.0275	0.0307

Clustered standard errors in parentheses, \*\*\*p<0.01, \*\*p<0.05, \*p<0.1

## 5. Conclusion

Secured borrowing is a widespread practice both for households and firms around the world. It has also 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 significant 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 correlates of collateralized borrowing in the data. In this paper, we show that collateralized borrowing is widespread. On average, 77% of loans from financial institutions require collateral, and among loans with collateral, collateral value is about 167% of the loan value. We argue that the collateral value for other assets (stocks, bonds and other financial assets), 120%, 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 83% of the collateral value.

We find that foreign firms are less likely to pledge collateral. More interestingly, we also find that informal firms (those that are small 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 finance, probably resort to local reputation and connections to local, informal lenders to circumvent the collateral requirement. These maneuvers are potentially very costly for small firms.

Finally, while we find great heterogeneity for the extensive margin, we do not find that for the intensive margin. The most robust and significant correlates 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 and number of firms in each country**

<b>SSA</b>		<b>EAP</b>		<b>ECA</b>	
Angola	28	Cambodia	130	Albania	51
Benin	93	Fiji	34	Armenia	162
Botswana	112	Indonesia	521	Azerbaijan	53
Burkina Faso	96	Lao PDR	83	Belarus	112
Burundi	86	Malaysia	82	Bosnia and Herzegovina	176
Cabo Verde	50	Micronesia, Fed. Sts.	18	Bulgaria	82
Cameroon	149	Mongolia	161	Croatia	148
Central African Republic	30	Myanmar	118	Czech Republic	98
Chad	22	Papua New Guinea	26	Estonia	94
Congo, Dem. Rep.	66	Philippines	542	Fyr Macedonia	154
Côte d'Ivoire	116	Samoa	41	Georgia	129
Eritrea	12	Solomon Islands	59	Hungary	66
Ethiopia	405	Thailand	54	Kazakhstan	95
Ghana	123	Timor-Leste	8	Kosovo	110
Guinea	9	Tonga	47	Kyrgyz Republic	59
Kenya	249	Vanuatu	46	Latvia	37
Lesotho	33	Vietnam	1081	Lithuania	54
Liberia	27			Moldova	115
Madagascar	139	<b>LAC</b>		Montenegro	44
Malawi	155	Antigua and Barbuda	56	Poland	95
Mali	58	Argentina	560	Romania	201
Mauritania	36	Bahamas, The	28	Russian Federation	959
Mauritius	156	Barbados	54	Serbia	179
Namibia	84	Belize	54	Slovak Republic	71
Niger	85	Bolivia	294	Slovenia	163
Nigeria	115	Chile	688	Sweden	163
Rwanda	96	Colombia	641	Tajikistan	44
Senegal	83	Costa Rica	234	Turkey	420
Sierra Leone	16	Dominica	49	Ukraine	143
South Sudan	38	Dominican Republic	298	Uzbekistan	100
Sudan	20	Ecuador	427		
Swaziland	17	El Salvador	425		
Tanzania	94	Grenada	49		
Togo	90	Guatemala	204	<b>MENA</b>	
Uganda	93	Guyana	65	Djibouti	39
Zambia	87	Honduras	240	Egypt, Arab Rep.	346
Zimbabwe	156	Jamaica	63	Iraq	37
		Mexico	513	Israel	254
<b>SAR</b>		Nicaragua	269	Jordan	87
Afghanistan	31	Panama	37	Lebanon	243
Bangladesh	395	Paraguay	387	Morocco	126
Bhutan	187	Peru	690	Tunisia	261
India	1768	St. Kitts and Nevis	55	West Bank and Gaza	42
Nepal	241	St. Lucia	43	Yemen, Rep.	75
Pakistan	19	St. Vincent and the Gr	67		
Sri Lanka	185	Suriname	54		
		Trinidad and Tobago	141		
		Uruguay	430		
		Venezuela, RB	60		

**Table A2: Percentage of loans that require collateral**

	<b>Number of firms</b>	<b>Mean</b>	<b>SD</b>	<b>Min</b>	<b>Max</b>
Whole sample	22,263	0.77	0.42	0	1
<b><i>By region</i></b>					
SSA	3,324	0.85	0.36	0	1
EAP	3,051	0.85	0.36	0	1
ECA	4,377	0.77	0.42	0	1
LAC	7,175	0.65	0.48	0	1
MENA	1,510	0.80	0.40	0	1
SAR	2,826	0.88	0.33	0	1
<b><i>By firm size</i></b>					
Small(<20)	7,481	0.75	0.43	0	1
Medium(20-99)	8,639	0.79	0.41	0	1
Large(100 And Over)	6,143	0.77	0.42	0	1
<b><i>By firm ownership</i></b>					
Domestic-private	19,977	0.78	0.42	0	1
State-owned	111	0.83	0.38	0	1
Foreign-owned	1,505	0.69	0.46	0	1
Others	275	0.76	0.43	0	1
<b><i>By sector</i></b>					
Manufacturing	12,698	0.77	0.42	0	1
Services	9,565	0.77	0.42	0	1
<b><i>Loan given by</i></b>					
A private bank	16,466	0.75	0.43	0	1
A state-owned bank	4,521	0.87	0.33	0	1
A non-bank financial institution	920	0.70	0.46	0	1
Others	239	0.57	0.50	0	1
<b><i>Years of operation</i></b>					
<5 years	2,463	0.81	0.39	0	1
5-10 years	3,950	0.80	0.40	0	1
10-25 years	9,901	0.77	0.42	0	1
>25 years	5,949	0.73	0.44	0	1
<b><i>Year of loan</i></b>					
2005	25	0.96	0.20	0	1
2006	173	0.89	0.31	0	1
2007	699	0.81	0.40	0	1
2008	1,860	0.79	0.41	0	1
2009	3,189	0.72	0.45	0	1
2010	3,713	0.68	0.47	0	1
2011	2,766	0.82	0.38	0	1
2012	3,643	0.83	0.38	0	1
2013	2,961	0.78	0.41	0	1
2014	1,274	0.84	0.37	0	1
2015	929	0.79	0.41	0	1
2016	837	0.69	0.46	0	1
2017	194	0.61	0.49	0	1

**Table A3: Collateral value as percentage of loan value**

	<b>Number of firms</b>	<b>Median</b>	<b>SD</b>	<b>Min</b>	<b>Max</b>
Whole sample	12,297	167	357	0	3,000
<b>By region</b>					
SSA	1,948	160	364	0	3,000
EAP	1,899	188	387	0	3,000
ECA	2,135	160	299	0	3,000
LAC	3,586	150	329	0	3,000
MENA	808	143	363	0	2,500
SAR	1,921	214	411	0	3,000
<b>By firm size</b>					
Small(<20)	4,095	185	357	0	3,000
Medium(20-99)	4,972	167	342	0	3,000
Large(100 And Over)	3,230	150	379	0	3,000
<b>By firm ownership</b>					
Domestic-private	11,168	167	357	0	3,000
State-owned	73	140	339	1	2,000
Foreign-owned	731	133	370	0	3,000
Others	131	150	353	0	2,500
<b>By sector</b>					
Manufacturing	7,185	175	374	0	3,000
Services	5,112	160	332	0	3,000
<b>Loan given by</b>					
A private bank	8,656	160	355	0	3,000
A state-owned bank	3,005	200	363	0	3,000
A non-bank financial institution	500	167	362	0	2,600
Others	96	154	404	2	2,600
<b>Type of collateral</b>					
Land/Building	7,519	189	388	0	3,000
Machinery and equipment	4,661	167	338	0	3,000
Account receivable and inventories	2,532	167	340	0	3,000
Personal assets of owner	3,887	200	360	0	3,000
Bonds, stocks and other assets	1,810	120	297	0	3,000
<b>Years of operation</b>					
<5 years	1,442	175	342	0	3,000
5-10 years	2,316	170	324	0	3,000
10-25 years	5,467	167	360	0	3,000
>25 years	3,072	150	384	0	3,000
<b>Year of loan</b>					
2005	24	100	95	5	500
2006	123	140	266	0	2,000
2007	447	133	368	0	3,000
2008	1,095	150	324	0	3,000
2009	1,750	164	339	0	2,857
2010	1,823	154	330	0	3,000
2011	1,569	180	337	0	2,875
2012	2,061	188	400	0	3,000
2013	1,605	188	362	0	3,000
2014	799	176	400	0	3,000
2015	511	167	387	0	2,505
2016	408	143	346	0	2,667
2017	82	153	305	0	2,000



**Table A4: Likelihood of collateralized borrowing – Logit**

Dependent Variable: Collateral Required=1 otherwise 0	2005-2017					
	OLS-FE	OLS with country characteristics				
	(1)	(2)	(3)	(4)	(5)	(6)
years of operation	-0.00176 (0.00108)	-0.00620*** (0.00147)	-0.00673*** (0.00164)	-0.00620*** (0.00180)	-0.00593*** (0.00228)	-0.00449** (0.00205)
Small(<20)	-0.378*** (0.0845)	-0.346*** (0.0822)	-0.356*** (0.0848)	-0.325*** (0.0847)	-0.434*** (0.150)	-0.301** (0.142)
Medium(20-99)	-0.0308 (0.0716)	-0.0390 (0.0593)	-0.0322 (0.0644)	-0.0209 (0.0631)	-0.187* (0.102)	-0.132 (0.105)
services (D)	-0.165* (0.0888)	0.115 (0.0940)	0.0912 (0.110)	0.0781 (0.102)	-0.137 (0.142)	-0.0944 (0.125)
loan from a state-owned bank (D)	0.293** (0.125)	0.622*** (0.102)	0.755*** (0.137)	0.593*** (0.120)	0.880*** (0.191)	0.436** (0.211)
loan from a non-bank financial institution (D)	-0.514*** (0.186)	-0.420** (0.185)	-0.321* (0.187)	-0.408** (0.184)	-0.679*** (0.243)	-0.856*** (0.250)
loan from others (D)	-1.269*** (0.258)	-1.096*** (0.206)	-1.004*** (0.203)	-1.114*** (0.213)	-1.805*** (0.364)	-2.002*** (0.403)
state-owned firm (D)	-0.713** (0.349)	-0.0877 (0.311)	-0.110 (0.291)	-0.216 (0.326)	0.0772 (0.689)	-0.121 (0.774)
foreign-owned firm (D)	-0.499*** (0.0982)	-0.416*** (0.0954)	-0.342*** (0.100)	-0.369*** (0.0985)	-0.277 (0.173)	-0.280* (0.159)
other firm (D)	-0.428** (0.185)	-0.205 (0.256)	-0.169 (0.282)	-0.156 (0.270)	-0.256 (0.464)	-0.110 (0.394)
% of sales in export >50%	0.0302 (0.0782)	0.0606 (0.0746)	0.0671 (0.0744)	0.0788 (0.0709)	-0.138 (0.133)	0.0130 (0.131)
an internationally recognized certification	-0.0764 (0.0468)	-0.0665 (0.0540)	-0.0942* (0.0550)	-0.0879 (0.0584)	-0.0142 (0.130)	0.0267 (0.104)
a checking and/or saving account	0.0964 (0.114)	0.0809 (0.129)	0.0737 (0.157)	0.0418 (0.135)	-0.240 (0.209)	-0.197 (0.190)
overdraft facility	0.0397 (0.0633)	-0.235** (0.118)	-0.212 (0.131)	-0.185 (0.127)	-0.195 (0.223)	-0.162 (0.199)
GDP per capita		-0.0000478*** (0.0000109)				-0.0000469* (0.0000270)
rule of law			-0.298** (0.120)			0.627* (0.342)
regulatory quality				-0.534*** (0.129)		-0.874*** (0.325)
depth of credit information					-0.129*** (0.0298)	-0.0275 (0.0366)
Constant	2.101*** (0.286)	4.061*** (0.322)	3.716*** (0.339)	3.681*** (0.308)	2.623*** (0.346)	2.606*** (0.468)
Observations	20305	20318	19811	19811	5466	5382
country dummies	Yes	No	No	No	No	No
year dummies	Yes	Yes	Yes	Yes	Yes	Yes

Clustered standard errors in parentheses, \*\*\*p<0.01, \*\*p<0.05, \*p<0.1