# Foreign and Domestic Loans over the Business Cycle*

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**Abstract**

During good economic times, the likelihood of obtaining a loan from a foreign bank increases in the borrower firm's opacity. During bad economic times (recessions), this relation reverses as the probability of obtaining a foreign loan decreases for all firms, but drops disproportionately more for opaque borrowers. Independently of the business cycle, firms with a higher share of foreign sales are more likely to obtain a foreign loan. We derive these predictions in a formal theoretical framework and confirm them empirically using a loan-bank-firm level dataset covering forty countries during the 1999–2016 period.

*Keywords:* foreign banks, cross-border loans, business cycles

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# 1 Introduction

Due to increasing financial and economic integration in recent decades, loans from foreign banks have become an ever more important source of external funding for firms. Claessens (2017) shows that the market share of foreign banks exceeded 50 percent in 63 out of 118 countries in 2007. Foreign loans declined during the financial crisis and the subsequent sovereign debt crisis in Europe, but foreign bank presence has continued to grow in emerging and developing countries over the past ten years, having potentially far-reaching consequences for borrowers' credit access, financial stability, and economic growth. A useful step towards a better understanding of these aggregate economic effects would be to zoom in on the firm level. In particular, we know very little about why some loans to domestic firms are provided by domestic banks and others by foreign banks.

The aim of this paper is to examine both theoretically and empirically when a firm takes up a loan from a domestic bank and when it borrows from a foreign bank, taking into account both the stage of the business cycle and the opacity of the borrower firm. In our Hotelling (1929)-type theoretical framework, each potential borrower has a project that can either be successful or unsuccessful. The true success probability is affected by realized shocks to a factor which includes both a market-wide macro component and an idiosyncratic project-specific component. The market-wide component (e.g., GDP growth) captures the prevailing macroeconomic conditions in the domestic economy and is easily observable by all agents including the foreign lenders. Each idiosyncratic component (e.g., consumer preference for a certain product) affects only the success probability of

an individual borrower project and is prohibitively costly to observe for agents located outside the domestic economy.

While foreign banks know the exposure of each borrower to the idiosyncratic shocks, they do not observe the realization of these shocks. Consequently, the standard deviation of a borrower's project-specific component can serve as a measure of borrower's opacity from the point of view of foreign lenders. When assessing the success probability of borrower projects, foreign banks have to rely only on the overall macroeconomic conditions and the opacity of individual borrowers. By contrast, domestic banks fully observe both the market-wide and the idiosyncratic component affecting the success probability of projects pursued by their potential borrowers.

For reasonable ranges of parameter values, our model then predicts that foreign banks are matched with fewer borrowers during bad economic times (characterized by low realizations of the macro component) and with more borrowers during good economic times (characterized by high realizations of the macro component), compared to domestic banks. Moreover, during bad times, foreign banks are matched to a larger extent with low-opacity borrowers (characterized by small standard deviation of the project-specific component), and during good times, they are matched to a larger extent with high-opacity borrowers (characterized by large standard deviation of the project-specific component). Finally, firms in closer "proximity" to foreign banks (e.g., more internationalized firms) are more likely to obtain loans from foreign lenders due to lower transaction costs.

We test and confirm our theoretical predictions using a detailed loan-bank-firm dataset that includes both loan and borrower characteristics and covers 40 countries during the

period from 1999 to 2016. The dataset identifies not only the borrowers and lenders for individual loans, but it also tracks both the immediate parents and the global ultimate owners of lenders over time. This allows us to properly identify a given loan as being domestic or foreign. The dataset also enables us to distinguish between direct cross-border loans (foreign loans made by a foreign bank located outside of the borrower's country) and loans provided by branches or subsidiaries of foreign banks located in the country of the borrower.

Our paper contributes to the existing research on how cross-border loans and the presence of foreign banks affect domestic borrowers and their access to debt financing (e.g., Mian, 2006; Detragiache, Tressel, and Gupta, 2008; Giannetti and Ongena, 2009; Giannetti and Ongena, 2012; Bruno and Hauswald, 2014; Bremus and Neugebauer, 2018). The empirical results in this literature tend to point in somewhat different directions. For example, Giannetti and Ongena (2009, 2012) find positive effects of foreign bank presence for large firms, whereas smaller firms indirectly benefit from increased competition in the banking sector. In contrast, Detragiache, Tressel, and Gupta (2008) find that countries with a large foreign bank presence have both a less developed loan market and worse access to loan financing for small companies. Most of the studies on interactions between foreign banks and domestic borrowers lack disaggregated loan-level data, or they focus on borrowers from a single large country or a selected group of smaller countries. By contrast, we rely on a recent global dataset at the loan-bank-firm level introduced by Forssbæck, Lundtofte, Strieborny, and Vilhelmsson (2018).

Our paper also provides a theoretical framework that could guide further empirical

work on the interactions between domestic firms and foreign and domestic banks. The existing literature on cross-border banking has a very clear empirical focus, often lacking a formal theoretical framework. As for the previous theoretical work on the subject, it focuses mostly on competition among lenders (banks). Our focus is on the matching of individual borrower firms with a (domestic or foreign) lender, based on the firm's characteristics and the stage of business cycle in the domestic economy, employing a Hotelling (1929)-type modelling approach. Subsection 2.1 provides more details by placing our theoretical approach in the context of the existing literature.

The rest of the paper is organized as follows. The next section introduces our theoretical framework. Sections 3 and 4 describe our empirical strategy and empirical results, respectively. Section 5 concludes.

# 2 Theoretical framework

In the theoretical framework formally presented in Subsection 2.2, we build on the classic Hotelling (1929) model, but analyze a situation where repayments from borrowers are not certain. In the model, there are two groups of lenders: domestic and foreign. For simplicity, we assume that there is perfect within-group competition among lenders. Each potential borrower is a penniless entrepreneur with a project that can either be successful or unsuccessful. The true success probability is related to a factor with two components: a systematic, market-wide macro component and an idiosyncratic, project-specific component. While the domestic lenders can observe both of these drivers of borrowers' success,

it is prohibitively costly for the foreign lenders to observe the project-specific component.

In assessing the borrowers' success probabilities, foreign lenders use their information on the macro component, but they also take into account the positive correlation between the macro component and the unobserved project-specific components. Consequently, if we let the true value of the project-specific components stay constant at their mean of zero, and the value of the macro component observed by all agents is non-zero, the foreign lenders overreact to the macro component. This overreaction affects the loan interest rate offered which, in turn, affects borrowers' choice between borrowing from a domestic or a foreign bank.

The other key factor determining whether a firm ends up with a loan from a domestic or a foreign lender is transaction costs, which are assumed to increase linearly in the distance to the respective lender groups. One can thus think of the "distance" between domestic borrower and foreign lender (represented in the Hotelling framework by the distance between the locality of the borrower on the [0,1] line segment and point 1 where foreign lenders are located) as capturing the transaction costs facing a domestic borrower when dealing with a foreign lender. In particular, this distance would arguably be lower for internationally active firms.

Subsection 2.1 places our modelling approach into the context of existing theoretical literature, which thus far contains only a few contributions employing a Hotelling (1929)-type approach to lender-borrower matching and focuses mostly on competition among lenders, rather than on individual borrower's matching with a domestic or foreign lender. Subsection 2.2 presents the formal model and our main analytical results. Subsection2.3

reports the results of the comparative statics analysis, yielding the empirically testable predictions of the model. Subsection 2.4 provides a numerical example with reasonable parameter values and contains an additional discussion of the economic insights that can be gained from the model.

## 2.1 Existing literature and theoretical contribution

Wong and Chan (1993) merge the theories of financial intermediation and optimal contracting with the standard Hotelling (1929) model. They show that, in an unregulated market, there is too little investment and too much costly monitoring. One of their key assumptions is that banks' monitoring costs are increasing in the distance between the entrepreneur and the bank, while we impose search costs on the borrowers. Matutes and Vives (1996) present a model in which banks compete for depositors and the economy in their model exhibits fragility due to a coordination failure among depositors and not bank competition. In a variety of settings in which banks are also effectively competing for depositors, but where bank competition may cause financial instability, Allen and Gale (2004) demonstrate that the relationship between competition and financial stability is far more complex than just a simple trade-off. In particular, they apply Hotelling's (1929) framework and find that the existence of a trade-off between competition and financial stability depends on which locations a bank is allowed to occupy.

Heddergott and Laitenberger (2017) develop a model in which small and large banks compete for transparent and opaque borrowers, and they analyze the relation between

credit access and bank competition, finding that this relation depends on the degree of heterogeneity in the banking market. In their paper, they distinguish between two borrower types, calling borrowers for which the project returns are certain "transparent borrowers" and borrowers for which the project returns are uncertain "opaque borrowers." Our model allows for varying degrees of opacity, by defining borrower opacity based on the standard deviation of a component that is not observed by the foreign lenders.

Overall, when compared to the theoretical work cited above, we allow for a greater degree of heterogeneity among borrowers, while assuming perfect within-group competition among domestic and foreign lenders, respectively.

Bank entry in foreign markets has also been analyzed from other perspectives and with other aims by, e.g., Dell'Ariccia and Marquez (2004), Sengupta (2007), Detragiache, Tressel, and Gupta (2008), Gormley (2014) and Niepmann (2015). In Dell'Ariccia and Marquez (2004), lenders' private information leads to borrower capture, which in turn leads to higher interest rates and the financing of less creditworthy borrowers in industries with greater information asymmetries. Another result in their paper is that domestic lenders reallocate credit towards sectors where their competitors face greater adverse selection problems as competition increases. In Sengupta (2007), foreign banks enter domestic credit markets using collateral as a screening device to compensate for their information disadvantage vis-à-vis incumbent domestic banks, and their success in attracting high-quality local borrowers increases in their cost advantage. Similarly, Detragiache, Tressel, and Gupta (2008) develop a model with asymmetric information to analyze how foreign bank entry affects financial sector development in poor countries. They show that the

entry of foreign banks might lead to welfare losses because the foreign banks may drive out the domestic banks and as a result, opaque domestic firms become credit constrained. In a related paper by Gormley (2014), which emphasizes information asymmetries and comparative advantages, the entry of new lenders can create a segmented credit market in which credit access is reduced for many firms. Niepmann (2015) builds an international trade-type model to explain various patterns in cross-border lending, and shows that when a capital-scarce country liberalizes its banking sector, it can experience a capital outflow to the detriment of domestic firms. Though her model features an exogenously given function intended to capture monitoring costs, she does not model information asymmetries explicitly.

## 2.2 The model set-up

Lenders and borrowers are risk-neutral and maximize expected profits. The borrowers consist of a continuum of penniless entrepreneurs with a total mass of one, uniformly distributed on the [0,1] interval and each with a project with independently and identically distributed payoffs $\tilde{Y}_i$ and unit cost. Depending on whether a project is successful or unsuccessful, $\tilde{Y}_i$ can either take on a value of $y > 0$ with probability $p_i$ or value 0 with probability $(1 - p_i)$.[1]

Situated at 0, there is a large number of domestic lenders in perfect competition and, correspondingly, at 1, there is a large number of foreign lenders in perfect competition.

[1]In order to keep the analysis tractable, we thus equalize a firm with a penniless entrepreneur and introduce a one-to-one correspondence between entrepreneur and project. In the empirical part, we look at loans by firms and control for various firm characteristics such as size and leverage.

For simplicity, we assume that the lenders' opportunity cost of capital is zero. The true success probability of borrower $i$ is related to a factor $f_i$ which consists of both a macro component $f$ common to all projects and a project-specific component $\vartheta_i$,

$$\ln\left(\frac{p_i}{1-p_i}\right) = \beta f_i + \epsilon_i, \tag{1}$$

where $f_i = f + \vartheta_i$. Both $f$ and $\vartheta_i$ are zero in expectation ($E[f] = E[\vartheta_i] = 0$) and are subject to stochastic shocks. A possible extension of the model could include a factor sensitivity $\beta_i$ which varies across firms, but since it is not the focus of our analysis, we abstract from it.

$\epsilon_i \sim N(0, \sigma_\epsilon^2)$ is a random noise term, independent of $f$ and each $\vartheta_i$. The vector $(f, \vartheta_i)$ follows a bivariate normal distribution, with the coefficient of correlation between the market-wide component $f$ and the project-specific component $\vartheta_i$ denoted by $\rho$. Any two project-specific components $\vartheta_i$ and $\vartheta_j$ $(i \neq j)$ are independent.

We assume $\beta > 0$. Consequently, a positive realization of the market-wide component $f$ increases the success probability for all projects, while a positive realization of the idiosyncratic component $\vartheta_i$ increases the success probability for project $i$. We further assume $\rho > 0$. In other words, when the overall macroeconomic conditions are good, the individual projects will experience more positive idiosyncratic shocks. For example, one can think of positive demand shocks for individual products being more probable when the overall economy is booming rather than when the economy as a whole is doing badly.

Both the domestic and the foreign lenders know the predictive relation in (1), including

the true values of all parameters, and they both observe the macro component $f$. However, only the domestic lenders observe the project-specific component $\vartheta_i$.

The borrowers' transaction costs are linear in the distance to the lender. For a borrower situated at $x \in [0, 1]$, the transaction costs are either $tx$ if she borrows from a domestic lender or $t(1 - x)$ if she borrows from a foreign lender, with $t > 0$.

Lenders offer interest rates to borrowers secretly and simultaneously. Due to perfect competition within each group of lenders and their risk neutrality, interest rates are set such that lenders' expected profit from each loan is equal to zero. Borrowers pick a lender whose offer represents the lowest sum of interest rate and transaction costs. We assume that it is too costly for lenders to collect information on borrowers' historical interest rates if they previously borrowed from another lender.

As it turns out, expected profits are related to expectations of sigmoids of normally distributed random variables. In the following lemma, we show that, with a slight correction, these expectations can be approximated by sigmoids evaluated at expected values.

**Lemma 1.** *Suppose $X \sim N(\mu, \sigma^2)$. Then, the expectation of a sigmoid function $E[s(X)]$, where $s(w) = 1/(1 + e^{-w})$, can be approximated by a sigmoid function*

$$E[s(X)] \approx s\left(\frac{\mu}{\sqrt{1 + \frac{\pi}{8}\sigma^2}}\right). \tag{2}$$

*Proof: see Appendix.*

Lemma 1 is useful in proving the following proposition, which enables us to approximate the border between borrowers who take up a domestic loan and those who take up a

foreign loan. In cases where the offers by domestic and foreign lenders are deemed equally good by the borrowers, we assume that borrowers take up a domestic loan. Further, we assume that, for each $x_i$ there is support for a range of values on $\sigma_{\vartheta_i}$, $\sigma_{\vartheta_i} \in (\underline{\sigma_\vartheta}, \overline{\sigma_\vartheta})$, where $\underline{\sigma_\vartheta} > 0$.

**Proposition 1.** *The border between borrowers who take up a domestic loan and those who take up a foreign loan can be approximated by the surface*

$$t(1-2x_i) + \exp\left(-\frac{\left(\beta\left(1+\frac{\rho\sigma_{\vartheta_i}}{\sigma_f}\right)\right)f}{\sqrt{1+\frac{\pi}{8}\left(\beta^2(1-\rho^2)\sigma^2_{\vartheta_i}+\sigma^2_\epsilon\right)}}\right) - \exp\left(-\frac{\beta\left(f+\vartheta_i\right)}{\sqrt{1+\frac{\pi}{8}\sigma^2_\epsilon}}\right) = 0, \quad (3)$$

*with* exp() *denoting the natural exponent. Those borrowers for whom the value of the above expression is weakly negative* ($\leq 0$) *take up a domestic loan whereas borrowers for whom the value of the above expression is strictly positive* ($> 0$) *take up a foreign loan. We assume that, given the values on $f$ that we consider, for each $x_i \in [0,1]$, there is just one $\sigma_{\vartheta_i} \in (\underline{\sigma_\vartheta}, \overline{\sigma_\vartheta})$, which solves the above equation.*

*Proof: see Appendix.*

The last condition of a unique solution can be achieved by letting $\sigma_f$ be sufficiently small, so that the second term in Equation (3) is strictly monotonic in $\sigma_{\vartheta_i}$ for all $\sigma_{\vartheta_i} \in (\underline{\sigma_\vartheta}, \overline{\sigma_\vartheta})$ and all values on $f$ that we consider.

## 2.3 Comparative statics and empirical implications of the model

Having arrived at the approximate surface in (3), we can perform a comparative statics analysis on how the surface moves as we change some inputs, generating empirically testable predictions of the model. Since borrowers are uniformly distributed on [0,1], the (approximate) market share of the foreign lenders among borrowers with opacity $\sigma_{\vartheta_i}$ equals $\hat{\theta}_F(\sigma_{\vartheta_i}) = 1 - \bar{x}_i(\sigma_{\vartheta_i})$, where $(\bar{x}_i, \sigma_{\vartheta_i})$ is the position of a borrower on the surface in (3). We establish the following two propositions.

**Proposition 2.** *Suppose that $\vartheta_i = E[\vartheta_i] = 0$. Then, for $\sigma_f$ sufficiently small,*

$$Sign\left(\frac{\partial \hat{\theta}_F}{\partial \sigma_{\vartheta_i}}\right) = Sign\left(f\right). \tag{4}$$

*Proof: see Appendix.*

**Proposition 3.** *Suppose $\vartheta_i = E[\vartheta_i] = 0$. Then, for the cases when either (i) $f$ is negative and $\sigma_f$ is sufficiently small,*

*or (ii) $f$ is nonnegative and both $f$ and $\sigma_f$ are sufficiently small,*

*we have that, for all $\sigma_{\vartheta_i} \in (\underline{\sigma_\vartheta}, \overline{\sigma_\vartheta})$,*

$$\frac{\partial \hat{\theta}_F}{\partial f} > 0. \tag{5}$$

*Proof: see Appendix.*

Proposition 2 states that the derivative of the foreign lenders' market share with respect to borrower's opacity ($\frac{\partial \hat{\theta}_F}{\partial f}$) has the same sign as the market-wide component cap-

turing the overall macroeconomic situation in the borrowers' country ($f$). Consequently, during the good economic times in the domestic economy ($f > 0$), the market share of foreign lenders increases in the opacity of the domestic borrowers ($\frac{\partial \hat{\theta}_F}{\partial f} > 0$). When the overall economic situation in the domestic economy is bad ($f < 0$), the market share of foreign lenders decreases in the opacity of the domestic borrowers ($\frac{\partial \hat{\theta}_F}{\partial f} < 0$).

Independently on the opacity of the borrowers, Propositions 3 states that – subject to certain parametric constraints – the market share of foreign lenders $\hat{\theta}_F$ increases in the observable state of the economy $f$. The better the economy is doing, the more borrowers take a loan from the foreign rather than domestic lenders. Foreign lenders thus have a larger market share during good economic times than they have during recessions.

The joint interpretation of both propositions is following. During good economic times, opaque borrowers are disproportionately more likely to obtain a loan from foreign lenders. When the economic situation turns bad, the foreign lenders pull out of the domestic market, so that their market share drops for all domestic borrowers. However, the probability of obtaining a foreign loan in a recession drops especially for opaque borrowers who consequently have to rely disproportionately on loans from domestic lenders during bad economic times.

## 2.4 Numerical example and graphical representation

Figure 1 depicts the market share of foreign lenders ($\hat{\theta}_F$) as a function of borrowers' opacity ($\sigma_{\vartheta_i}$). The opacity parameter captures uncertainty regarding the project-specific

component ($\vartheta_i$) which cannot be observed by the foreign lenders. In Figure 1, we hold this project-specific component constant at its expected value ($\vartheta_i = E[\vartheta_i] = 0$).

The macro component ($f$) observed by all agents captures the overall economic situation in the borrower's country. Figure 1 shows four scenarios, representing a strongly booming economy ($f = +0.25$), a moderately growing economy ($f = +0.1$), an economy facing a moderate contraction ($f = -0.1$), and an economy in deep recession ($f = -0.25$).[2]

[Insert Figure 1 about here]

In the limit, as $\sigma_{\vartheta_i} \to 0$, all lenders (including the foreign ones) essentially know that $\vartheta_i = E[\vartheta_i] = 0$, i.e., foreign and domestic lenders have identical information sets and thus, they end up with equal market shares for this group of borrowers ($\hat{\theta}_F \to 0.5$ as $\sigma_{\vartheta_i} \to 0$). The situation is different if there is uncertainty regarding the project-specific component ($\sigma_{\vartheta_i} > 0$), because then the foreign banks are at informational disadvantage compared to the domestic ones. While foreign lenders know the extent of the uncertainty regarding the project-specific component for all potential borrowers (they know $\sigma_{\vartheta_i}$ for every $i$), they do not observe this component (they do not know the value of $\vartheta_i$). Foreign banks thus know the overall idiosyncratic volatility facing the project of each potential borrower, but they do not observe the actual realizations of these idiosyncratic shocks. This will affect the interest rate the foreign banks offer and consequently the market share they achieve among these borrowers.[3]

[2]Other parameter values are $\beta = 0.3$, $\rho = 0.3$, $\sigma_\vartheta = 0.3$, $\sigma_f = 0.3$, $\sigma_{\epsilon_i} = 0.2$, and $t = 0.05$.

[3]Note that $\sigma_{\vartheta_i}$ does not affect the true success probability in Equation (1). However, $\sigma_{\vartheta_i}$ does affect the conditionally expected success probability in the view of the foreign lenders as can also be seen in Equation (19) in the Appendix.

The impact of borrowers' opacity on the market share of foreign lenders depends on the common market-wide component $f$, whose values are observable both by domestic and foreign lenders. The relationship between $f$, $\sigma_{\vartheta_i}$, and $\hat{\theta}_F$ depicted in Figure 1 is in line with the analytical results in Propositions 2 and 3. As the magnitude of negative macroeconomic shocks increases ($f$ gets increasingly negative), foreign lenders decrease their total exposure and their market share $\hat{\theta}_F$ declines for all borrowers. In particular, the $(f = -0.25)$-line is below the $(f = -0.1)$-line for all (strictly) positive values of $\sigma_{\vartheta_i}$.

Crucially, during bad economic times ($f < 0$), foreign lenders decrease their exposure towards more opaque borrowers to a larger extent than towards less opaque borrowers. This can be seen in the negative slope of the $(f = -0.1)$-line representing a mild contraction scenario and in the even more negative slope of the $(f = -0.25)$-line representing a deep recession. The opposite effect occurs if we instead consider positive macroeconomic shocks ($f > 0$). Here the market share of foreign banks increases in the borrowers' opacity as documented by the positive slopes of the two corresponding lines, with a steeper positive slope for the $(f = 0.25)$-line representing strong boom than for the $(f = 0.1)$-line representing a moderately growing economy.

In the context of the Hotelling theoretical framework with borrowers uniformly distributed on the [0,1] interval, the technical interpretation of all results captured in Figure 1 is the following. When $f = \vartheta_i = 0$, the two groups of lenders are effectively identical, except for their location at the opposite endpoints of the [0,1] interval. The two groups of lenders thus split the market equally, with borrowers closer to domestic lenders ($x_i \leq 1/2$) borrowing locally, and borrowers closer to foreign lenders ($x_i > 1/2$) taking up

foreign loans, regardless of opacity. This equal split can be formally verified by plugging $f = \vartheta_i = 0$ into Equation (3). Note also that as $\sigma_{\vartheta_i} \to 0$, both domestic and foreign lenders essentially know that $\vartheta_i = E[\vartheta_i] = 0$ and are thus identical, implying that as $\sigma_{\vartheta_i} \to 0$, $\bar{x}_i \to 1/2$. However, when $f \neq 0$ and $\sigma_{\vartheta_i} \neq 0$, the domestic and foreign lenders are no longer identical, and the "less similar" they are, the more they depart from the equal split. As in the benchmark case with $f = \vartheta_i = 0$, a smaller distance to foreign banks makes firms more likely to borrow from them due to lower transaction costs, but the level of opacity and the realization of the macro component jointly determine the threshold position at which firms are indifferent between borrowing locally and borrowing internationally.

# 3 Empirical Approach

## 3.1 Data

Our primary source of data is a recently constructed loan-borrower-lender dataset from Forssbæck, Lundtofte, Strieborny, and Vilhelmsson (2018). The unit of observation in the dataset is an individual loan with loan characteristics taken from Thomson Reuters/LPC's DealScan database (Dealscan) and borrower characteristics taken from S&P Compustat/Capital IQ (CIQ). Dealscan is a global database comprising detailed information on mostly large and often syndicated corporate loans, with loan-level information including borrower and lender identities, loan purpose, loan amount, detailed price and non-price

loan terms, etc. It has been used extensively in academic research (e.g., by Sufi, 2007, Chava and Roberts, 2008, and many subsequent contributions).

There are three key advantages of the dataset used in our paper compared to other data on cross-border loans that are available for a large set of countries. First, the dataset makes a detailed matching of all loans also to lenders and not only to borrowers.[4] Second, each loan in the dataset is classified not only as being foreign or domestic but also according to whether the foreign loan is made directly by a foreign bank (a direct cross-border loan), by a subsidiary of a foreign bank, or by a branch of a foreign bank. Finally, the dataset tracks the immediate parents and the global ultimate owners of the lenders over time, which is necessary to properly classify a loan as being domestic or foreign. For more details on the construction of the dataset, the reader is referred to Forssbæck, Lundtofte, Strieborny, and Vilhelmsson (2018).

To capture a negative macroeconomic shock to the domestic firms, we construct a recession dummy for the borrower country that takes value one if the loan was originated during a month classified as a recession by the OECD recession indicators available from the St. Louis Fed's FRED database. This restricts our sample to 40 countries that include both OECD members and several large emerging countries.[5] We make use of

[4]The Dealscan database originally did not contain any company identifier that would allow a direct matching with other standard databases. The existing academic research therefore often relied on matching between Dealscan loans and borrower data developed by Chava and Roberts (2008). The newest version of Dealscan includes a company identifier that allows matching of data with the information on borrowers but not lenders.

[5]The included countries are: Australia, Austria, Belgium, Brazil, Canada, Chile, China, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, India, Indonesia, Ireland, Israel, Italy, Japan, South Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Russia, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States.

additional country-pair information on common language, geographical distance, colonial relationships, and shared border from Mayer and Zignago (2011).

Since we want to cleanly identify negative macroeconomic shocks to the domestic borrowers rather than to the foreign lenders, we exclude observations for which there is simultaneously a recession in both the borrower and the lender country. We also exclude loans where the borrower is from the United States. US companies operate in a large English-speaking product market that is closely followed by the rest of the world. Foreign lenders active in the US market would therefore be not at such a disadvantage compared to domestic US banks when it comes to observing idiosyncratic shocks affecting the success probability of US borrowers. Finally, we exclude financial and utility borrowers.[6]

As can be seen from Table 1, restricting ourselves to the 40 countries in our sample results in only a relatively small reduction in the number of included loans from 14,523 to 12,655. The average size of the borrowers also remains approximately the same, with 12,280 million USD for all countries and 13,765 million USD for the countries in our sample.[7] Overall, our borrower characteristics are almost unchanged by restricting ourselves to the 40 countries in our sample. For example, the share of listed firms (93 percent) is the same in both samples. Also loan characteristics are similar with an average loan size of 416 million USD for all countries and 549 million USD for the countries in our sample. Almost all loans (95 percent in both samples) are syndicated, few (14 percent among all

[6]Observations where the borrower is a financial firm (primary 1-digit SIC equal to 6) or a utility (primary 2-digit SIC equal to 49) are excluded.

[7]Our borrowers are on average substantially larger than in papers focusing on unlisted firms. For example, the average size of the borrower is 36 million USD in Giannetti and Ongena (2012), who investigate mainly unlisted firms in developing countries.

countries and 15 percent among the countries in our sample) have performance pricing provisions, and relatively few (21 percent among all countries and 17 percent among the countries in our sample) are collateralized.

In the main results, we measure the borrower firm's opacity by the share of intangible assets. In a series of robustness tests reported in Subsection 4.2, we use an indicator variable equal to one for high-tech firms and the ratio of R&D expenditure to total revenue as two alternative measures of opacity. We measure the proximity of a firm to foreign banks by the borrower firm's share of foreign sales.

Our sample period covers the period from 1999 to 2016. Although Dealscan does have loans starting already in 1986, its international coverage is not comprehensive until the late 1990s.

[Insert Table 1 about here]

## 3.2 Estimation strategy

We would like to know how the propensity of a firm to take a foreign loan depends both on the business cycle in the domestic economy (proxied by the recession dummy) and on the opacity of the borrower (proxied by the share of intangible assets in the main specifications). We would also like to investigate if these two factors interact by looking at how the effect of the borrower's opacity varies across the business cycle.

To answer these questions, we define a binary variable with value one for foreign loans and zero for domestic loans and regress it on the firm's opacity, the recession dummy,

and an interaction term between these two variables. The regressions also include a measure of a borrower's proximity to foreign banks (proxied by the firm's share of foreign sales), a number of firm-specific controls (total assets, total asset growth, return on assets, leverage, market-to-book ratio, R&D expenses, dummy variables for listed firms and high-tech firms), and various sets of fixed effects. To be able to calculate marginal effects of the interaction terms and to include various fixed effects, we run linear probability models, even though the dependent variable is binary.

We define a loan as being foreign in two different ways. A loan is foreign if the lender, the lender's parent, or the lender's global ultimate owner is domiciled in a different country than the borrower on the loan origination date. We define a loan as a *direct* cross-border loan if the lender is domiciled in a different country than the borrower on the origination date of the loan. We use two different sets of fixed effects. The "reduced set of fixed effects" includes dummy variables for 1-digit SIC industry, year, loan type, loan purpose, and borrower region.[8] The "full set of fixed effects" additionally includes lender-country fixed effects, and it replaces borrower-region by borrower-country fixed effects and 1-digit SIC by 2-digit SIC fixed effects. All standard errors are clustered at the borrower-country level.

[8]The borrower-region fixed effects are defined in accordance with the World Bank's geographical regions, based on the borrower firm's home country. The regions are Europe & Central Asia, Latin America & Caribbean, Middle East & North Africa, North America, South Asia, and Sub-Saharan Africa.

# 4 Empirical Results

Our model predicts that the probability of taking a foreign loan is increasing in the borrower's opacity during good economic times and decreasing in the borrower's opacity during recessions (Proposition 2). The model also implies that the probability of taking a foreign loan is smaller for all firms in recessions (Proposition 3). Furthermore, in the model the probability of taking a foreign loan is increasing in the proximity of a borrower to foreign rather than domestic banks due to lower transaction costs. This section provides results of testing these predictions.

## 4.1 Main results

Table 2 reports our main results. The odd-numbered columns report the results for specifications using the reduced set of fixed effects while the even-numbered columns report the results for specifications using the full set of fixed effects. Columns 1–4 report results for all borrower firms and columns 5–8 report results for the subsample of listed borrowers. Columns 1–2 and 5–6 report results for all foreign loans. Columns 3–4 and 7–8 report results for estimations focusing on the subsample of direct cross-border loans.

[Insert Table 2 about here]

A clear result across all specifications in Table 2 is that the propensity to take a foreign loan is considerably smaller (about 8 percentage points with the full set of fixed effects and 15 percentage points with the reduced set of fixed effects) during recessions.

This effect is always highly statistically significant, and its magnitude is substantial given that the overall unconditional probability of obtaining a foreign loan is 33 percent for all cross-border loans and 31 percent for direct cross-border loans. Also in agreement with our theoretical predictions, we find that the share of foreign sales has a positive and highly significant effect, with a one standard deviation increase in the share of foreign sales increasing the probability of taking a foreign loan by about 2–7 percentage points, depending on the specification.

During normal (good) times, the probability of taking a foreign loan is increasing in borrower's opacity, with significant results for all specifications with the full set of fixed effects. By contrast, the propensity to take a foreign loan is smaller during recessions for opaque firms, with the interaction between the share of intangible assets and the recession dummy being negative (and significant at least at the 10 percent level). Based on specification 4 in Table 2, a one standard deviation increase in opacity during recessions decreases the probability of obtaining a foreign loan by 2.4 percentage points, showing that the economic importance of opacity is roughly equal to the effect of firm size.

Figure 2 shows the probability of obtaining a foreign loan for different levels of intangible assets during recessions and normal times, respectively, calculated from specification 4 and with all other variables set to their average values. The results in Figure 2 correspond closely to the theoretical predictions depicted in Figure 1. The changes in market shares of foreign banks during good economic times and bad economic times captured by Figure 1 (e.g., comparing the two lines corresponding to $f = +0.1$ and $f = -0.1$) correspond to the changes in borrowers' probability of obtaining a foreign loans in non-recessions and

recessions in Figure 2. These changes are both statistically significant and economically important. In particular, the market share of foreign banks is about 35 percent during non-recessions and 25 percent during recessions, implying a recession-driven reduction in the market share of foreign banks of 28.6 percent (10 percent divided by 35 percent). The slopes in Figure 1 also predict that the foreign market share should be increasing in opacity during good economic times and decreasing during recessions, which is exactly what we see in Figure 2. For the most opaque firms, the loss in market share for foreign banks is from around 37 percent during non-recessions to less than 25 percent during recessions whereas for the most transparent firms the corresponding drop is from around 34 percent to 27 percent.

[Insert Figure 2 about here]

The results for listed and non-listed firms are generally very similar. The same applies to a comparison between all foreign loans and direct cross-border loans only. The small difference between the results for all foreign loans and those for direct cross-border loans might be due to the small number (343) of loans by branches and subsidiaries of foreign banks in the sample.

In agreement with Mian (2006) and Giannetti and Ongena (2012), we find that the probability of obtaining a foreign loan is increasing in the size of the borrower. Giannetti and Ongena (2012) find an increase of about 3 percentage points per standard deviation increase in the log of total assets, and interestingly we find a very similar effect (3.5 percentage points with the full set of fixed effects and 2.6 percentage points with the

reduced set of fixed effects). This is despite the fact that Giannetti and Ongena (2012) examine much smaller firms in developing countries.

## 4.2 Alternative measures of opacity

In the results reported in Subsection 4.1, our proxy for opacity has been the share of intangible assets to total assets. To ascertain the robustness of these results, we run a series of regressions with alternative proxies for opacity. All these regressions use the full set of fixed effects, but we alternate between specifications for all firms and listed firms only, as well as between all foreign loans and direct cross-border loans only. The results are reported in Table 3.

[Insert Table 3 about here]

In specifications 1, 3, 5 and 7 of Table 3, we use an indicator variable that is equal to one if a firm is "high-tech" as our proxy for opacity. During recessions, the probability of obtaining a foreign loan is three to four percentage points lower for high-tech firms depending on the specification (the effect is somewhat larger for listed firms), which is about the same magnitude as we found when using the share of intangible assets as an opacity proxy. In specifications 2, 4, 6 and 8, we use the ratio of R&D expenditure to total revenue as our opacity measure, and we again find a significant effect for the interaction term of opacity with the recession dummy. Using this measure, we find that during recessions the probability of a foreign loan is 1.4 percentage points lower per standard deviation increase in R&D expenditure to total revenue when including all foreign loans,

and 1.0 percentage point lower when including only direct cross-border loans.

## 4.3 The distance between borrower's and lender's country

A central idea in Mian (2006) is that if the headquarters of a foreign bank and the local loan officer are distant from each other, then it becomes more difficult for the foreign bank to take soft information into account. Hence, the opacity of the firm should be increasingly important for borrower-lender country pairs that are geographically, culturally, or institutionally distant from each other. If that is indeed the case, opacity might play a more important role for distant country pairs also in the context of the mechanism explored in our paper. We allow for this possibility by exploring if the empirical patterns from previous subsections become stronger when excluding foreign loans from borrower-lender country pairs that are in some sense close to each other.

[Insert Table 4 about here]

For a better comparison, specification 1 of Table 4 repeats the main results for the sample of all foreign loans controlling for the full set of fixed effects. Specification 2 excludes loans from borrower-lender country pairs that have a geographical distance smaller than the median distance for cross-border loans, specification 3 excludes cross-border loans from borrower-lender country pairs that share a common language, specification 4 excludes loans from borrower-lender country pairs that are contiguous (share a border), and specification 5 excludes loans from borrower-lender country pairs that had a colonial relationship in 1945 or more recently. Specification 6 of Table 4 excludes all loans that

were excluded in any of the specifications 2–5.

Interestingly, we do not find much support for intangibility becoming more important for loans between distant borrower-lender pairs. During non-recessions, the share of intangible assets is somewhat more important when we exclude foreign loans between countries sharing a common border and between countries that share a common language. However, during recessions the importance of intangible assets actually decreases except when country pairs sharing a colonial relationship are excluded.

# 5 Conclusions

Foreign banks' lending behavior evolves differently over the business cycle than that of domestic banks. During good economic times, foreign banks are more likely to provide loans to opaque borrowers. During bad economic times, foreign lending decreases more dramatically than lending by domestic banks, causing a reduction in the probability of obtaining a foreign loan for all domestic firms. Moreover, foreign borrowing drops disproportionately more in the case of opaque firms. Consequently, during bad economic times, the probability of obtaining a foreign loan is decreasing in the opacity of the borrower – the opposite of what is the case during good economic times.

We derive these results in a formal theoretical framework inspired by the classic Hotelling (1929) model, showing how an information asymmetry between domestic and foreign banks regarding idiosyncratic shocks affecting individual borrowers can lead foreign lenders to overreact to changes in an easily observable macroeconomic factor (e.g.,

GDP growth). Given the standard Hotelling (1929)-style theoretical framework, our model also implies that firms that are "closer" to foreign banks are more likely to obtain a foreign loan due to lower transaction costs.

We test the predictions of our model exploiting a global dataset at the loan-bank-firm level for forty countries during the 1999–2016 period, using recession indicators to proxy for low realizations of the local macroeconomic factor. Our results confirm that the probability of obtaining a foreign loan decreases during recessions in the borrower's home country and disproportionately so for opaque firms. We define opaque firms as firms with a high share of intangible assets, firms from high-tech sectors, and firms with a high share of expenses on research and development. Using the share of foreign sales at the firm level to proxy for a firm's proximity to foreign banks, we also confirm that firms that are "closer" to foreign lenders have a higher probability of obtaining a foreign loan. Interestingly, we do not find much support for the notion that geographical, cultural or institutional distance between the borrower's and lender's country magnifies the importance of firm's opacity.

# Appendix

### Proof of Lemma 1

*Proof.* It is well-known in the machine learning literature that the sigmoid function can be approximated by the c.d.f. of a standard normal (see, e.g., Bishop, 2006, Ch. 4.5.2),

$$s(w) \approx \Phi(\xi w), \tag{6}$$

where we pick $\xi$ such that $\xi^2 = \frac{\pi}{8}$ to equalize slopes at the origin.

Thus, we have that

$$E[s(X)] = \int_{-\infty}^{+\infty} s(w) f_X(w) dw \approx \int_{-\infty}^{+\infty} \Phi(\xi w) f_X(w) dw = \Phi\left(\frac{\xi\mu}{\sqrt{1+\xi^2\sigma^2}}\right), \tag{7}$$

where the last equality follows from observing that if $Y$ and $Z$ are independently distributed as $Y \sim N(0,1)$ and $Z \sim N(a, b^2)$, respectively, then

$$Prob\left(Y \leq \xi Z | Z = w\right) = Prob(Y \leq \xi w) = \Phi(\xi w). \tag{8}$$

By the law of total probability,

$$Prob(Y \leq \xi Z) = \int_{-\infty}^{+\infty} \Phi(\xi w) f_Z(w) dw. \tag{9}$$

On the other hand, we have that

$$Prob(Y \leq \xi Z) = Prob(Y - \xi Z \leq 0) = \Phi\left(\frac{\xi a}{\sqrt{1+\xi^2 b^2}}\right). \tag{10}$$

Therefore, it must be that

$$\int_{-\infty}^{+\infty} \Phi(\xi w) f_Z(w) dw = \Phi\left(\frac{\xi a}{\sqrt{1+\xi^2 b^2}}\right). \tag{11}$$

Finally, we approximate $\Phi\left(\frac{\xi\mu}{\sqrt{1+\xi^2\sigma^2}}\right)$ in Equation (7) by $s\left(\frac{\mu}{\sqrt{1+\xi^2\sigma^2}}\right)$ and insert $\xi^2 = \pi/8$ (to equalize slopes at the origin in the approximation in (6)), from which the result follows.

□

**Proof of Proposition 1**

*Proof.* By assumption, lenders' opportunity cost of capital is zero. Hence, the domestic and foreign lenders' expected profits from a loan to borrower $i$, located at $x_i$, are given by

$$\Pi_i^D = E[p_i|(f,\vartheta)] r_{D,i} - (1 - E[p_i|(f,\vartheta)]) \cdot 1 \tag{12}$$

and

$$\Pi_i^F = E[p_i|f] r_{F,i} - (1 - E[p_i|f]) \cdot 1, \tag{13}$$

respectively.

Due to perfect competition within each group of lenders, the lenders' offered interest rates can be found by putting their expected profits equal to zero. The resulting interest rates are

$$r_{D,i} = \frac{1}{E[p_i|(f,\vartheta)]} - 1 \tag{14}$$

and

$$r_{F,i} = \frac{1}{E[p_i|f]} - 1. \tag{15}$$

Borrower $i$'s decision is based on

$$Min\left\{r_{D,i} + tx_i, r_{F,i} + t(1-x_i)\right\} = Min\left\{\frac{1}{E[p_i|(f,\vartheta)]} - 1 + tx_i, \frac{1}{E[p_i|f]} - 1 + t(1-x_i)\right\}. \tag{16}$$

Solving for $p_i$ in Equation (1), we get that, $p_i$ follows the same distribution as

$$p_i = \frac{1}{1 + e^{-\beta_i f - \gamma_i \vartheta - \epsilon_i}}, \tag{17}$$

where the domestic lenders observe $f$ and $\vartheta$, and the foreign lenders only observe $f$.

We note that both the domestic and the foreign lenders view (17) as being a sigmoid of a normally distributed random variable. Thus, it follows from Lemma 1 that the domestic lenders' expected success probability is given by

$$E[p_i|(f,\vartheta_i)] \approx s\left(\frac{(\beta(f+\vartheta)}{\sqrt{1+\frac{\pi}{8}\sigma_\epsilon^2}}\right). \tag{18}$$

When it comes to the foreign lenders' expected success probability, we need to take the effect of the correlation ($\rho$) between $f$ and $\vartheta_i$ into account as we calculate the conditional expectation and variance that go into the sigmoid function. We find the conditional expectation and variance by using results regarding conditional distributions when conditioning a normally distributed random variable on another normally distributed random variable (see, e.g., Greene, 2012, Appendix B.11).[9] We have that

$$E[p_i|f] \approx s\left(\frac{\beta\left(1+\frac{\rho\sigma_{\vartheta_i}}{\sigma_f}\right)f}{\sqrt{1+\frac{\pi}{8}\left(\beta^2(1-\rho^2)\sigma^2_{\vartheta_i}+\sigma^2_\epsilon\right)}}\right). \tag{19}$$

The proposition then follows from inserting Equations (18) and (19) into expression (16), from realizing that $1/s(w) = 1 + e^{-w}$ and from the assumption that in the case of equally good offers, borrowers take up a loan from a domestic lender.

□

**Proof of Proposition 2**

*Proof.* Solving for $x_i$ in equation (3), we obtain

$$\bar{x}_i = \frac{1}{2} + \frac{1}{2t}\left(\exp\left(-\frac{\beta\left(1+\frac{\rho\sigma_{\vartheta_i}}{\sigma_f}\right)f}{\sqrt{1+\frac{\pi}{8}\left(\beta^2(1-\rho^2)\sigma^2_{\vartheta_i}+\sigma^2_\epsilon\right)}}\right) - \exp\left(-\frac{\beta(f+\vartheta_i)}{\sqrt{1+\frac{\pi}{8}\sigma^2_\epsilon}}\right)\right). \tag{20}$$

Hence, if the macro component has a value of $f$, the (approximate) market share of foreign

[9]Note that the resulting conditional distribution is also normal.

banks among borrowers with opacity $\sigma_{\vartheta_i}$ is given by

$$\hat{\theta}_F(f,\sigma_{\vartheta_i}) = 1-\bar{x}_i(f,\sigma_{\vartheta_i}) = \frac{1}{2}-\frac{1}{2t}\left(\exp\left(-\frac{\beta\left(1+\frac{\rho\sigma_{\vartheta_i}}{\sigma_f}\right)f}{\sqrt{1+\frac{\pi}{8}\left(\beta^2(1-\rho^2)\sigma^2_{\vartheta_i}+\sigma^2_\epsilon\right)}}\right)-\exp\left(-\frac{\beta_i(f+\vartheta_i)}{\sqrt{1+\frac{\pi}{8}\sigma^2_\epsilon}}\right)\right). \tag{21}$$

Suppose that $\vartheta_i = E[\vartheta_i] = 0$. From inspection of the above equation, we see that if $f > 0$ and $\sigma_f$ is sufficiently small, then $\hat{\theta}_F$ is increasing in $\sigma_{\vartheta_i}$, whereas if $f < 0$ and $\sigma_f$ is sufficiently small, it is decreasing in $\sigma_{\vartheta_i}$, and if $f = 0$, then $\hat{\theta}_F$ does not change with $\sigma_{\vartheta_i}$. □

**Proof of Proposition 3**

*Proof.* Taking the derivative of $\hat{\theta}_F$ in (21) with respect to $f$ and inserting $\vartheta_i = E[\vartheta_i] = 0$, we have that

$$\frac{\partial\hat{\theta}_F}{\partial f} = \frac{1}{2t}\left(\frac{\beta\left(1+\frac{\rho\sigma_\vartheta}{\sigma_f}\right)}{\sqrt{1+\frac{\pi}{8}\left(\beta^2(1-\rho^2)\sigma^2_{\vartheta_i}+\sigma^2_\epsilon\right)}}\exp\left(-\frac{\beta\left(1+\frac{\rho\sigma_{\vartheta_i}}{\sigma_f}\right)f}{\sqrt{1+\frac{\pi}{8}\left(\beta^2(1-\rho^2)\sigma^2_{\vartheta_i}+\sigma^2_\epsilon\right)}}\right) - \left(\frac{\beta}{\sqrt{1+\frac{\pi}{8}\sigma^2_\epsilon}}\right)\exp\left(-\frac{\beta f}{\sqrt{1+\frac{\pi}{8}\sigma^2_\epsilon}}\right)\right). \tag{22}$$

Investigating the cases in which the above expression is positive, negative or equal to zero, respectively, we can conclude that

$$Sign\left(\frac{\partial\hat{\theta}_F}{\partial f}\right) = Sign\left(-\frac{1}{2}\ln\left(\frac{1+\frac{\pi}{8}\left(\beta^2(1-\rho^2)\sigma^2_{\vartheta_i}+\sigma^2_\epsilon\right)}{1+\frac{\pi}{8}\sigma^2_\epsilon}\right)+\frac{1}{2}\ln\left(1+\beta\frac{\rho\sigma_{\vartheta_i}}{\beta\sigma_f}\right) + \left(\frac{\beta}{\sqrt{1+\frac{\pi}{8}\sigma^2_\epsilon}}-\frac{\beta\left(1+\frac{\rho\sigma_{\vartheta_i}}{\sigma_f}\right)}{\sqrt{1+\frac{\pi}{8}\left(\beta^2(1-\rho^2)\sigma^2_{\vartheta_i}+\sigma^2_\epsilon\right)}}\right)f\right). \tag{23}$$

From the above equation, we see that for small $\sigma_f$, the second term is positive and the coefficient in front of $f$ is negative and they are both large in magnitude. Hence, the sign of the total expression is positive for negative $f$. If $f$ is positive and sufficiently small, the whole expression is also positive, provided that $\sigma_f$ is sufficiently small, since the second term dominates in this case. Similarly, if $f$ is zero and $\sigma_f$ is sufficiently small, the sign of the total expression is positive. $\square$

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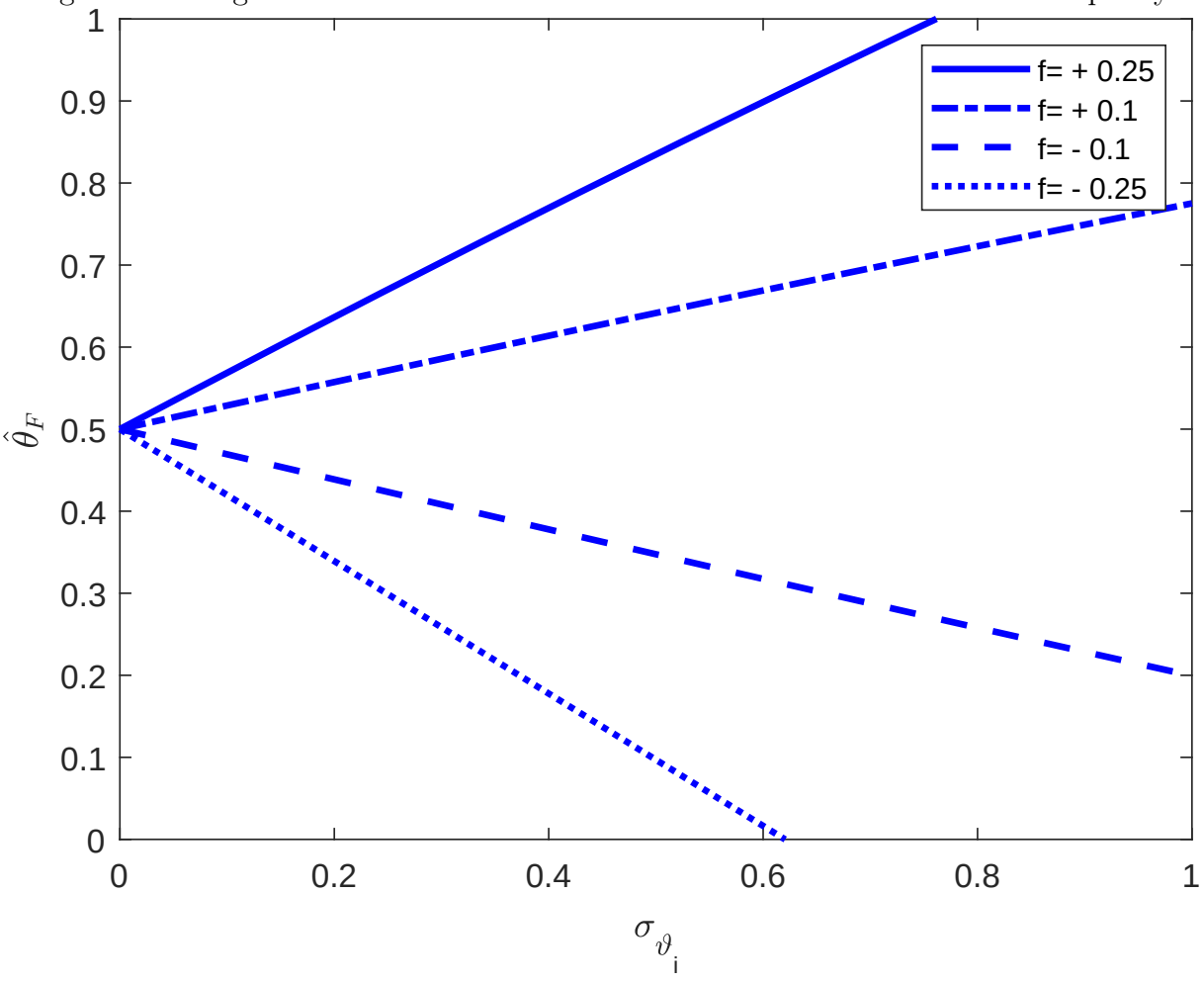
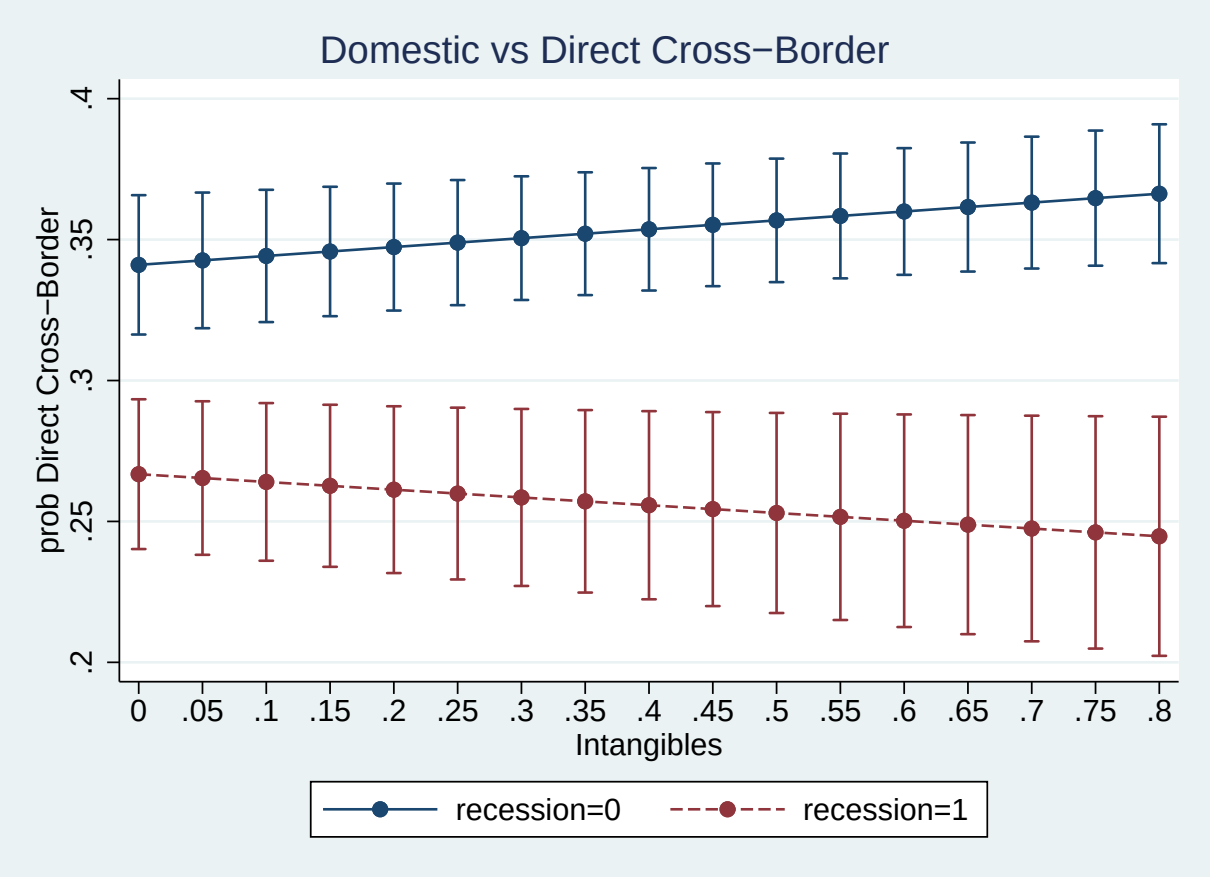
Wong, K. P., and D. K. Chan (1993): "A Simple Model of Spatial Banking Competition," *Economics Letters*, 42, 391–397.

Figure 1: Foreign lenders' market share as a function of domestic borrowers' opacity




The figure depicts the foreign lenders' market share ($\hat{\theta}_F$) for different levels of opacity ($\sigma_{\vartheta_i}$) among domestic borrowers when $f = +0.25$, $f = +0.1$, $f = -0.1$ and $f = -0.25$, holding $\vartheta_i$ constant at its expected value ($\vartheta_i = E[\vartheta_i] = 0$). Other parameter values are $\beta = 0.3$, $\rho = 0.3$, $\sigma_\vartheta = 0.3$, $\sigma_f = 0.3$, $\sigma_{\epsilon_i} = 0.2$, and $t = 0.05$.

Figure 2: Probability of taking a direct cross-border loan




The figure depicts the probability of obtaining a foreign loan for different shares of intangible assets during normal times and recessions, respectively. Predicted probabilities are calculated from specification 4 in Table 2, and all other variables are set to their average values. The vertical bars are 95 percent confidence intervals calculated using the delta method.

Table 1: Firm and loan characteristics

| | Mean | | Median | | Std. dev. | | 1st Percentile | | 99th Percentile | |
|---|---|---|---|---|---|---|---|---|---|---|
| | All fac. | Available | All fac. | Available | All fac. | Available | All fac. | Available | All fac. | Available |
| Total assets (constant USD mn) | 12,280 | 13,765 | 1,966 | 2,362 | 31,617 | 33,561 | 45.6 | 51.9 | 175,113 | 186,282 |
| Total assets growth | 0.076 | 0.073 | 0.044 | 0.043 | 0.24 | 0.24 | -0.43 | -0.44 | 1.07 | 1.06 |
| Share of intangible assets | 0.36 | 0.37 | 0.40 | 0.40 | 0.41 | 0.41 | 0.00 | 0.00 | 0.98 | 0.98 |
| Return on assets | 0.041 | 0.044 | 0.037 | 0.039 | 0.047 | 0.047 | -0.078 | -0.072 | 0.18 | 0.18 |
| Leverage | 0.30 | 0.29 | 0.29 | 0.28 | 0.18 | 0.18 | 0 | 0 | 0.78 | 0.78 |
| Market leverage (listed firms) | 0.26 | 0.24 | 0.23 | 0.22 | 0.17 | 0.16 | 0 | 0 | 0.70 | 0.67 |
| Market-to-book ratio (listed firms) | 2.30 | 2.41 | 1.40 | 1.45 | 5.60 | 5.83 | 0.19 | 0.19 | 14.3 | 15.9 |
| Share of foreign sales | 0.37 | 0.36 | 0.32 | 0.30 | 0.33 | 0.33 | 0 | 0 | 0.99 | 0.99 |
| R&D expense/revenue | 0.0097 | 0.0083 | 0 | 0 | 0.030 | 0.028 | 0 | 0 | 0.15 | 0.15 |
| High-tech firm (dummy) | 0.17 | 0.15 | 0 | 0 | 0.38 | 0.36 | 0 | 0 | 1 | 1 |
| Listed firm (dummy) | 0.93 | 0.93 | 1 | 1 | 0.25 | 0.26 | 0 | 0 | 1 | 1 |
| Loan amount (constant USD mn) | 416 | 459 | 122 | 143 | 1,084 | 1,147 | 3.80 | 4.19 | 4,301 | 4,497 |
| Maturity (months) | 50.2 | 49.2 | 49 | 48 | 35.4 | 36.1 | 6 | 6 | 180 | 180 |
| No. of lenders | 6.80 | 6.53 | 5 | 4 | 5.97 | 6.09 | 1 | 1 | 30 | 31 |
| Syndicated (dummy) | 0.95 | 0.95 | 1 | 1 | 0.21 | 0.22 | 0 | 0 | 1 | 1 |
| Spread (bp) | 174 | 203 | 130 | 175 | 144 | 158 | 15 | 15 | 725 | 800 |
| No. of covenants | 0.27 | 0.094 | 0 | 0 | 0.78 | 0.46 | 0 | 0 | 3 | 3 |
| No. of perf. pricing provisions | 0.14 | 0.15 | 0 | 0 | 0.88 | 0.91 | 0 | 0 | 5 | 5 |
| Collateralized (dummy) | 0.21 | 0.17 | 0 | 0 | 0.41 | 0.38 | 0 | 0 | 1 | 1 |
| Loan in borrower's home currency (dummy) | 0.72 | 0.71 | 1 | 1 | 0.45 | 0.46 | 0 | 0 | 1 | 1 |
| Borrower country recession (dummy) | | 0.39 | | 0 | | 0.49 | | 0 | | 1 |
| Number of observations | 14,523 | 12,655 | | | | | | | | |

This table reports descriptive statistics for firm- and loan-level variables for the estimation sample. Variable definitions are found in Table 12 of Forssbæck, Lundtofte, Strieborny, and Vilhelmsson (2018). Loans with borrowers domiciled in the United States are excluded. The "All fac." sample is defined on the basis of availability of firm- and loan-level variables and includes only observations for which the following borrower-firm and loan-level variables are simultaneously non-missing: Total assets, Share of intangible assets, Return on assets, Total assets growth, Leverage, Share of foreign sales, R&D expense/revenue, High-tech firm, Listed firm, Loan type, Loan purpose, and Loan origination date. Additionally, the home country of the lender bank (but not necessarily of its immediate parent or ultimate owner) must be identified. The sample called "Available" is restricted to the 40 countries for which the OECD recession indicator is available, and is the sample actually used in the regressions.

Table 2: Main results

| | All firms | | | | Listed firms | | | |
|---|---|---|---|---|---|---|---|---|
| | All foreign loans | | Direct CB loans | | All CB loans | | Direct CB loans | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Borrower country recession (dummy) | -0.16*** | -0.082*** | -0.15*** | -0.074*** | -0.16*** | -0.080*** | -0.15*** | -0.070** |
| | (0.037) | (0.025) | (0.035) | (0.024) | (0.046) | (0.027) | (0.044) | (0.026) |
| Recession × Share of intangible assets | -0.063** | -0.062*** | -0.065*** | -0.059*** | -0.053* | -0.061*** | -0.054** | -0.056*** |
| | (0.025) | (0.017) | (0.024) | (0.019) | (0.027) | (0.017) | (0.025) | (0.019) |
| Share of intangible assets | 0.012 | 0.034** | 0.012 | 0.032** | 0.015 | 0.044*** | 0.015 | 0.042*** |
| | (0.024) | (0.015) | (0.025) | (0.014) | (0.025) | (0.015) | (0.027) | (0.015) |
| Share of foreign sales | 0.24*** | 0.078*** | 0.22*** | 0.071*** | 0.24*** | 0.072*** | 0.22*** | 0.070*** |
| | (0.043) | (0.020) | (0.045) | (0.019) | (0.043) | (0.023) | (0.044) | (0.021) |
| R&D expense/revenue | 0.39 | 0.59*** | 0.36 | 0.44*** | 0.55** | 0.66*** | 0.50* | 0.48*** |
| | (0.27) | (0.20) | (0.27) | (0.14) | (0.26) | (0.19) | (0.25) | (0.13) |
| Return on assets | 0.12 | -0.16 | 0.19 | -0.14* | 0.058 | -0.17 | 0.049 | -0.18** |
| | (0.21) | (0.11) | (0.19) | (0.075) | (0.20) | (0.10) | (0.19) | (0.070) |
| Leverage or market leverage | -0.0074 | -0.020 | -0.013 | -0.024 | -0.077 | -0.031 | -0.076 | -0.032 |
| | (0.068) | (0.029) | (0.077) | (0.025) | (0.091) | (0.026) | (0.094) | (0.021) |
| Total assets (constant USD mn, log) | 0.014 | 0.019*** | 0.017* | 0.020*** | 0.018** | 0.022*** | 0.020** | 0.022** |
| | (0.0087) | (0.0059) | (0.0088) | (0.0069) | (0.0088) | (0.0075) | (0.0093) | (0.0084) |
| High-tech firm (dummy) | 0.0087 | -0.010 | 0.0093 | -0.0089 | -0.012 | -0.0059 | -0.0073 | -0.0055 |
| | (0.018) | (0.019) | (0.017) | (0.018) | (0.020) | (0.023) | (0.017) | (0.021) |
| Listed firm (dummy) | -0.070 | -0.027 | -0.063 | -0.027 | | | | |
| | (0.042) | (0.016) | (0.039) | (0.016) | | | | |
| Borrower country GDP/capita | -0.19*** | -0.24 | -0.19*** | -0.23 | -0.19*** | -0.20 | -0.19*** | -0.20 |
| | (0.036) | (0.17) | (0.034) | (0.18) | (0.034) | (0.17) | (0.032) | (0.19) |
| Total assets growth | 0.047 | 0.020 | 0.027 | 0.0059 | 0.059 | 0.019 | 0.037 | 0.0033 |
| | (0.046) | (0.019) | (0.037) | (0.015) | (0.050) | (0.020) | (0.039) | (0.017) |
| Market-to-book ratio (listed firms) | | | | | 0.00085 | 0.00097 | 0.00054 | 0.00054 |
| | | | | | (0.00091) | (0.00070) | (0.00084) | (0.00076) |
| Fixed effects | Reduced | Full | Reduced | Full | Reduced | Full | Reduced | Full |
| Observations | 12,655 | 12,655 | 12,312 | 12,312 | 10,998 | 10,998 | 10,728 | 10,728 |
| R-squared | 0.310 | 0.628 | 0.306 | 0.640 | 0.312 | 0.625 | 0.309 | 0.640 |

This table reports the results of OLS regressions of the probability of a foreign loan as a function of the borrower-country recession dummy, key borrower-firm characteristics, and controls. For specifications using "All foreign loans" the dependent variable takes the value one if the lender, the lender's immediate parent or its global ultimate owner is domiciled in a different country than the borrower. For specifications using "Direct CB loans" the dependent variable takes the value one if the lender is domiciled in a different country than the borrower. The sample is restricted to loans originated between 1999 and 2016. We use two different sets of fixed effects. "Reduced" fixed effects include dummies for 1-digit SIC Industry, Year, Loan type, Loan purpose, and Borrower region. The Borrower region fixed effects are dummies for each of the World Bank's geographical regions based on the borrower firm's home country. The regions are Europe & Central Asia, Latin America & Caribbean, Middle East & North Africa, North America, South Asia and Sub-Saharan Africa. "Full" fixed effects include all the reduced fixed effects plus lender country effects, and replace borrower region by borrower country effects and 1-digit SIC by 2-digit SIC effects. Standard errors are clustered at borrower country level. */**/*** indicates statistical significance at the 10/5/1 percent level.

Table 3: Different opacity proxies

| | All firms | | | | Listed firms | | | |
|---|---|---|---|---|---|---|---|---|
| | All foreign loans | | Direct CB loans | | All foreign loans | | Direct CB loans | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Borrower country recession (dummy) | -0.087*** | -0.087*** | -0.078*** | -0.080*** | -0.082*** | -0.083*** | -0.072** | -0.074** |
| | (0.028) | (0.028) | (0.028) | (0.029) | (0.029) | (0.030) | (0.029) | (0.030) |
| Recession × High-tech firm | -0.033** | | -0.030* | | -0.041** | | -0.035** | |
| | (0.016) | | (0.016) | | (0.018) | | (0.017) | |
| Recession × R&D expense/revenue | | -0.48*** | | -0.32*** | | -0.50** | | -0.35** |
| | | (0.14) | | (0.11) | | (0.19) | | (0.14) |
| High-tech firm (dummy) | 0.0056 | -0.0096 | 0.0063 | -0.0074 | 0.016 | -0.0030 | 0.014 | -0.0019 |
| | (0.018) | (0.017) | (0.020) | (0.016) | (0.021) | (0.019) | (0.021) | (0.017) |
| R&D expense/revenue | 0.53** | 0.74*** | 0.41** | 0.56*** | 0.54** | 0.74*** | 0.39** | 0.54*** |
| | (0.21) | (0.23) | (0.16) | (0.16) | (0.22) | (0.23) | (0.15) | (0.14) |
| Share of foreign sales | 0.072*** | 0.072*** | 0.064*** | 0.064*** | 0.064*** | 0.064*** | 0.062*** | 0.062*** |
| | (0.019) | (0.019) | (0.019) | (0.019) | (0.020) | (0.021) | (0.020) | (0.020) |
| Return on assets | -0.19* | -0.19* | -0.17** | -0.17** | -0.18* | -0.18* | -0.19** | -0.18** |
| | (0.10) | (0.10) | (0.076) | (0.077) | (0.10) | (0.10) | (0.069) | (0.069) |
| Leverage or market leverage | -0.0049 | -0.0043 | -0.0062 | -0.0057 | -0.033 | -0.033 | -0.034* | -0.034* |
| | (0.024) | (0.023) | (0.020) | (0.020) | (0.022) | (0.022) | (0.018) | (0.018) |
| Total assets (constant USD mn, log) | 0.017*** | 0.018*** | 0.018** | 0.018** | 0.020** | 0.021** | 0.020** | 0.020** |
| | (0.0058) | (0.0058) | (0.0067) | (0.0067) | (0.0077) | (0.0078) | (0.0086) | (0.0086) |
| Listed firm (dummy) | -0.024 | -0.024 | -0.025 | -0.025 | | | | |
| | (0.016) | (0.016) | (0.016) | (0.016) | | | | |
| Borrower country GDP/capita | -0.23 | -0.23 | -0.22 | -0.23 | -0.19 | -0.19 | -0.19 | -0.19 |
| | (0.17) | (0.17) | (0.18) | (0.18) | (0.17) | (0.17) | (0.19) | (0.19) |
| Total assets growth | 0.025 | 0.025 | 0.010 | 0.011 | 0.025 | 0.025 | 0.0088 | 0.0093 |
| | (0.020) | (0.020) | (0.016) | (0.016) | (0.021) | (0.021) | (0.018) | (0.018) |
| Market-to-book ratio (listed firms) | | | | | 0.00065 | 0.00065 | 0.00030 | 0.00031 |
| | | | | | (0.00074) | (0.00075) | (0.00083) | (0.00083) |
| Full fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 15,108 | 15,108 | 14,731 | 14,731 | 13,175 | 13,175 | 12,889 | 12,889 |
| R-squared | 0.641 | 0.641 | 0.653 | 0.653 | 0.637 | 0.637 | 0.652 | 0.652 |

This table reports the results of OLS regressions of the probability of a foreign loan as a function of the borrower-country recession dummy, key borrower-firm characteristics, and controls. For specifications using "All foreign loans" the dependent variable takes the value one if the lender, the lender's immediate parent or its global ultimate owner is domiciled in a different country than the borrower. For specifications using "Direct CB loans" the dependent variable takes the value one if the lender is domiciled in a different country than the borrower. The sample is restricted to loans originated between 1999 and 2016. All specifications include fixed effects for 2-digit SIC Industry, Year, Loan type, Loan purpose, Borrower country, and Lender country. Standard errors are clustered at borrower country level. */**/*** indicates statistical significance at the 10/5/1 percent level.

Table 4: Large distance loans

| | All (1) | Geo dist (2) | Diff language (3) | Non-contiguous (4) | Non-colonial (5) | Any (6) |
|---|---|---|---|---|---|---|
| Borrower country recession | -0.082*** | -0.030** | -0.066*** | -0.071*** | -0.080*** | -0.019** |
| | (0.025) | (0.013) | (0.021) | (0.021) | (0.025) | (0.0091) |
| Recession × Share of intangible assets | -0.062*** | -0.024* | -0.059*** | -0.059*** | -0.067*** | -0.014 |
| | (0.017) | (0.012) | (0.022) | (0.015) | (0.017) | (0.0092) |
| Share of intangible assets | 0.034** | 0.031** | 0.038** | 0.043*** | 0.034** | 0.023** |
| | (0.015) | (0.012) | (0.016) | (0.015) | (0.015) | (0.010) |
| Share of foreign sales | 0.078*** | 0.060*** | 0.076*** | 0.096*** | 0.074*** | 0.040*** |
| | (0.020) | (0.014) | (0.022) | (0.020) | (0.019) | (0.013) |
| R&D expense/revenue | 0.59*** | 0.11 | 0.66*** | 0.40** | 0.59*** | 0.20* |
| | (0.20) | (0.11) | (0.21) | (0.19) | (0.20) | (0.097) |
| Return on assets | -0.16 | -0.18** | -0.13* | -0.18 | -0.16 | -0.14* |
| | (0.11) | (0.081) | (0.072) | (0.11) | (0.10) | (0.075) |
| Leverage | -0.020 | -0.062*** | 0.0077 | -0.037* | -0.022 | -0.036** |
| | (0.029) | (0.017) | (0.031) | (0.021) | (0.029) | (0.017) |
| Total assets (constant USD mn, log) | 0.019*** | 0.0099*** | 0.020*** | 0.017*** | 0.019*** | 0.0082*** |
| | (0.0059) | (0.0028) | (0.0071) | (0.0051) | (0.0060) | (0.0016) |
| High-tech firm | -0.010 | 0.00046 | -0.019 | -0.012 | -0.0084 | -0.0086 |
| | (0.019) | (0.011) | (0.021) | (0.016) | (0.019) | (0.0075) |
| Listed firm (dummy) | -0.027 | 0.015 | -0.019 | -0.021 | -0.026 | 0.027** |
| | (0.016) | (0.013) | (0.015) | (0.017) | (0.016) | (0.011) |
| Borrower country GDP/capita | -0.24 | -0.087 | -0.23 | -0.18 | -0.23 | -0.085 |
| | (0.17) | (0.17) | (0.15) | (0.15) | (0.17) | (0.15) |
| Total assets growth | 0.020 | 0.0027 | 0.0083 | 0.018 | 0.020 | 0.0024 |
| | (0.019) | (0.012) | (0.015) | (0.019) | (0.019) | (0.011) |
| Full fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 12,655 | 10,330 | 11,256 | 11,834 | 12,550 | 9,712 |
| R-squared | 0.628 | 0.701 | 0.609 | 0.621 | 0.631 | 0.718 |

This table reports the results of OLS regressions of the probability of a foreign loan as a function of the borrower-country recession dummy, key borrower-firm characteristics, and controls. The dependent variable takes the value one if the lender, the lender's immediate parent or its global ultimate owner is domiciled in a different country than the borrower. "Geo dist" excludes loans from borrower-lender country pairs which have a geographical distance smaller than the median distance for cross-border loans; "Diff language" excludes cross-border loans from borrower-lender pairs that share a common language; "Non-contiguous" excludes loans from borrower-lender pairs that are contiguous (share a border); "Non-colonial" excludes loans from borrower-lender pairs that had a colonial relationship in 1945 or more recently; finally, the column "Any" excludes all loans that were excluded in any of specifications 2–5. The sample is restricted to loans originated between 1999 and 2016. All specifications include fixed effects for 2-digit SIC Industry, Year, Loan type, Loan purpose, Borrower country, and Lender country. Standard errors are clustered at borrower country level. */**/*** indicates statistical significance at the 10/5/1 percent level.