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When in Rome: lending to SMEs by foreign and domestic banks

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Non-technical summary

The potential advantages of foreign banks' presence in domestic markets in alleviating credit constraints and stimulating credit competition may not be fully accomplished due to limitations of the former. The empirical banking literature points, for example, that foreign-owned banks usually shy away from extending loans to small and medium enterprises (SME). Theoretical arguments relate the cause of such behavior to disadvantages of foreign-owned banks in processing SMEs soft information, coupled with the fact that hard data availability for SME firms is usually scarce. (Hard information is usually simple to characterize in numbers whereas soft information is not).

In this paper, we unveil a novel mechanism used by foreign banks to mitigate their information disadvantages vis-a-vis private domestic banks. We conjecture that recent loans granted by other banks to a non-current borrower may represent valuable information regarding this borrower's good financial condition. That is, when deciding whether or not to grant a loan to a non-current borrower, financial intermediaries may interpret the existence of recent loans granted to this borrower by other banks as a signal of its quality. This should be particularly true when foreign-owned banks evaluate SME firms that borrowed from domestic private banks in the recent past, since the latter may have informational advantages in evaluating the prospects of informationally opaque firms. Our findings are consistent with this hypothesis.

We find that recent credit operations with private domestic banks increase the chance a loan will be granted to SME firms by 2.5 p.p. more for foreign banks in comparison to private domestic banks (or, equivalently, by 22% of the foreign bank unconditional probability of granting a loan). The analogous estimates for large firms are close to zero and not statistically significant. Furthermore, previous new loans with foreign banks do not statistically change the differential probability of a loan being granted to a SME by a foreign bank in comparison to a domestic bank.

Resumo não-técnico

Vantagens potenciais da presença de bancos estrangeiros em mercados domésticos, no que diz respeito ao alívio das restrições de crédito e ao estímulo da concorrência creditícia, podem não ser totalmente aproveitadas devido às limitações dos primeiros. A literatura bancária empírica aponta, por exemplo, que os bancos de propriedade estrangeira geralmente têm mais receio de conceder empréstimos a pequenas e médias empresas (PMEs). Os argumentos teóricos relacionam a causa desse comportamento às desvantagens dos bancos de propriedade estrangeira no processamento de informações qualitativas das PMEs, aliada ao fato de que a disponibilidade de dados quantitativos para empresas de pequeno e médio porte geralmente é escassa.

Neste artigo, revelamos um novo mecanismo usado por bancos estrangeiros para mitigar suas desvantagens informacionais em relação aos bancos domésticos privados. Conjecturamos que empréstimos recentes concedidos por outros bancos a um tomador não-corrente podem representar informações valiosas sobre a boa condição financeira desse tomador. Ou seja, ao decidir se concedem ou não um empréstimo a um tomador novo, os intermediários financeiros podem interpretar a existência de empréstimos recentes concedidos a esse tomador por outros bancos como um sinal de sua qualidade creditícia. Isso deve ser particularmente verdadeiro quando bancos estrangeiros avaliam pequenas e médias empresas (PMEs) que tomaram empréstimos de bancos privados nacionais recentemente, uma vez que estes últimos podem ter vantagens informacionais na avaliação das perspectivas de empresas com informações opacas. Nossos resultados são consistentes com essa hipótese.

Constatamos que recentes operações de crédito com bancos privados nacionais aumentam a probabilidade de um empréstimo ser concedido a PMEs em 2.5 pontos percentuais a mais para bancos estrangeiros em comparação com bancos privados nacionais (ou, equivalentemente, em 22% da probabilidade incondicional de um banco estrangeiro conceder um empréstimo). As estimativas análogas para grandes empresas são próximas de zero e não são estatisticamente significativas. Além disso, novos empréstimos anteriores com bancos estrangeiros não alteram estatisticamente a probabilidade diferencial de um empréstimo ser concedido a uma PME por um banco estrangeiro em comparação com um banco nacional.

When in Rome: Lending to SMEs by foreign and domestic banks*

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Abstract

Conditional on a loan application filed by a small or medium enterprise (“SME”), we find that the existence of recent loans of that firm with private domestic banks increases the chance a loan will be granted by a foreign bank relative to a private domestic bank. On the other hand, recent loans extended by foreign banks or by domestic state-owned banks do not produce this differential effect. Furthermore, the aforementioned effect vanishes for large firms. These findings are consistent with a mechanism by which foreign banks overcome borrower informational asymmetries by relying on their domestic peers’ recent behavior. Indeed, the higher ability of private domestic banks to access informationally opaque SMEs, dependent on soft information, makes recent loans with them a more valuable signal for foreign lenders who lack the same ability.

JEL codes: D80, D81, D82, G21

Keywords: Foreign banks, information asymmetries, bank loans, SME firms

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1 Introduction

Financial liberalization in a large number of countries allowed foreign bank presence to expand in the 90's and 2000's. Using a rich database that encompasses 137 countries, [Claessens and Horen \(2014\)](#) show that the average proportion of foreign banks among countries jumped from 20% in 1995 to 34% in 2009. The increase is specially pronounced in emerging markets, where this proportion rose from 18% to 36% in the same period. In terms of bank assets, [Barth et al. \(2013\)](#) document an increase in the average share of total bank assets held by foreign banks from 29% in 1999 to 47% in 2011. However, the potential expected advantages of the growing foreign banks' presence in alleviating credit constraints and stimulating competition is not without limitations. The empirical banking literature points, for example, that foreign-owned banks usually shy away from extending loans to small and medium enterprises (SME).¹ Theoretical arguments relate the cause of such behavior to disadvantages of foreign-owned banks in processing soft information, coupled with the fact that data availability for SME firms is usually scarce. (Hard information is usually simple to characterize in numbers whereas soft information is not). This problem may be even more severe in underdeveloped countries, where other aspects (e.g. weak enforcement of creditor rights) may compound in contributing to foreign banks focusing only on a limited group of large and financially transparent firms.

In this paper, we unveil a novel mechanism used by foreign banks to mitigate their information disadvantages vis-a-vis private domestic banks. We conjecture that recent loans granted by other banks to a non-current borrower may represent valuable information regarding this borrower's good financial condition. That is, when deciding whether or not to grant a loan to a non-current borrower, financial intermediaries may interpret the existence of recent loans granted to this borrower by other banks as a signal of its quality. This should be particularly true when foreign-owned banks evaluate SME firms that borrowed from domestic private banks in the recent past, since the latter may have informational advantages in evaluating the prospects of informationally opaque firms. Our findings are consistent with this hypothesis.

We argue that Brazil is a good setting to investigate the aforementioned hypothesis. In contrast to the international pattern, Brazil represents a case where banking internationalization has contracted in the past. After a large-scale entry in the late 90s, foreign banks have retreated, in a great part being absorbed by their domestic competitors ([Fachada, 2008](#)). Therefore, most foreign banks that had survived in Brazil by the 2000's can perhaps be seen as the ones who managed to adopt the more successful strategies to cope with the adverse environment of doing business overseas. One of those adversities is precisely their informational disadvantage in dealing with SMEs. Thus, to the extent that most foreign banks that remained in Brazil by the 2000's have overcome such challenge, the use of the Brazilian setting over a recent sample

¹See [Berger et al. \(2001\)](#), [Clarke et al. \(2005\)](#), [Mian \(2006\)](#), [Berger et al. \(2008\)](#) and [Giannetti and Ongena \(2012\)](#). Some of these papers also point that foreign banks are biased towards foreign-owned corporations and firms that have multiple banking relationships.

helps us to unveil mostly succeeding informational strategies of such banks.² In other words, our results are not polluted by a material number of possibly less successful strategies of foreign banks who decided to exit the country.

In order to explain the mechanisms behind foreign banks' aversion to SME firms, the literature usually points to distance-related informational asymmetries. The material geographical distances between the headquarters and the subsidiaries of foreign banks may imply an increase of agency problems in the transmission and verification of SME firms' soft information (Mian, 2006). Regarding organizational distance, foreign banks are also more hierarchical than domestic banks; thus their various hierarchical layers might impair the proper transmission of soft information between the loan officer generating the information and the high management (Stein, 2002; Liberti and Mian, 2009; Canales and Nanda, 2012). Since evaluating and monitoring SME firms are activities intensive in soft information, foreign banks would be at disadvantage from this perspective. Cultural distance might also create difficulties for foreign banks to perform relationship intensive activities, such as lending to SME firms and renegotiating past due credit obligations (Mian, 2006).

Besides having their loan portfolios more concentrated in large firms, foreign banks may also employ other mechanisms to substitute away their informational disadvantages in dealing with SME firms. Beck et al. (2017) shows that foreign owned banks can overcome distance-related information asymmetries through contract design. By requiring collateral more often and granting shorter maturity loans, foreign banks can provide services to the same clientele as domestic banks. Moreover, as long as the loan contract satisfies these conditions, foreign bank loans don't present more repayment problems than domestic bank loans. In the same spirit, Sengupta (2007) competition model shows that foreign banks may require collateral as a screening device to mitigate asymmetric information problems with domestic banks. In a cross-country study, Clarke et al. (2005) suggest that strong and accessible credit bureaus might be important to mitigate informational barriers between foreign and domestic banks. Our paper relates to those in the sense that we unveil a novel mechanism through which foreign banks can mitigate informational disadvantages vis-a-vis private domestic banks.

As a way to overcome informational barriers, we test if foreign banks rely on their peers' recent behavior in order to decide the outcome of a loan application. For that, we match a comprehensive database of bank-borrower loan information requests to actual individual loan data. Our data comprises roughly all information requests and loan approvals about firms located in the city of São Paulo from 2013 to 2016. Information requests about potential borrowers are filed by banks to the Central Bank of Brazil, who collects and stores loan level information in its credit registry. According to Brazilian rules, banks are allowed to request (aggregate) firm credit information only if they have explicit authorization of the firm. Since

²As an exception to the behavior of most foreign banks, a couple of them (e.g. Citibank and HSBC) just realized exiting strategies from the Brazilian market towards the end of our sample period.

this authorization is automatically given by firms when they engage in a credit relationship, we focus on information requests for non-current borrowers. The requests for non-current borrowers constitute a better proxy for loan applications, since requests for current borrowers might have different reasons other than evaluating a new loan demand (e.g. updating loan credit scores).³ With this procedure, we intend to disentangle the demand determinants of bank loans through the loan applications, so we can identify more clearly what drives bank loan supply schedules. Similar proxies for loan applications are also used by [Jiménez et al. \(2012\)](#) and [Jiménez et al. \(2014\)](#) in order to analyze the determinants of loan supply in a different context. To the best of the authors' knowledge, this is the first study to use loan application data from Brazil. In our context, this is critical to disentangle loan supply from demand issues.

To address firm unobservables and firm selection concerns across domestic and foreign-owned banks, our benchmark specification controls for all time varying firm heterogeneity. With firm-month fixed effects, we focus on firms that made loan applications for different bank groups within the same month. We find that when a firm applies for loans in both a domestic and a foreign bank in the same month, the existence of previous operations in the past 3 months increases more the probability that the loan will be granted by the foreign bank than by the domestic bank and that this increase is higher when the firm is a SME. This finding is consistent with the hypothesis that foreign banks mitigate their information disadvantages by looking at their competitors' past behavior towards a given firm. Also, it remarks that this mechanism is more pronounced in market segments where informational barriers are higher (i.e. SME firms). As a way to evaluate if firm quality signals provided by recent loans vary with the previous lender ownership type, we further discriminate past credit operations granted by foreign banks from those granted by private domestic ones. We find that recent new credit operations with private domestic banks increase the chance a loan will be granted to SME firms by 2.5 p.p. more for foreign banks in comparison to private domestic banks (or, equivalently, by 22% of the foreign bank unconditional probability of granting a loan). The analogous estimates for large firms are close to zero and not statistically significant. Furthermore, previous new loans with foreign banks do not statistically change the differential probability of a loan being granted to a SME by a foreign bank in comparison to a domestic bank. We interpret this last non-significance finding as evidence that recent SME loans with foreign banks do not constitute a valuable signal, since even banks with informational disadvantages do not change more their behavior upon it.

We also test the effect of recent new loans with public banks. Consistent with the view that public bank objectives may take into account other considerations beyond profit maximization, so that their loans may not constitute a good signal of firm quality, we find no differential

³Additionally, new loans demanded by current borrowers might not even compel the bank to file an information request to the credit register, as the bank may have already accumulated enough inside information through the credit relationship with this borrower ([Petersen and Rajan, 1994](#)). Thus, it increases the chances the bank will look after other sources of information to reach a decision.

change in the probability of foreign banks granting loans to firms (both large and SMEs) that borrowed from public banks in the last 3 months in comparison to domestic banks. Overall, our results are robust, among other factors, to different time horizons for the recognition of recent new credit operations (3 or 6 months), to different measures of firm size underlying the SME definition and for clustering of standard errors in different ways. Our results also stand a very saturated specification that includes bank-month fixed effects.

Although the mechanism we unveil of a group of banks overcoming borrower informational asymmetries by relying on their peers' behavior has not been, to the best of our knowledge, discussed in the banking literature, the idea that occurrences of new loans convey relevant nonpublic positive information about the borrower to outside parties is well established in the literature. For example, [James \(1987\)](#) shows that borrower stocks present abnormal returns in the time range surrounding bank loan agreements. In comparison, the announcement of other forms of external finance, such as public straight debt offerings, don't cause the same impact on stock prices. Moreover, these findings are not related to the purpose of the loan. [James \(1987\)](#) states that bank loans reveal inside information of firms, which differentiates them from other forms of private debt.

It is important to remark that because the dependent variable in our paper is a dummy indicating whether the loan was granted, and not the (unobserved) loan conditions that were offered to the borrower, competition effects display a latent role in our estimations. Indeed, the related banking literature discusses the extent to which borrowers become captured if information gathered through a lending relationship is not public knowledge ([Dell'Ariccia and Marquez, 2004](#)). This capability of locking-in a borrower should be higher in market segments with higher information asymmetries (e.g. SME firms) and should also vary with the ability of banks to process soft information. In a number of papers, this ability is proxied by the geographical distance between borrowers and lenders, since soft information requires some kind of personal contact to be gathered and verified ([Degryse and Ongena, 2005](#); [Hauswald and Marquez, 2006](#); [Agarwal and Hauswald, 2010](#)). To the extent that non-current borrowers applying for a new loan already have a previous credit relationship, this might give previous lenders a comparative advantage to attend these firms' needs, thus reducing the probability they will get a loan from a new lender. This "capture effect" should be higher for SME firms, since greater information asymmetries in this segment might obstruct external lenders competition. Also, the capture effect is likely to be less effective if carried out by foreign banks, given their disadvantages in dealing with soft information intensive borrowers. Thus, if anything, the lock-in effect goes in the opposite direction of our hypothesis and may only underestimate our findings.

This study connects to the literature that investigates theoretically the potential effectiveness of foreign banks in alleviating credit constraints. While the presence of foreign banks generally improves conditions for the targeted market segment (typically large firms), some papers have shown that foreign banks might "cream skim" the pool of borrowers of domestic

banks, intensifying adverse selection problems for the remainder of the pool and deteriorating non-large firms ability to access bank loans (Detragiache et al., 2008; Gormley, 2010). On the other hand, others argue that foreign banks' presence enhances small firms access to external funding, even if this occurs through general equilibrium effects that force domestic banks to expand credit to these firms (Dell'Ariccia and Marquez, 2004; Clarke et al., 2006; Giannetti and Ongena, 2012; Bruno and Hauswald, 2013). None of these papers acknowledges, however, the potential of foreign banks to follow domestic banks' loan granting decisions, as in our paper, and therefore may miss a relevant aspect of the general picture.

This paper also has some connection to the literature on uniform behavior and imitation can provide close links to our paper. For example, the Informational Cascades model of Bikhchandani et al. (1992) helps to rationalize our hypothesis. In their model, binary decisions of agents are taken sequentially. Each agent observes a private random signal about the quality of the object under evaluation and the previous decisions taken by its peers towards this object (but not previous peers' private signals). The sequence of decisions evolve in a such a way that, with high probability, agents end up following their peers' actions, independent of their own private signals. Moreover, with heterogeneity across agent signals' precisions, agents of more precise signals act first and others free ride on their decisions. This result closely mimics our narrative that previous decisions taken by domestic banks towards financing SME firms have a higher chance of being followed by foreign owned banks.

Section 2 presents summary statistics regarding loan and firm size distributions by bank ownership type and shows anecdotal evidence that foreign banks also shy away from SME firms in Brazil (in comparison to domestic banks). Section 3 describes our data and characterizes our sample. Section 4 presents the empirical strategy. It describes and discusses the econometric specifications, the hypotheses tested and some identification concerns. Section 5 presents and discusses our main results whereas section 6 conducts an array of robustness exercises. The last section concludes.

2 Stylized facts about loan and firm distributions by bank ownership in São Paulo

Table 1 presents statistics of the loan and firm distributions of the credit portfolios of firms in São Paulo held by foreign and private domestic banks, as well as the number of banks themselves. As we can see, 45% of the 132 banks with credit presence in São Paulo are foreign-owned. (This number is accounted for at the individual bank level). Despite having more than 100 participants in São Paulo, the bank loan market is concentrated. In our sample period, the top 10 banks with more loan applications account for 85% of all loan applications of non-current borrowers.

Table 1: Firm and loan market share by bank ownership

Bank Ownership	Number of banks	Number of borrowers (thous.)	Number of new loans (thous.)	Total bank credit (BRL 2015 billions)
Foreign	60	70	1,141	227
Private domestic	72	162	2,809	359
Total	132	208	3,950	586

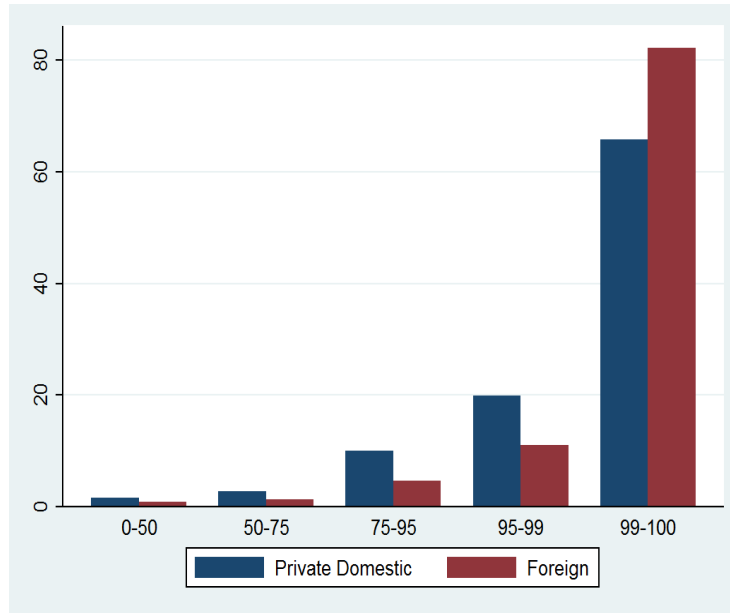
Note: Market shares computed over a sample of private banks loans to all firms located in the city of São Paulo from 2012M01 to 2017M06.

Foreign banks own a significant share of private loans in São Paulo, roughly 30% of new loans and 39% of the overall loan amount. They also provide credit services for a considerable clientele, 70,000 firms.⁴ Table 1 indicates that the loan size distribution of foreign and domestic banks is clearly different: the average borrower of a foreign bank got 3.2 million reais in bank loans while the average borrower of a private domestic banks got 2.2 millions. Furthermore, there is substantial firm size variability both within bank ownership type and within specific banks.

Figure 1 presents the distributions of total bank credit by firm size according to the two analyzed bank ownership types. Firm size is measured by maximum outstanding debt (between 2005 and 2017). Both axes denote percentile levels. Since total bank credit is highly asymmetric along firm size, percentile intervals of different lengths are employed in the horizontal axis. Figure 1 shows that, in comparison to domestic banks, a larger fraction of foreign bank loans goes to larger firms. This evidence is also robust to other possible proxies of firm size, such as gross revenues reported by the banks themselves. Figure 2 replicates the exercise of Figure 1 with a focus on the number of new loans instead of total bank credit. The difference between the foreign and domestic distributions is even more striking in this case.

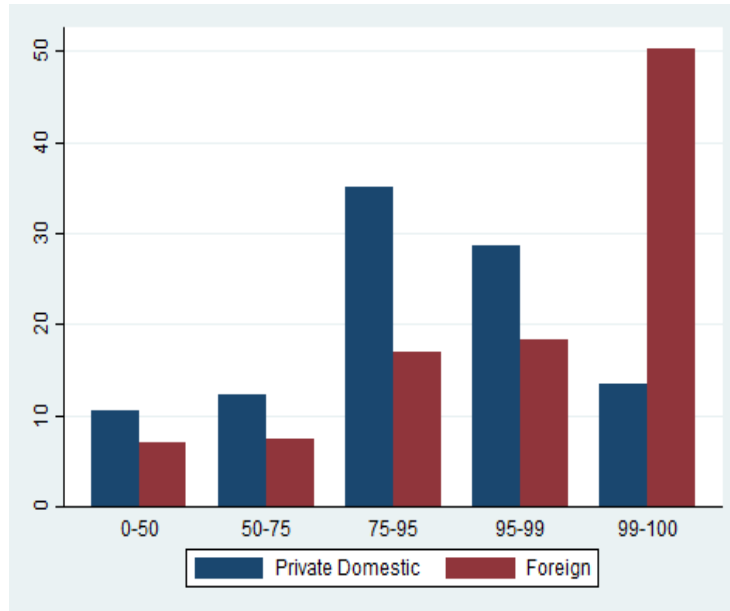
⁴The total number of borrowers in Table 1 is not the result of the sum of the first two lines because some firms borrow from both foreign and domestic banks.

Figure 1: Distribution of total bank credit by firm size.



Note: Horizontal axis labels denote percentile intervals of firm size proxied by maximum outstanding debt between 2005 and 2017. Vertical axis labels denote the percentage of total bank credit extended to each firm size category. Both blue and red bars add up to 100%. Distributions computed over the sample of private bank loans to all firms located in the city of São Paulo from 2012M01 to 2017M06.

Figure 2: Distribution of the number of new loans by firm size.



Note: Horizontal axis labels denote percentile intervals of firm size proxied by maximum outstanding debt between 2005 and 2017. Vertical axis labels denote the percentage of the number of new loans extended to each firm size category. Both blue and red bars add up to 100%. Distributions computed over the sample of private bank loans to all firms located in the city of São Paulo from 2012M01 to 2017M06.

The previous figures constitute only anecdotal evidence that bank ownership is related to the degree of SME lending. In those figures, we do not control for different characteristics of loan demand facing foreign and domestic banks, nor do we control for other bank variables that might be correlated to ownership type. If, for instance, foreign banks are larger on average, the driving force behind figures 1 and 2 might be bank size rather than ownership.⁵ Nevertheless, the anecdotal evidence is consistent with the findings of the banking literature that show that foreign banks have informational disadvantages vis-a-vis domestic banks regarding lending to SME firms and may shy away from lending to them (Berger et al., 2001; Clarke et al., 2005; Mian, 2006; Berger et al., 2008; Giannetti and Ongena, 2012). In the next sections, we formally specify our hypothesis that foreign banks mitigate these informational asymmetries by relying on their domestic peers' behavior and present an econometric strategy to test it.

3 Data

Our dataset comprises roughly 409 thousand monthly information requests from 2013M01 to 2016M09 filed by banks about potential borrowers matched to the occurrence (or not) of new loans in the months following the requests. We define as potential borrowers those firms that don't have a credit relationship with the bank making the request at the time the request is made. Requests are stored in a transactional database operated by the Central Bank of Brazil that records for each request the identity of the bank making the request and the firm and month to be researched. Requests return aggregate information about the firm debt (e.g. number of loans, number of banks and the repayment schedule amounts aggregated by loan type). This credit information is collected and stored in the Brazilian Credit Register, which is a comprehensive repository of loan-level data that encompasses all loans with more than 1,000 reais during most of our sample period. We employ credit registry data from 2012M07 to 2016M12.⁶ We work with a sample of all loans above 5000 reais that purposefully leave small operations of receivables discounting out of the sample.⁷ The main piece of data from the registry employed in our paper are the months in which new loans are granted by every bank to every firm. A binary variable indicating whether a new loan is granted up to 3 months after the loan application will be the dependent variable in our regressions. Since we focus on loans to non-current borrowers, loan renewals and renegotiated loans are not a source of concern.

We interpret the information requests to the credit registry as proxies for loan applications.

⁵However, this is unlikely the case here. Of the top 20 banks, the average size of private domestic banks is roughly twice the size of the average foreign bank.

⁶Note that the period employed predates the emergence of PIX and the surge of Fintechs, with their supposed ability to better "harden" soft information.

⁷The small credit amounts coupled with the collateral provided by the receivables of such credit operations are likely to make their informational content about the borrower's creditworthiness less valuable. Furthermore, the credit risk analysis of these operations may not even require the sophistication of examining the borrowers recent past. Therefore, these loans are likely less related to the mechanism studied in this paper.

Reasons for the requests not related to loan demand are unlikely in our setting. One might be concerned that banks usually request borrower information to monitor its credit risk, but this is very much the reason why we focus on information requests for non-current borrowers. It may also be a cause of concern that banks may request information to prospect new borrowers. Nevertheless, Brazilian regulation demands that banks have explicit client authorization to request its credit information stored in the Brazilian Credit Register, so it is unlikely that requests are made to prospect firms with no relationship with the banks. Nevertheless, it is still possible that banks get the aforementioned authorizations from firms that are neither their current borrowers nor potential borrowers that demand credit, but just (non-time) depositors with them. In this situation, banks would be able to consult the register about their deposit holders just for credit prospecting goals. To minimize this possibility, we exclude from our sample of information requests those carried out in a “batch mode” and, consequently, more likely to have been automated to process the list of depositors of the banks. Finally, we exclude information requests filed by public banks, since their behavior is not the primary focus of this paper.

The months in which recent loans were granted to a firm can, in general, be inferred by the banks by following the trajectory of the firm aggregate debt, obtained through the requests to the register. On the other hand, the identities of the other (past) lenders are not disclosed by the register to the requesting bank (similarly to other loan-level data, like interest rates and loan terms, which are not provided either). However, current market practices in Brazil suggest that, following replies to their information requests, banks go after more disaggregated information for serious candidates, including the bank identity or at least the ownership type of the firm’s previous lenders. This usually occurs informally through personal contacts between loan applicants and the banks (e.g. bank interviews with firm managers). We make, therefore, the assumption the ownership type of previous lenders is known to the bank receiving the application from the new borrower.

We consider only loan applications and loans granted to firms located in the city of São Paulo for different reasons. First, given that São Paulo is the financial center of Brazil, the presence of foreign-owned banks is more pervasive there, leading to a more balanced environment for our analysis.⁸ Second and more important, the greater geographical scattering of domestic banks in Brazil typically unbalances the playing field between foreign and domestic banks, a characteristic of our setting we want to control for. Indeed, monitoring and screening costs that require personal contacts between borrowers and lenders, for example, are expected to be higher, the greater is the distance between the bank loan officer and the borrower. Thus, our geographical restriction of borrowers from São Paulo eliminates concerns that foreign banks are at informational disadvantages in evaluating SME firms because they are, on average, more

⁸In March-2015, foreign banks owned 16% of loan officers in Brazil. When we restrict the sample to the city of São Paulo, this number jumps to 25%. This information is available in the Central Bank of Brazil website.

distant from potential borrowers. We also exclude financial firms and other very small firms (of maximum total outstanding debt below 30,000 reais).⁹

In order to control for bank determinants of loan supply, we employ bank balance sheet data to build our bank controls. Bank balance sheet data come from the accounting database of Brazilian financial institutions (COSIF). Commonly used indicators of bank financial position, bank risk and bank efficiency are employed. They include holding of liquid assets over total assets (*liq_ratio*), capital over risk weighted assets (*cap_ratio*), logarithm of total assets (*ln_assets*), the share of non-performing loans (*NPL*), quarterly return on assets (*ROA*) and the standard deviation of the annual return on assets (*Sd_ROA*). We also include the growth rate of total loans (*credit_growth*) to account for recent bank movements to expand or contract its credit portfolio and total loans to total assets ratio (*total_loans*) to control for the varying importance of the credit portfolio for each bank. At the firm level, however, there is a scarcity of available data in Brazil for SME firms, the focus of this paper. For this reason, our benchmark specification controls for all time-varying heterogeneity at the firm level through the inclusion of firm-month fixed effects.

4 Methodology

Equation 1 presents our initial regression specification. The subscripts f, b, t index an information request submitted by bank b about firm f in month t . The dependent variable, *LoanGranted*, takes the value 1 if a loan is granted to the firm up to 3 months after the information request, and 0 otherwise.¹⁰ *SME* is an indicator variable for small and medium firms. We define SMEs as those firms with maximum outstanding debt below 23 millions (the maximum value taken over the period 2005-2017 in 2005 BRL values). This threshold encompasses the 99% smallest firms. Nevertheless, we show in the next section that results are robust to other proxies of firm size underlying the SME definition. \mathcal{F} is a dummy that indicates that the loan application addresses a foreign-owned bank. The variable *PreviousLoan* indicates whether or not the firm had borrowed from another bank in the last 3 months. The vector **Bank** contains bank controls and comprises indicators of liquidity, solvency, risk, efficiency and credit growth, defined at the bank holding level. Because we lack data on firm controls (particularly for SMEs), our regression specifications include always firm or firm-month fixed effects, represented by F . Monthly dummies, M , are also included when appropriate to control for

⁹The maximum total outstanding debt corresponds to the maximum monthly amount between 2005 and 2017 (in 2005 BRL values) of the sum of outstanding loans, past-due loans, write-offs and guarantees. Since firm-level data is scarce, we used this measure throughout the paper as a proxy of firm size. It's a widely used measure in the Brazilian Financial Stability Report. The referred exclusion aims at removing firms comprising a single individual and that behave precisely as individuals, a common practice used in Brazil to reduce employment taxes and contributions. It also allows the exclusion of some types of loans that resemble more loans to individuals rather than corporate bank loans (e.g. credit cards).

¹⁰This definition of the dependent variable closely follows [Jiménez et al. \(2012\)](#) and [Jiménez et al. \(2014\)](#).

unobserved common macroeconomic effects. Finally, some regression specifications introduce bank or bank-month fixed effects to control for bank unobservables.

$$\begin{aligned}
LoanGranted_{fbt} = & + \beta_0 SME_f + \beta_1 \mathcal{F}_b + \beta_2 PreviousLoan_{ft} + \gamma_1 \mathcal{F}_b \bullet SME_f + \gamma_2 \mathcal{F}_b \bullet PreviousLoan_{ft} \\
& + \gamma_3 PreviousLoan_{ft} \bullet SME_f + \lambda \mathcal{F}_b \bullet PreviousLoan_{ft} \bullet SME_f \quad (1) \\
& + \theta'_b \mathbf{Bank}_{bt-1} + F_{ft} + M_t + \epsilon_{fbt}
\end{aligned}$$

Equation 1 explains the probability that a loan is granted conditional on the existence of a loan application. The coefficient β_0 measures how this probability varies if the loan applicant is a SME compared to a large firm. It may reflect the impact, as seen by the banks, of the different risk profiles of these two groups of firms. (However, due to our pervasive use of firm fixed effects we will not be able to identify this coefficient). The coefficient β_1 measures the impact of foreign bank ownership, compared to the private domestic one, on the aforementioned probability. It may reflect different credit standards or risk appetites between these two groups of banks. The coefficient γ_1 measures the degree by which the loan supply probability to SMEs of foreign banks differs from that of domestic banks. If foreign banks have greater difficulties in evaluating relationship intensive borrowers and shy away from them, this coefficient should be negative.

The coefficient β_2 allows us to access if recent loans granted by other lenders affect the probability that a loan is granted by a new lender. It captures two different effects of opposite directions. On the one hand, β_2 reflects competition effects. Since previous lenders already have a (possibly long) credit relationship with the firm, they possibly have informational advantages about it over the new bank to which the application is addressed, therefore making it harder for the latter to win the latent competition for the new loan (i.e. expected negative sign for β_2). On the other hand, β_2 also reflects informational effects, since recent loans of potential borrowers might reveal important positive information about their current creditworthiness. Both competition and informational effects should be of secondary importance for large, transparent firms, but possibly of material relevance to more opaque SMEs. Indeed, SMEs are both more easily captured in a credit relationship and more rewarded when a positive signal of their creditworthiness are revealed. The coefficient γ_3 measures the net differential impact of these two effects for SMEs in comparison to large firms.

Informational and competition channels may also affect differently foreign banks in relation to private domestic ones, which is captured by γ_2 . At least, this is clearly the case for SMEs. Since foreign banks are at comparative disadvantage in screening firms that rely on soft information (i.e. SME firms), the existence of previous loans of SME firms should constitute more valuable information for foreign banks than for domestic ones, making the positive informational channel stronger for the former. Foreign banks are also less likely to win a latent competition for a new loan given their informational limitations, making the *negative* lock-in

effect with the past lender stronger too. The triple interaction coefficient λ measures the net effect of the two channels for SMEs. If the informational channel is of stronger magnitude, we expect a positive signal for λ .

Equation 1 assumes that, following the return to the queries about potential borrowers, banks infer about the existence of recent loans granted to these borrowers by other lenders. As long as banks file information requests for multiple months, they can see through the recent trajectory of the firm outstanding debt. Furthermore, even though loan-level information is not disclosed following information requests, it is common practice in the Brazilian credit market for banks to ask for more details from serious candidates for borrowing, including their recent lenders' identities or ownership type. In order to check if the signal about borrower quality given by the existence of recent loans varies according to the past lender ownership, equation 2 splits recent loans into those granted by private domestic and foreign-owned banks:

$$\begin{aligned}
LoanGranted_{fbt} = & + \beta_0 SME_f + \beta_1 \mathcal{F}_b + \beta_2 PreviousLoan_D_{ft} + \beta_3 PreviousLoan_F_{ft} \\
& + \gamma_1 \mathcal{F}_b \bullet SME_f + \gamma_2 \mathcal{F}_b \bullet PreviousLoan_D + \gamma_3 \mathcal{F}_b \bullet PreviousLoan_F \\
& + \gamma_4 PreviousLoan_D_{ft} \bullet SME_f + \gamma_5 PreviousLoan_F_{ft} \bullet SME_f \quad (2) \\
& + \lambda_1 \mathcal{F}_{bt} \bullet PreviousLoan_D_{ft} \bullet SME_f + \lambda_2 \mathcal{F}_b \bullet PreviousLoan_F_{ft} \bullet SME_f \\
& + \theta'_b \mathbf{Bank}_{bt-1} + F_{ft} + M_t + \epsilon_{fbt}
\end{aligned}$$

where *PreviousLoan_D* takes the value 1 if the firm borrowed from another private domestic bank in the last three months and equals 0 otherwise. *PreviousLoan_F* is an analogous variable, considering recent loans with foreign lenders.

The interpretation of the coefficients of equation 2 is analogous to that of equation 1. The main difference here derives from the split of recent loans into those supplied by private domestic banks and those supplied by foreign banks, leading to more coefficients to be estimated. If private domestic banks are better suited to screen SME firms, recent loans with them should be positively informative about the creditworthiness of such firms and, therefore, of more value to foreign banks at informational disadvantages. This translates into an expectation of $\lambda_1 > 0$ in equation 2. On the other hand, the signal revealed by recent loans of SMEs with foreign banks is likely to be materially discounted, if even considered, given the informational problems of the latter. Therefore, we should expect $0 \leq \lambda_2 < \lambda_1$ from an informational signaling standpoint. Analogous to equation 1, it is also possible that lock-in effects play a role in the estimations of the aforementioned coefficients. Again, they would push towards the negative direction, against the informational channel. SMEs with recent loans with domestic banks are more easily captured than if past loans were with foreign banks, suggesting coefficient λ_1 is the one more effectively influenced by this negative channel. Thus, lock-in effects may only underestimate our potential findings about the informational signaling channel.

In the next section, we also test a specification that includes the effect of recent loans

with public banks. The banking literature points both to the possibility of public banks taking into account political considerations in their loan supply decisions (Carvalho, 2014) and to their lower performance in comparison to private competitors (Micco et al., 2007; Berger et al., 2009). Hence, we conjecture that recent loans with public banks should not constitute a relevant signal about the firm quality; therefore they should not interfere on the relative chances of foreign banks granting a new loan. If our estimates confirm this conjuncture, we believe our hypothesis regarding the importance of the information conveyed by the existence of recent loans for foreign banks would be further strengthened.

Equations 1 and 2 constitute a linear probability model. We avoid estimating a conditional logit model with firm-month fixed effects, since it would restrict the sample to those firms that both borrowed and were denied a loan within the same month. Also, a conditional logit estimation makes the interpretation of marginal effects less direct. Standard errors are clustered at the bank-month level. Our results are also robust to clustering errors at the bank or at the firm level.

Our benchmark specification will be the one that uses firm-month fixed effects to control for all time-varying heterogeneity at the firm level. In this specification, identification of the parameters of interest necessarily come from firms that applied for loans in both foreign and private domestic banks in the same month. In this way, we account for firm unobservables that correlate to the ownership of the bank it decides to apply and to the bank loan granting decision. As long as our bank information requests represent a good proxy for loan applications, demand for bank loans is controlled for by design. Of course, the firm can always reject the initial loan conditions and renegotiate further the loan terms, so even our rich data does not completely rule out demand side effects related to loan terms. To the extent that those effects do not differ systematically according to the lender ownership, this shouldn't be a cause of concern in our econometric methodology.¹¹

The mean values and standard deviations of all the main variables and the bank controls in our sample, according to bank ownership type, are shown in Table 2. After loan applications are filed, roughly 10% of them turn into credit operations. Also, 90% of foreign bank queries are about SME firms. This compares to 85% for private domestic banks. Regarding foreign banks requests, the queried firms are more likely to have borrowed from another lender in the recent past in comparison to private domestic banks. This finding also holds when we restrict the previous lenders' ownership type. Perhaps SME firms internalize that their chance of getting a new loan from a foreign bank is higher once they borrowed from other lenders in the recent past, as in our hypothesis.

¹¹Ideally, it would be optimal to observe, following a loan application, the loan conditions offered by the bank to the firm. This seems a very difficult data to get a hand on in most settings.

Table 2: Description and sample statistics of the regression variables

Variable	Description and statistics of the regression variables	Foreign	Private Domestic	Total
$LoanGranted_{fbt}$	= 1 if loan is granted from t to $t + 3$, = 0 otherwise	0.117 (0.321)	0.099 (0.298)	0.104 (0.305)
\mathcal{F}_b	= 1 if the information request was submitted by a foreign bank, = 0 otherwise	1.000 (0.000)	0.000 (0.000)	0.272 (0.445)
SME	= 1 if information request is about an SME firm, = 0 otherwise	0.904 (0.295)	0.850 (0.357)	0.864 (0.343)
$PreviousLoan$	= 1 if the firm borrowed from another bank from $t - 3$ to $t - 1$, = 0 otherwise	0.328 (0.470)	0.225 (0.417)	0.253 (0.435)
$PreviousLoan_D$	= 1 if the firm borrowed from another private domestic bank from $t - 3$ to $t - 1$, = 0 otherwise	0.283 (0.451)	0.179 (0.383)	0.207 (0.405)
$PreviousLoan_F$	= 1 if the firm borrowed from another foreign bank from $t - 3$ to $t - 1$, = 0 otherwise	0.098 (0.297)	0.087 (0.282)	0.090 (0.286)
$PreviousLoan_G$	= 1 if the firm borrowed from a public bank from $t - 3$ to $t - 1$, = 0 otherwise	0.118 (0.322)	0.074 (0.262)	0.086 (0.280)
Bank controls:				
ln_assets	Logarithm of total assets	25.048 (1.628)	25.851 (2.274)	25.632 (2.148)
liq_ratio	Liquid assets over total assets	0.194 (0.086)	0.164 (0.074)	0.172 (0.078)
cap_ratio	Capital over risk weighted assets	0.157 (0.051)	0.166 (0.045)	0.163 (0.047)
ROA	Quarterly return on assets	0.004 (0.019)	0.015 (0.018)	0.012 (0.019)
Sd_ROA	Standard deviation of the annual return on assets	0.004 (0.005)	0.003 (0.006)	0.004 (0.006)
total loans	Total loans to total assets ratio	0.562 (0.162)	0.515 (0.089)	0.528 (0.116)
NPL	Share of non-performing loans	0.069 (0.034)	0.058 (0.020)	0.061 (0.025)
credit_growth	Growth rate of total loans	0.022 (1.013)	0.006 (0.036)	0.010 (0.530)

Note: Mean values of every variable displayed by bank ownership type. Standard errors in parenthesis. Sample statistics computed over the period from 2013M01 to 2016M09.

5 Results

Table 3 presents OLS estimates of equation 1. From columns (1) to (4), we increasingly saturate the estimation with fixed effects. Overall, we intend to control for variables and unobservables that might influence the lender decision to grant a loan to a potential borrower and that might be also correlated to the bank ownership type, the firm size category and/or to whether or not the firm borrowed from other lenders in the previous 3 months.

Column (1) features a number of bank financial characteristics that might be related to the bank ability or willingness to grant a new loan, including measures of bank size, liquidity, profitability, capital, risk, credit growth and relative importance of credit. It also includes month fixed effects that aim to control for macroeconomic unobservables that affect loan supply schedules in a similar fashion across banks. Firm fixed effects are included to control for time-invariant heterogeneities at the firm level. It controls, for example, for the firm economic sector and the firm size. These characteristics might change in the long-run for a given firm, but are unlikely to change substantially in a 4-year horizon.

Column (2) introduces individual bank fixed effects, which makes coefficients of the bank controls to differ substantially from column (1). Column (3) adds firm-month fixed effects so that the resulting main estimates are based on firms that applied for loans in different banks in the same month. Since the coefficients of interest require variation in bank ownership, identification of such parameters with firm-month fixed effects comes from firms that necessarily applied for loans in at least one foreign and one private domestic bank in the same month. Thus, it controls, not only for the unobserved time-varying credit risk of the firm, but also for the self-selection of firms to bank ownership type. In this regard, it reduces concerns prompted by the possibility that firms with higher quality are more likely to apply for loans in foreign-owned banks. This specification is our benchmark.

It is still possible that banks react to each other depending on their current credit market shares, leading to more aggressive or looser movements in their loan supply policies. In order to avoid that this competition for market shares confounds the estimation of our effects of interest, column (4) introduces bank-month fixed effects. Therefore, column (4) presents a very saturated specification that features both firm-month and bank-month fixed effects. It controls for all time varying heterogeneity at both the firm and the bank levels that affect loan supply schedules.

Table 3 estimates show that, following a loan application, the probability that a loan is granted in the next 3 months is statistically larger at the 1% confidence level for foreign banks. However, this increase is nullified if the loan applicant is a SME firm, consistent with the idea that foreign banks shy away from SMEs (i.e. coefficient of $\mathcal{F} \times SME$ is negative and of similar magnitude to the positive coefficient of \mathcal{F} in column (1)). The coefficients associated to *PreviousLoan* and *PreviousLoan* \times *SME* in columns (1) and (2) indicate that the existence

of new loans in the last 3 months has only slightly positive or statistically insignificant effect on the probability that a loan is granted for large firms, but has material and statistically negative effect for SME firms. This last finding is consistent with the lock-in of SMEs in their recent lenders, making it harder for the bank to whom the loan application is addressed to win the new loan.

The heterogeneous effect of *PreviousLoan* according to the ownership of the recipient bank is not robust. Indeed, the coefficient of $\mathcal{F} \times \textit{PreviousLoan}$ is not statistically significant in column (1), is highly significant and negative in column (2) and only slightly significant and positive in columns (3) and (4). Finally, the triple interaction of *SME*, \mathcal{F} and *PreviousLoan* is positive and statistically significant in all columns, consistent with our hypothesis that recent loans taken out by a SME represent a more important signal of its creditworthiness for foreign banks than for private domestic ones. The positive sign of the triple interaction reveals that this SME quality signal employed by foreign banks is strong enough to mitigate potential lock-in effects by previous lenders.

It is also worthwhile to remark the magnitude of the estimated increases in the probability that a loan will be granted by foreign banks in comparison to domestic ones due to the existence of recent loans with other lenders. In our benchmark specification (3), these increases amount to 1 p.p. for large firms and 2.6 p.p. for SMEs. In comparison to the foreign bank unconditional probability, these figures are equivalent to a 9% rise in the probability a loan is granted for large firms and 22% for SME firms.¹² Therefore, not only are our estimated coefficients of interest statistically significant (standing for example the very saturated specification (4) at a 10% level of statistical significance) but also their magnitudes are material.

Table 4 presents coefficient estimates of equation 2, which separates past loans according to bank ownership. Results are qualitatively similar to the previous table. Again, the probability that a loan is granted is statistically larger at the 1% confidence level for foreign banks but this increase is nullified if the loan applicant is a SME firm. The existence of new loans in the last 3 months has slightly positive and statistically significant effect on the probability that a loan is granted for large firms, but only if these recent loans were granted by private domestic banks (see coefficients of *PreviousLoan_D* and *PreviousLoan_F* in columns (1) and (2)). Perhaps this indicates that the informational signals posed by domestic banks' recent loans also have a (minor) bearing on large firms. On the other hand, the coefficients associated to *PreviousLoan_D* \times *SME* and *PreviousLoan_F* \times *SME* in columns (1) and (2) indicate that the existence of recent loans with both types of banks has material and statistically negative effects on the probability a new loan is granted for SME firms, consistent with the lock-in of SMEs in their incumbent lenders. Additionally, this effect is stronger (i.e. more negative) for SMEs that borrowed from private domestic banks, which suggests a better ability of those

¹²These numbers are calculated through a comparison of coefficient estimates and the unconditional share of loans approved by foreign banks. For large firms: $0.010/0.117 = 9\%$; and for SME firms: $0.026/0.117 = 22\%$.

banks to capture their SME borrowers because, possibly, they are better able to process SME soft information.

Table 3: Linear probability model estimates of equation (1). Dependent variable: $LoanGranted_{ft}$

Variables	(1)	(2)	(3)	(4)
\mathcal{F}_b	0.024*** (0.004)			
$\mathcal{F}_b \bullet SME_f$	-0.023*** (0.004)	0.001 (0.004)	0.004 (0.004)	0.003 (0.004)
$PreviousLoan_{ft}$	0.003 (0.002)	0.006** (0.002)		
$\mathcal{F}_b \bullet PreviousLoan_{ft}$	-0.003 (0.005)	-0.014*** (0.005)	0.010* (0.005)	0.009* (0.005)
$PreviousLoan_{ft} \bullet SME_f$	-0.037*** (0.003)	-0.034*** (0.003)		
$\mathcal{F}_b \bullet PreviousLoan_{ft} \bullet SME_f$	0.012** (0.006)	0.017*** (0.006)	0.016** (0.007)	0.014* (0.007)
Bank controls:				
lag_ln_assets	0.000 (0.001)	0.001 (0.006)	-0.009 (0.006)	
lag_liq_ratio	-0.241*** (0.030)	-0.006 (0.024)	0.107*** (0.023)	
lag_cap_ratio	0.108*** (0.019)	-0.005 (0.024)	-0.048* (0.027)	
lag_ROA	0.217*** (0.059)	-0.006 (0.035)	0.075 (0.046)	
lag_Sd_ROA	-1.019*** (0.201)	-0.321 (0.228)	-0.328 (0.245)	
lag_credit_assets	-0.021 (0.018)	0.005 (0.021)	0.057*** (0.020)	
lag_NPL	-0.178*** (0.060)	-0.078* (0.044)	-0.027 (0.048)	
lag_credit_growth	0.002 (0.003)	0.000 (0.003)	0.021*** (0.004)	
Fixed effects:				
Month	Yes	Yes	-	-
Bank	No	Yes	Yes	-
Firm	Yes	Yes	-	-
Firm-month	No	No	Yes	Yes
Bank-month	No	No	No	Yes
Observations	378,558	378,558	101,067	101,067

Note: Standard errors in parentheses, clustered at the bank-month level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Columns (1) and (2) present 53,497 firm fixed effects. Columns (3) and (4) present 42,082 firm-month fixed effects.

Table 4: Linear probability model estimates of equation (2). Dependent variable: $LoanGranted_{fbt}$

Variables	(1)	(2)	(3)	(4)
\mathcal{F}_b	0.024*** (0.004)			
$\mathcal{F}_b \bullet SME_f$	-0.023*** (0.004)	0.002 (0.004)	0.004 (0.004)	0.003 (0.004)
$PreviousLoan_D_{ft}$	0.005* (0.002)	0.007*** (0.003)		
$\mathcal{F}_b \bullet PreviousLoan_D_{ft}$	-0.008 (0.006)	-0.013** (0.006)	0.001 (0.006)	0.001 (0.006)
$PreviousLoan_F_{ft}$	-0.002 (0.003)	0.000 (0.003)		
$\mathcal{F}_b \bullet PreviousLoan_F_{ft}$	0.008 (0.006)	-0.002 (0.007)	0.017** (0.007)	0.016** (0.007)
$PreviousLoan_D_{ft} \bullet SME_f$	-0.037*** (0.004)	-0.032*** (0.004)		
$\mathcal{F}_b \bullet PreviousLoan_D_{ft} \bullet SME_f$	0.017*** (0.006)	0.017** (0.007)	0.025*** (0.008)	0.024*** (0.008)
$PreviousLoan_F_{ft} \bullet SME_f$	-0.022*** (0.005)	-0.024*** (0.005)		
$\mathcal{F}_b \bullet PreviousLoan_F_{ft} \bullet SME_f$	0.001 (0.009)	0.004 (0.009)	-0.005 (0.011)	-0.007 (0.012)
Bank controls:	Yes	Yes	Yes	-
Fixed effects:				
Month	Yes	Yes	-	-
Bank	No	Yes	Yes	-
Firm	Yes	Yes	-	-
Firm-month	No	No	Yes	Yes
Bank-month	No	No	No	Yes
Observations	378,558	378,558	101,067	101,067

Note: Standard errors in parentheses, clustered at the bank-month level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Columns (1) and (2) present 53,497 firm fixed effects. Columns (3) and (4) present 42,082 firm-month fixed effects.

The heterogeneous relative effect of $PreviousLoan_D$ for foreign recipient banks is not statistically significant in all specifications but the (2). The effect of $\mathcal{F} \times PreviousLoan_F$ is also not statistically significant in columns (1) and (2) but positive and statistically significant at 5% in specifications (3) and (4). Our hypothesis does not involve positive signs for this coefficient and it indeed becomes insignificant in some of our robustness exercises (see next section).

Of most interest to testing our hypothesis are the estimates of $\mathcal{F} \times PreviousLoan_D \times SME$ and $\mathcal{F} \times PreviousLoan_F \times SME$. The former is positive and highly significant at 1% in almost all specifications whereas the latter is never statistically significant. Recent loans of SME firms are relatively more informative for foreign lenders in comparison to domestic ones, only when those loans were granted by domestic banks. Since private domestic banks have informational advantages regarding lending to SME firms, recent loans of SME firms granted by them should constitute more valuable information for the group of informationally disadvantaged banks, the foreign-owned ones. Note that the positive sign of the coefficient in the case of SME recent loans with domestic banks reveals that the signaling channel surpasses potential lock-in effects when they are also possibly stronger (i.e. SMEs lock-in by previous domestic lenders). It is also remarkable that recent loans of SME firms with foreign banks do not display the same additional informational value to foreign banks (at least in comparison to large firms, as indicated by insignificance of $\mathcal{F} \times PreviousLoan_F \times SME$). Note that in this case the potential opposing lock-in effects should also be weaker in theory. The insignificance of $\mathcal{F} \times PreviousLoan_F \times SME$ is consistent with our hypothesis that foreign banks overcome borrower information asymmetries by relying on their domestic peers' behavior, given the differential ability of the latter to process SME soft information.

In our benchmark specification (3), the increase in the probability that a loan is granted by foreign banks in comparison to domestic ones due to the existence of recent loans with domestic banks amounts to 2.5 p.p. for SME firms (and null for large firms). This is equivalent to an increase by 22% of the foreign bank unconditional probability of granting a loan. Thus, the estimated magnitude is material.

We mentioned before that banks have to resort to direct interactions in order to get information from non-current borrowers about their previous lenders' ownership type. In this regard, the distinct effects of $PreviousLoan_D$ and $PreviousLoan_F$, alone and in their interactions, throughout Table 4, represent an indirect ex-post evidence consistent with the fact that banks are aware of this information, even if it is not supplied by the replies to the bank queries to the credit register.

To further confirm that informational asymmetries are the driving force behind our results on the coefficients of interest, we now explore the possibly heterogeneous signaling effect of recent loans with government-owned banks (in comparison to private domestic and foreign banks). We expect that recent loans with public banks do not constitute important signaling

information for other banks' loan offer decisions. Indeed, public banks may be less productive in screening potential borrowers due to less advanced technology or their objectives may encompass alternative considerations, such as the financing of firms that have political connections with the government. Because of that, we expect the signal posed by recent loans with public banks to be seriously discounted by all banks and for all potential borrowers.

For the new estimations of Table 5, we build a dummy variable, *PreviousLoan_G*, that indicates whether or not the firm borrowed from public banks in the last 3 months. We then incorporate in the regressions the effect of this new variable as well as its interactions with the dummy indicators of foreign-bank ownership and SME. All of the coefficients associated to interactions that include *PreviousLoan_G* are not statistically significant in all columns. These findings suggest that public banks are not efficient in capturing their borrowers. Additionally, the existence of recent loans with public banks doesn't provide additional valuable information for foreign banks' decisions to grant loans to non-current borrowers, either SMEs or large firms. We interpret these findings as corroborating our view that recent loans with public banks are a weak signal about borrower quality. Finally, it is worthwhile to remark that the estimates on the coefficients not related to *PreviousLoan_G* remain qualitatively similar to the previous table. In particular, the coefficient on $\mathcal{F} \times \text{PreviousLoan}_D \times \text{SME}$ remains positive and highly significant at 1% in all specifications whereas the coefficient on $\mathcal{F} \times \text{PreviousLoan}_F \times \text{SME}$ remains statistically insignificant in all of them too.

Table 5: Linear probability model estimates. Dependent variable: $LoanGranted_{fbt}$

Variables	(1)	(2)	(3)	(4)
\mathcal{F}_b	0.023*** (0.004)			
$\mathcal{F}_b \bullet SME_f$	-0.024*** (0.004)	0.002 (0.004)	0.004 (0.004)	0.003 (0.004)
$PreviousLoan_D_{ft}$	0.004* (0.002)	0.006** (0.002)		
$\mathcal{F}_b \bullet PreviousLoan_D_{ft}$	-0.009* (0.005)	-0.014** (0.006)	-0.001 (0.006)	-0.002 (0.006)
$PreviousLoan_F_{ft}$	-0.003 (0.003)	-0.000 (0.003)		
$\mathcal{F}_b \bullet PreviousLoan_F_{ft}$	0.007 (0.007)	-0.003 (0.007)	0.015** (0.007)	0.014* (0.007)
$PreviousLoan_G_{ft}$	0.010** (0.005)	0.010** (0.005)		
$\mathcal{F}_b \bullet PreviousLoan_G_{ft}$	0.005 (0.008)	0.007 (0.008)	0.013 (0.010)	0.016 (0.010)
$PreviousLoan_D_{ft} \bullet SME_f$	-0.037*** (0.004)	-0.032*** (0.004)		
$\mathcal{F}_b \bullet PreviousLoan_D_{ft} \bullet SME_f$	0.018*** (0.006)	0.017*** (0.007)	0.025*** (0.008)	0.025*** (0.008)
$PreviousLoan_F_{ft} \bullet SME_f$	-0.021*** (0.005)	-0.023*** (0.005)		
$\mathcal{F}_b \bullet PreviousLoan_F_{ft} \bullet SME_f$	0.001 (0.009)	0.004 (0.009)	-0.006 (0.012)	-0.007 (0.012)
$PreviousLoan_G_{ft} \bullet SME_f$	0.008 (0.006)	0.006 (0.006)		
$\mathcal{F}_b \bullet PreviousLoan_G_{ft} \bullet SME_f$	0.001 (0.010)	0.002 (0.010)	0.002 (0.015)	-0.001 (0.015)
Bank controls:	Yes	Yes	Yes	-
Fixed effects:				
Month	Yes	Yes	-	-
Bank	No	Yes	Yes	-
Firm	Yes	Yes	-	-
Firm-month	No	No	Yes	Yes
Bank-month	No	No	No	Yes
Observations	378,558	378,558	101,067	101,067

Note: Standard errors in parentheses, clustered at the bank-month level. ***, **, and * indicate statistical significance at, respectively, 1%, 5%, and 10% levels. Columns (1) and (2) present 53,497 firm fixed effects. Columns (3) and (4) present 42,082 firm-month fixed effects.

6 Robustness

In this section, we present some robustness analyses to variations in the specifications, samples and definitions adopted in the previous estimations, and also some placebo exercises. In Table 6 each column represents a particular modification to our previous setup. For brevity, we present here only estimates with firm-month and bank fixed effects, our benchmark specification (column (3) in previous regression tables).

The first new estimation in column (1) deals with concerns that regression errors of banks' loan supply decisions may be serially correlated. If that is the case, standard errors clustered at the bank-month level might be too narrow, overstating the statistical significance of the estimated coefficients. For this reason, column (1) defines error clusters at the individual bank level. Since only 10 banks concentrate 85% of loan applications, clustering at the bank level allows errors of a large number of observations to be serially correlated. Nevertheless, the coefficient on $\mathcal{F} \times PreviousLoan_D \times SME$ remains statistically significant at 5% and there is no increase in statistical significance for the other coefficients. In unreported results, we also verify that our findings are robust to clustering errors at the firm level.

Next, we verify if our findings are sensitive to the definition of SME firms. With this purpose, we employ an alternative categorization of firm size based on thresholds of gross revenues and total assets. We redefine as SMEs those firms with annual gross revenues and total assets below 300 millions and 240 millions reais, respectively (as reported by the banks themselves). Results for this specification are shown in column (2). After this modification, the triple interaction is still statistically significant at 5%. Additionally, the coefficient on $\mathcal{F} \times PreviousLoan_F$ becomes not statistically significant, as expected. In unreported results, we further replace the dummy variable for SME firms by a continuous variable proxy for firm size, the monthly total outstanding debt (defined in footnote 7). Our findings also stand this specification.

In all estimations up to this point, the variables $PreviousLoan_D_{ft}$ and $PreviousLoan_F_{ft}$ are defined based on 3 months prior to the information request. It is possible, however, that bank loans somewhat further in the past are also informative about the potential borrower quality. Consequently, so we modify those variables to account for the granting of new loans in any of the last 6 months before the loan application. Column (3) presents estimates for this specification. Our results are qualitatively similar. The coefficient on the triple interaction of most interest even reaches back its 1% confidence level.

It might also prompt some concern the possibility that banks submit multiple information requests about the same borrower in a short interval. If borrowers approach lenders that just denied them loans in the very recent past, chances of getting a new loan this time might be even slimmer. To the degree that this behavior of borrowers correlate with the potential lender ownership, this may confound our results.¹³ Hence, we test a specification that filters only

¹³Given our focus on information requests about non-current borrowers, multiple information requests in a short period are unlikely for firms that were actually granted a loan, since, in this case, these borrowers would

bank information requests on borrowers about whom no information requests were filed by the same bank in the last 6 months. Additionally, to maintain time intervals aligned, we keep the definitions of $PreviousLoan_D_{ft}$ and $PreviousLoan_F_{ft}$ of column (3) based on 6 months. Results are displayed in column (4). Despite the large drop in the number of observations, our coefficient of most interest is still statistically significant at 10%, and is considerably larger in this case.

The next robustness exercise examines the implications of splitting the borrower recent past into three groups: recent loans with only private domestic banks, recent loans with only foreign banks and recent loans with both groups. The latter is incorporated by means of a new variable: $PreviousLoan_D_F_{ft}$. Its interactions with the main variables are included in column (5). Here, the variables $PreviousLoan_D_{ft}$ and $PreviousLoan_F_{ft}$ stand for recent loans with only the respective banking group. It may be the case that borrowers frequently take out loans from both bank ownership types within a short time interval. Therefore, one might be concerned that the signaling channel we captured in our estimations so far is driven by the existence of recent loans granted by both groups of banks and not just by the private domestic ones. Column (5) alleviates this concern by showing that the variable $\mathcal{F} \times PreviousLoan_D_F_{ft} \times SME$ is not statistically significant whereas $\mathcal{F} \times PreviousLoan_D \times SME$ remains significant at 1%. On the other hand, for large firms the joint effect is significant, as indicated by the coefficient on $\mathcal{F} \times PreviousLoan_D_F_{ft}$.

Yet, we perform two placebo exercises to further confirm the robustness of our results. In the first exercise, in column (6), we randomly modify bank ownership for each information request. We set the probability of fake foreign bank ownership equal to the proportion of information requests made by foreign banks.¹⁴ None of the coefficients displayed is statistically significant. In the second exercise, in column (7), we restrict our sample to two large Brazilian domestic banks of somewhat similar size. We take one of them to play the falsified role of a foreign bank whereas the other defines the basal category. Again, there is no statistically significant coefficient displayed.¹⁵ The results of the two placebo exercises are consistent with the view that it is the bank ownership characteristic that drives the informational asymmetric problems underlying our previous results.

probably no longer satisfy the non-current borrower criteria when submitting subsequent loan applications

¹⁴According to Table 2, 27,2% of loan information requests are filed by foreign owned banks.

¹⁵Please note that the variable \mathcal{F} has a different definition in columns (6) and (7) from the standard definition employed so far.

Table 6: Robustness exercises. Dependent variable: $LoanGranted_{fbt}$

Variable	Errors clustered at the bank level	SME defined according to gross revenues and total assets	Recent loans computed over the last 6 months	No recently denied recurrent applicants	Previous new loans split in three groups	Placebo: bank ownership randomly assigned	Placebo: Sample restricted to two similar domestic banks
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\mathcal{F}_b \bullet SME_f$	0.004	-0.005	0.003	0.020	0.004	0.002	-0.013
$\mathcal{F}_b \bullet PreviousLoan_D_{ft}$	0.001	-0.002	-0.002	-0.025	0.002	0.000	0.021
$\mathcal{F}_b \bullet PreviousLoan_D_{ft} \bullet SME_f$	0.025**	0.020**	0.024***	0.041*	0.024***	0.004	0.016
$\mathcal{F}_b \bullet PreviousLoan_F_{ft}$	0.017*	0.003	0.021***	0.086***	0.019*	0.005	0.028
$\mathcal{F}_b \bullet PreviousLoan_F_{ft} \bullet SME_f$	-0.005	0.011	-0.008	-0.018	-0.005	0.005	-0.005
$\mathcal{F}_b \bullet PreviousLoan_D_F_{ft}$					0.017**		
$\mathcal{F}_b \bullet PreviousLoan_D_F_{ft} \bullet SME_f$					0.018		
Bank controls:	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects:							
Month	-	-	-	-	-	-	-
Bank	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm	-	-	-	-	-	-	-
Firm-month	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank-month	No	No	No	No	No	No	No
Observations	101,067	101,067	99,020	13,091	101,067	101,067	

Finally, in additional exercises in the online appendix we produce revised versions of tables 3 and 4 after restricting the sample to loans above 10000 reais, in order to further remove the influence of small receivables discounting. The small credit amounts coupled with the collateral provided by the receivables of these operations are likely to make their informational signal about the borrower’s creditworthiness less valuable. Furthermore, the credit risk analysis of these operations may not even require the sophistication of examining the borrower’s recent past. Results are qualitatively similar in the restricted sample. If anything, the triple interaction of interest becomes stronger in the specifications more saturated with fixed effects.

7 Conclusion

We have shown that foreign banks can mitigate their informational barriers towards potential borrowers by observing their private domestic peers’ recent behavior. Recent loans of SME firms granted by private domestic banks are specially valuable since the latter are at comparative advantage in evaluating informationally opaque SME firms. In this regard, our results are adherent to the vast literature that documents foreign bank disadvantages in assessing prospects of borrowers dependent on soft information and relationship lending. In a way, the mechanism we claim foreign banks resort to cope with their disadvantages could be seen as a reliance on the “hardening” of soft information carried out by the group of banks better equipped to that task. The existence of recent loans of a firm is indeed a piece of information easily communicated and verified across jurisdictions, so that the agency problems of foreign banks should not preclude or hinder the full use of such information.

Through proxies of loan applications made by non-current borrowers, we estimate the impact that the existence of recent loans in the last three months have on the probability that a new loan is approved. For SME loan applicants, this probability can increase up to 22% more for foreign banks in comparison to private domestic ones, if the recent loans were granted by domestic banks. This finding is robust to different definitions, samples and specifications underlying our estimations.

As far as policy implications are concerned, our results point, at a general level, to the need of reducing informational barriers across bank ownership types. Thus, more available public information at the firm level, for example through private credit bureaus, may alleviate informational constraints and balance the playing field across lenders. In particular, the availability of aggregate borrower information by banks’ ownership type could substantially affect foreign banks’ loan supply, according to the results of this paper. On the other hand, it is worth remarking that the mechanism we unveil in this paper also brings implicitly the concept of fragility ([Bikhchandani et al., 1992](#)). Indeed, a shock to the risk of a SME borrower as perceived by domestic banks (and that make them alter their loan decisions towards this borrower) would be effectively transmitted to the remaining group of foreign banks, so that

the consequences to the borrower are amplified (even if the original shock was not grounded on solid evidence). A policy maker should therefore be mindful of this sort of fragility underlying the banking credit market in situations where there is evidence that a group of banks follows another to some relevant extent.

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