

## Foreign banks as shock absorbers in the financial crisis?



# Working Paper Research

by Giorgia Barboni

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## **Abstract**

This paper finds that foreign banks can act as a buffer against negative credit supply shocks, in contexts where the domestic credit market is heavily hit by a country-specific adverse shock. A new dataset is constructed, which combines Belgian Credit Register data with firms and banks' balance sheets. After 2008, Belgian firms borrowing from domestic banks experienced a stronger credit contraction (minus 1.8 percentage points) than firms borrowing from foreign banks. Also, foreign banks "cherry-picked" new relationships with more profitable firms to a higher extent during the crisis, and turned down existing relationships more frequently than domestic banks. Results from this paper suggest that foreign banks can mitigate negative financial shocks in countries where domestic financial intermediaries unexpectedly experienced the consequences of the financial crisis to a higher extent.

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## 1. Introduction

Foreign banks have been identified as a major source of diffusion of crises (see Giannetti and Laeven, 2012 for a review), through at least two different mechanisms. First, they can transmit shocks from their home country to their cross-border affiliates (e.g. Peek and Rosengreen, 2000). Second, they tend to be intrinsically more risky because they rely more on the wholesale funding market (De Haas and Van Lelyveld, 2013).

During the 2008-2009 financial crisis, in particular, foreign banks contributed to exacerbate the consequences of the financial turmoil in host countries. As a result, firms borrowing from branches or subsidiaries of foreign banks experienced a sharp credit tightening (e.g. Cetorelli and Goldberg, 2011; Ongena et al., 2013, Popov and Udell, 2012). Despite the extensive evidence of foreign banks acting as shock-propagators, theory suggests that they can also offer a buffer against negative credit supply shocks in the host country (Levine, 1996). Yet, very limited evidence exists for this positive role. Belgium, however, offers an interesting exception.

At the beginning of October 2008, the Belgian domestic credit market saw its key players heavily damaged by the financial turmoil spreading after Lehman Brothers' default. The crisis hit particularly hard Belgian domestic banks because of the failure of corporate governance arrangements (Van der Elst, 2010). The high liquidity risks faced by Belgian banks were not only caused by newly originated financial debt, but also by distorted incentive packages to banks' executives, along with weak strategies and oversights in risk management systems.

The Belgian case raises important questions on how credit markets react when the main banks in the domestic scene are hit by a country-specific shock. How do foreign banks behave when domestic credit markets face a country-specific shock? Do they still act as shock propagators or, instead, help mitigate the consequences of the crisis in the country? Moreover, what lending strategies do they adopt in the wake of the financial crisis?

To answer these questions, the identification strategy adopted in this paper builds on the heterogeneity in bank ownership in Belgium, and on the different impact the country-specific shock had on domestic *versus* foreign banks. This is used to study differences in the lending strategies between domestic and foreign banks.

The main result of the paper is that in Belgium foreign banks lent more, and more selectively, than their domestic counterparts. This because they were more insulated from the specific shock affecting the hosting market. Indeed, the loan growth by foreign banks in Belgium after 2008 has increased by 1.8 percentage points more than the loan growth by domestic banks.<sup>1</sup> This result is robust for both authorised and drawn credit, and after studying branches and subsidiaries of foreign banks separately.

The data used in this paper allow one to test two main competing hypotheses regarding the role of foreign banks during the financial crisis when hosting countries are affected by a country-specific shock. First, higher growth rates of the loans disbursed by foreign banks might simply reflect a substitution effect in the credit lines held by Belgian firms. Since domestic banks reduced their lending, firms then resorted to other sources of credit, among which foreign credit. Second, foreign banks may have played a more active role in financing Belgian firms during the crisis, by taking advantage of the temporary breakdown of Belgian banks to increase their market share in Belgium and targeting specific firm segments in their lending strategies.

It is also shown that foreign banks actively exploited the collapse of Belgian banks using three main tests. First, the extensive margin of lending is explored, which shows that, during the crisis, foreign banks were more likely to terminate an existing relationship, but also to start new ones. This effect is more pronounced for foreign banks that relied on wholesale funding to a higher extent. A possible explanation is that foreign banks acted more aggressively in a country with weak domestic financial sector, as a means to compensate for potential losses they encountered elsewhere.

Second, using firms' balance sheet variables, foreign banks are found to be more likely to start new relationships with more profitable (higher growth rate of sales) firms during the financial crisis.

Third, a test is run with firms that from 2005 to 2010 only borrowed from domestic banks. This allows to explore differences in lending rates between large domestic and small domestic banks. Compared to large domestic banks, small ones have less “functionally-distant” organizational structure, which exposed them to a lower extent to the country-specific shock (Van der Elst, 2010). Results show that during the crisis, small domestic banks have lent even less than large domestic

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<sup>1</sup> In conducting the analysis, only resident banks are considered. Domestic banks are classified as those originating in Belgium; conversely, foreign banks includes both subsidiaries of banks that are owned by at least 50% by not-resident banks and branches of not-resident banks. Section 4 in the paper included a more detailed discussion on the adopted banks' classification.

banks. This finding suggests that the effect detected not only is caused by the squeezing in lending from (large) domestic banks, but also by the predatory behaviour of foreign banks. If this was not the case, then small domestic banks lending should also be observed to a higher extent during the financial crisis.

Taken together, the results of this paper suggest that foreign banks, during the crisis, have adopted a “cherry-picking” strategy. They interrupted existing lending relationships more frequently but, at the same time, they were also more likely than domestic banks to start new relationships, especially with healthier firms. One potential explanation for this finding is that foreign banks rely more than domestic banks on hard information (e.g. Mian, 2006, Detragiache et al., 2008), which becomes far more important during periods of high-risk aversion. As a consequence, hard information borrowers, which are characterised by better performance indicators than soft information borrowers (who mostly rely on their reputation), have been captured by foreign banks to a higher extent. At the same time, international banks, which may have been hit by the crisis to a larger extent in other foreign markets because of their higher reliance on wholesale funding, adopted a more aggressive lending strategy in countries where domestic banks created a “vacuum” in the credit supply.

This paper contributes to the literature on the role of foreign banks during the financial crisis, along at least three dimensions. First, although multinational banks may have cut credit growth in many countries (e.g. Cetorelli and Goldberg, 2011; 2012), there are still cases in which they increased their lending, possibly to counteract their overall bad performance. Second, using firm-bank data, the paper shows that foreign banks after the crisis not only continued lending, but also they did so in a more selective fashion. This would contribute to explain businesses’ performance during financial crisis, by suggesting what type of funding they would resort to when their main lenders go bankrupted. On a more general level, this paper suggests that foreign banks act as shock absorbers when they operate in host markets that are affected by country-specific shocks. Similar results have been indeed found for the Tequila crisis in Argentina and Mexico in early 1990s (Goldberg et al., 2000), or in Italy during the 2011 sovereign debt crisis (Bofondi et al., 2013).

The paper is organised as follows: after a brief description of the Belgian credit market context in section 2, a review of the literature on the role of foreign banks during financial crises is presented in section 3. Section 4 discusses the dataset construction and descriptive statistics. In section 5 the

main identification strategy is illustrated, which explores differences in lending between foreign and domestic financial intermediaries during the financial crisis. Results are commented in section 6. Section 7 concludes.

## **2. Context**

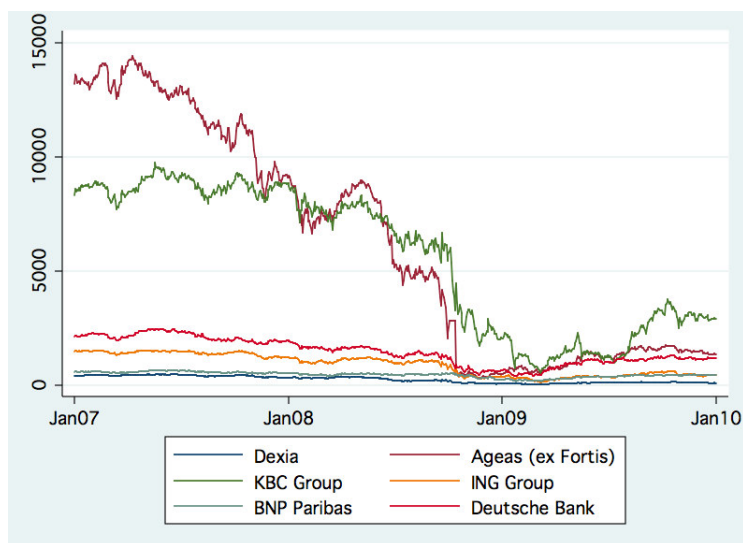
In September 2008, the main Belgian domestic credit institutions (Dexia, Fortis, and then KBC) unexpectedly experienced a strong reduction in profitability and liquidity. The financial crisis revealed the problems accumulated by corporate governance deficiencies, by further reducing domestic banks' returns and increasing liquidity risks (National Bank of Belgium, 2009). Not surprisingly, the measures adopted by the Belgian government to rescue these banks included specific recommendations to banks' boards, in terms of professional trustworthiness and remuneration packages.

A few weeks after Lehman Brothers' default, Fortis was acquired by the French bank BNP Paribas. Soon after Fortis, the financial crisis swamped another key Belgian domestic bank, KBC, and Ethias, one of Belgium's main insurance companies. Dexia, on the contrary, although managed to survive thanks to a liquidity injection from the Belgian Government, was ultimately dismantled in 2011.

During the financial crisis, the main Belgian banks performed worse than banks residing in other neighbouring countries. For instance, the value of the total return index of Fortis and KBC dropped, respectively, by more than 85% and 67% (compared to a drop of 27% for BNP Paribas, France, 40% for Deutsche Bank, Germany, and 64% for ING, the Netherlands, as in Figure 1).

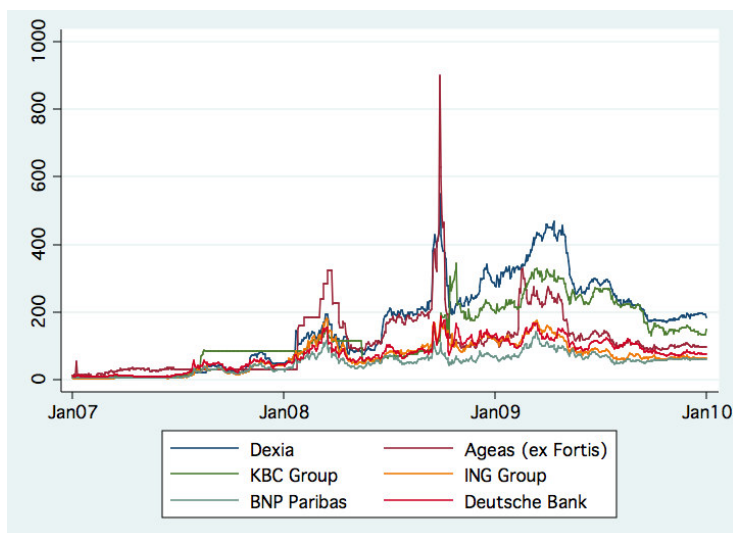


Figure 1: Total return index of the main Belgian banks and of foreign banks from neighbouring countries.  
 Source: Datastream, Thomson Reuters.



Similarly, data on CDS spreads (Figure 2) show that, after the outburst of the financial crisis, the CDS spread of Dexia and Fortis registered a huge hike. On September 26, 2008, ten days after Lehman Brothers filed for bankruptcy, the value of the CDS spread for Fortis and Dexia were, respectively, 28.5 and 9.4 times higher than the value registered in January of the same year (compared to an increase of 2.8 for Deutsche Bank, 3.8 for BNP Paribas and 1.3 for ING).

Figure 2: CDS spreads of the main Belgian banks and of foreign banks from neighbouring countries. Source: Datastream, Thomson Reuters.



Taken together, Figure 1 and 2 suggest that the drop in performance and the increase in riskiness of

Belgian domestic banks also heavily affected their financial strength in terms of regulatory capital requirements. It is thus reasonable to think that the lack of capital translated into a restriction in the credit supply, especially for domestic financial intermediaries.

Belgium offers a relevant setting to observe differences in the performance between domestic and foreign banks, for at least two reasons. First, domestic banks suffered more than foreign banks the consequences of the country-specific shock (as shown in Figure 1 and 2). Second, the Belgian credit market is characterised by a remarkable presence of foreign banks. Compared to the average presence of foreign banks in European countries, the share of foreign financial intermediaries active in this country is slightly higher (47% in 2009 as reported by Claessens and Van Horen, 2013, *vis-à-vis* 39% in Europe). It is also worth noticing that one fourth of the financial intermediaries operating in Belgium are branches of banks that originate either in France, Germany and the Netherlands (Table 1). This implies that a large fraction of banks in Belgium are owned by banks that were not affected by the country-specific shock under study.

### 3. Literature Review

This research primarily relates to the stream of literature that studies the behaviour of foreign banks in host countries, particularly after the outburst of financial crises. The central research question of this literature asks whether international banks act as shock propagators or shock absorbers in domestic markets, especially during financial downturns.

The presence of foreign banks, enlarged by the massive wave of mergers of domestic banks with multinational banks, has been widely documented in emerging economies. Several papers using international lending data show that, in countries where their presence is strong, foreign banks appear to have done more harm than good. Employing a comprehensive dataset with firm-bank observations across 14 countries in Eastern Europe and Near Asia, Ongena et al. (2012) find that compared to domestic banks that borrow only locally, internationally-borrowing domestic banks and foreign banks contracted their lending more during the crisis. In particular, these effects are amplified for firms engaged in a single bank lending relationship, as they are smaller and with less collateral. Cetorelli and Goldberg (2011), using bilateral country-level data, show that international banks largely contributed to transmit the shocks to emerging economies during the 2007-2009 crisis.

The same type of data are also used by Kalemlı-Ozcan et al. (2013) to study the correlation of business cycles: their results reveal that cross-border banking is associated with less synchronized output cycles. By analysing the role of foreign subsidiaries and branches in emerging European countries through survey data on SMEs, Popov and Udell (2012) find that firms borrowing from foreign banks experienced a higher credit contraction than those borrowing from domestic banks. Similarly, De Haas and Van Lelyveld (2014), who employ a large database of multinational banks containing information on their subsidiaries, find that banks that depended more on wholesale market funding were more likely to cut credit than their domestic counterparts. This is because domestic banks rely on more stable funding sources than foreign banks. Finally, De Haas and Van Horen (2013) study how banks reduced cross-border credit after the collapse of Lehman Brother. Interestingly, they find that international banks showed a higher propensity, during the financial crisis, to continue lending in countries where they already had a lending history or had previously established connections with domestic banks.

Yet, foreign banks can also act as buffer against negative shocks. It was the case, for instance, of foreign-owned banks operating in Mexico and Argentina after the Tequila crisis. As Goldberg et al. (2000) document, foreign banks displayed higher rates of credit growth than domestic banks after 1994 in these countries. Their results show that when the domestic credit market is damaged by a country-specific shock, healthy foreign banks act as a source of growth and stability for local businesses. Interestingly, a similar dynamic was in place in Italy during the recent sovereign debt crisis. Spreading in 2011, this crisis hit specifically Italian banks. In analysing the consequences of this country-specific shock, Bofondi et al. (2013) find that domestic banks have tightened credit to a higher extent than foreign banks.

The present analysis also relates to a number of papers that study the role of foreign banks in domestic credit markets during the financial crisis through loan data. Bonaccorsi di Patti and Sette (2012), using a dataset based on individual bank-firm observations for Italy, find that, during the 2007-2008 financial crisis, credit supply and cost conditions worsened particularly for the banks that were more exposed to the interbank market. Similarly, Albertazzi and Bottero (2012) show that foreign lenders restricted credit supply to the same firm in Italy more heavily than their domestic counterparts during the financial crisis. Almost unanimously, country-specific studies document an overall reduction in lending from foreign banks, at least when they focus on “global crises”. Peek and Rosengren (1997) consider the Japanese stock market crisis in 1990s to study the shock

transmission in the United States through Japanese cross-border banking, and find a substantial decline in lending by Japanese banks operating in the US market. Similarly, Puri et al. (2011), study the consequences of the US financial crisis in the German banking sector using a very detailed dataset of loan applications and loans granted in German savings banks. The authors find a substantial contraction in the supply of retail lending in Germany following the US crisis. Along the same line, Schnabl (2012) studies the 1998 Russian default and finds that after the shock international banks reduce bank-to-bank lending to Peruvian banks, which in turn contract lending to Peruvian firms.

Taken together, these studies suggest that foreign banks act as shock-propagators during banking crises. However, this is the case when the financial shock is transmitted across international credit markets, and affects both home and hosting countries. During these types of financial crises, foreign banks are heavily undermined because of their higher reliance on international wholesale funding. As a consequence, they contract their lending supply to a higher extent than domestic banks. Conversely, foreign banks appear to have an important, positive role when domestic credit markets are hit by a country-specific shock. In those cases, they are capable to absorb the shocks and to promote business growth. Results from country-specific financial crises both in emerging and developed countries indeed confirm the prediction that foreign banks are able to reduce the negative externalities resulting from weak domestic banks.

## **4. Banking Environment and Data Sources**

### **4.1 Banking Environment**

Belgium represents the ideal setting to study differences in the credit supply between domestic and foreign banks, for at least two reasons. First, as much as 47% of the banks operating in the country are foreign (slightly higher than the average of 39 per cent for European countries). Second, a remarkable share of foreign banks operating in Belgium originates from neighbouring countries.<sup>2</sup> It follows that Belgian firms borrow a large share of credit from foreign banks. Indeed, more than 20% of credit borrowed at firm level comes from a bank lending relationship with foreign banks (Table 4

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<sup>2</sup> Almost 30% of financial intermediaries operating in Belgium are branches of banks whose home country is adjacent to Belgium. Moreover, the number of banks whose home country is France, Germany and the Netherlands is 10, 6, and 8, respectively, the largest figures among foreign banks in the country (Table 1 in the Appendix).

in the Appendix).

To classify banks as being foreign or domestic, the definition generally used in the literature is adopted, which classifies as foreign either banks whose country of origin is other than Belgium or Belgian banks with 50 percent or more of their shares owned by foreigners. Information on banks' country of origin is initially taken from the Belgian Credit Register and then matched with foreign ownership data from Bankscope and from Claessens and Van Horen (2014)'s dataset.<sup>3</sup> The initial sample consists of 96 banks operating in Belgium.

Table 1 shows the distribution of banks across their country of origin. More than half of these banks originate in Belgium, while France, Germany, Great Britain and the Netherlands are the foreign countries the most represented. Among the 53 Belgian banks, a further distinction is made between domestic banks and subsidiaries of foreign banks, by relying on ownership information from Claessens and Van Horen (2014). The final sample consists of 43 domestic banks (originating in Belgium and owned by a majority of Belgian investors) and 53 foreign banks, of which 43 are branches of foreign banks (originating outside Belgium) and 10 are subsidiaries of foreign banks (originating in Belgium but owned for at least 50 per cent by foreign investors). This classification is reported in Table 2, which also summarizes the shares of total credit lent by each category of banks to Belgian firms. Interestingly, 13.15 per cent of the total credit comes from subsidiaries of foreign banks, while only 8.67 per cent from branches of foreign banks. This suggests the important role of these financial intermediaries in the Belgian credit market. Another important aspect to be acknowledged is that Fortis is classified as domestic for the entire panel. This decision moves from at least three reasons. First, the change in the ownership of Fortis took place only in 2009; second, including Fortis in our dataset as a foreign-owned bank, even only after 2009, would be conceptually wrong and may ultimately bias the estimates of this paper.<sup>4</sup> Indeed, this bank was affected by the financial crisis to the same extent, if not even more, as the other domestic banks. Last, it must be noticed that all the other foreign-owned banks included in the sample result from the large wave of mergers and acquisitions which took place in Belgium between 1997 and 2003, in very different contexts and for very different reasons than the acquisition of Fortis from BNP Paribas in 2009.

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<sup>3</sup> To see potential implications of the adopted definition of "foreign banks", a detailed discussion is present in Claessens and Van Horen (2014), from p.7.

<sup>4</sup> For robustness, the following regressions have also been performed: i) without Fortis ii) with the switch of Fortis from domestic to foreign. Results still hold in all the specifications.

## 4.2 Data Sources and Descriptive Statistics

This paper relies on a rich dataset that results from the merging of five different data sources: (1) The Belgian Credit Register, where all authorized and used volumes of credit granted by banks operating in Belgium to Belgian firms are reported. Bank-firm relations are reported in the Credit Register only once the exposure of the bank is greater than €25,000. Data on loans are used, from 2005 to 2010; (2) Firm Balance Sheets: these data come from firms' annual balance sheet filings, during the period 2005-2010; (3) Bank Balance Sheets: these data come from banks' annual balance sheet filings, as per the Supervisory Report Scheme, during the period 2005-2010; (4) Bureau van Dijk Bankscope, that records world-wide bank balance sheet data; (5) The dataset created by Claessens and Van Horen (2014), to derive banks' ownership.

By linking these five datasets, a panel is constructed where the unit of observation is the lending relationship between firm  $i$  and bank  $j$  in year  $t$ , where  $t = 2005, 2006, \dots, 2010$ . Knowing whether bank  $j$  is foreign or domestic, it is then possible to study the evolution of the firm-bank relationship across time and relate it to the ownership of the financing bank. Moreover, thanks to balance sheet data of both firms and banks, it is possible to control for both firms' and banks' characteristics. The final dataset, which comprises multiple borrowing firms only, consists of 80 banks and 22,358 firms.

Table 4 and Table 5 present descriptive statistics for the entire universe of firms and for multiple-borrowing firms, respectively. Compared to the full sample, firms in the used sample are older, larger, more profitable and more likely to borrow from foreign banks. The median annual loan growth rate of credit is  $-0.073$ , compared to  $-0.086$  for the full sample.

Table 6 shows descriptive statistics of banks' balance sheet variables. Mean difference tests are used to compare these values both between foreign and domestic banks and before and after the crisis.

Panel A of Table 6 shows that domestic and foreign banks included in the sample do not significantly differ in many financial and regulatory aspects, and these similarities remain stable after the crisis. Results from Panel A also reveal that domestic banks are on average larger than foreign banks, both before and during the crisis. During the crisis, domestic banks have higher overall liquidity than foreign banks.<sup>5</sup> This latter result could be driven by the fact that, as part of the restructuring plan undertaken to face domestic banks' financial crisis, the Belgian Government and

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<sup>5</sup> Liquidity is defined as cash plus net position in the interbank market plus short-term securities portfolio plus government bonds over assets, as in Degryse et al. (2011).

the National Bank of Belgium agreed on a massive capital injection to help domestic banks overcome the financial turmoil.<sup>6</sup> Panel B of Table 6 displays t-tests within banks' segments, again before and during the crisis. Compared to the pre-crisis period, during the financial crisis foreign financial intermediaries have increased their average financial strength: the tier 1 ratio has become significantly higher after 2008, while both the reliance on wholesale funding and interbank ratio increased (although not significantly). Conversely, none of these differences are significant for domestic banks: in particular, while the reliance on wholesale funding increase by 11% for foreign banks, a drop of about 8.5% of the same variable is observed for domestic banks, suggesting that the financial crisis heavily hit the latter.

Finally, differences before and during the crisis of foreign and domestic loan growth are studied. To this end, a fundamental assumption that needs to be verified to correctly estimate differences in lending between domestic and foreign banks is that, in absence of this shock, the growth rate of credit lent by domestic and foreign financial intermediaries would have followed the same trend. A first validation of this assumption is obtained by looking at Figure 3, which compares the mean and median rates of loan growth at firm-bank level between domestic and foreign banks, averaged by year, respectively. While before the crisis those rates had similar trends, starting from 2008 we observe foreign credit growing to a much higher extent than domestic credit.<sup>7</sup>

Moreover, Figure 4 shows the mean loan growth rates at bank level, again averaged by year. In particular, banks are classified based on the average quality of their portfolio of firms (measured in terms of sales growth). Figure 5 on the left shows the growth rate of total credit for banks whose average quality of financed firms is below the median, while Figure 5 on the right plots the growth rate of total credit for banks whose borrowers have a high operational revenues growth. The figure clearly shows that, before the crisis, these rates followed similar patterns, but they differ significantly during the crisis: foreign banks' loan growth is higher than domestic banks' loan growth for better performing firms, while the opposite holds for poorly performing businesses.

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<sup>6</sup> National Bank of Belgium (2009), Financial Stability Review.

<sup>7</sup> As also stressed by Bofondi et al. (2013), it must be noticed that bank fixed effects are also included in the regressions. This suggests that bank-specific time-invariant trends are already taken into account.

## 5. Identification Strategy

In order to identify differences in lending conditions during the financial crisis between foreign and domestic banks, it is estimated the amount of credit firm  $i$  receives from bank  $j$  in period  $\tau$ , where  $\tau$  is equal to either the pre-crisis or the crisis period (years between 2005 and 2007, and years between 2008 and 2010, respectively). This is shown in Equation (1):

$$\Delta \log(\text{credit})_{ij\tau} = \beta_0 + \beta_1 \text{Foreign}_j + \beta_2 (\text{Foreign}_j * \text{Crisis}_\tau) + \alpha_{i\tau} + \varepsilon_{ij\tau} \quad (1)$$

where the dependent variable,  $\Delta \log(\text{credit})_{ij\tau}$ , is the difference in the log of credit lent by bank  $j$  to firm  $i$  in period  $\tau$ . The dummy  $\text{Foreign}_j$  equals 1 if bank  $j$  is classified as foreign, and zero if the bank is domestic. The main variable of interest, the interaction term  $\text{Foreign}_j * \text{Crisis}_\tau$  is computed as the interaction between the dummy  $\text{Foreign}_j$  and the dummy  $\text{Crisis}_\tau$ , the latter being equal to 1 in year 2008, 2009 or 2010, and zero in year 2005, 2006, 2007.<sup>8</sup>

Using Khwaja and Mian (2008)'s approach, firm-period fixed effects,  $\alpha_{i\tau}$ , are also included in the main equation. The use of firm-time fixed effects allows one to test whether the same firm  $i$  borrowing from both domestic and foreign banks experienced a higher or lower growth rate of credit from the bank segment that was more heavily affected by the financial crisis.

## 6. Results

Results from equation (1) are reported in Table 7. Standard errors are double clustered at the bank and at the firm level. The dependent variable in columns (1) to (3) is the  $\Delta$  log of drawn credit, while the same analysis is replicated in columns (4) to (6) with authorised credit. Column (1) and (4) report estimates for the baseline model without fixed effects, while firm and time fixed effects, and firm\*time fixed effects are added in Column (2) and (5), and Column (3) and (6), respectively, along with bank fixed effects. Column (1) of Table 7 shows that, before the crisis, credit drawn from foreign banks grew by one percentage point less than domestic banks, as the coefficient of foreign bank reveals. However, looking at the crisis effect, the coefficient of foreign bank\*crisis shows that

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<sup>8</sup> In order to correct for inconsistency of standard errors (Bertrand et al., 2004), averages by period are taken (before and after the crisis) of each variable in the regression equation.



foreign banks expanded credit supply by 1.8 percentage points more than domestic banks.

The same regression with both bank and firm-period fixed effects is then estimated; the use of fixed effects absorbs both the foreign bank and the crisis dummies, which therefore do not appear in Table 7, as shown in Column (2) and (3) for drawn credit and (5) and (6) for authorised credit. The coefficient of foreign bank\*crisis remains positive and significant. In particular, its magnitude increases, especially in the estimates of authorised credit.

Two robustness checks are performed. The first uses the entire sample of firms (214,897) that contains both multiple-borrowing firms and firms engaged in single bank lending relationships. Table 8 reports results for both the regressions on drawn and authorised credit. The coefficient of foreign bank\*crisis is positive and significant. In terms of magnitude, the coefficient of the growth rate of drawn credit for the entire sample appears even higher than for multiple-borrowing firms (5 percentage points, compared to 1.8).

Second, foreign banks are disaggregated into branches and subsidiaries. This allows for a subsample analysis where bank branches and subsidiaries are considered separately. These estimates are reported in Table 9. Columns (2) and (4) display results for subsidiaries of foreign banks. The dependent variable is the growth rate of drawn credit (column 2) and authorised credit (column 4). Similarly, columns (3) and (6) show results for branches of foreign banks. Columns (1) and (3), instead, report findings for subsidiaries and branches considered together. The coefficients of the interaction term foreign bank\*crisis remain positive and significant for both subsidiaries and branches, when we look at drawn credit (the first three columns of table 9). In terms of magnitude, the effect appears larger for branches than for subsidiaries. Similar results hold for authorised credit (column (4), (5) and (6)). In this case, however, the higher credit growth detected from foreign banks seems only driven by subsidiaries of foreign banks.

Taken together, findings from Table 7, 8 and 9 suggest that foreign banks in Belgium, which were not affected by the country-specific shock hitting Belgian credit market, lent more than domestic banks during the crisis years. Yet, further analysis is necessary to test which hypothesis regarding the role of foreign banks during the financial crisis dominates in the Belgian context. At the one end of the spectrum, higher growth rates of the loans disbursed by foreign banks might reflect a substitution effect in the credit lines held by Belgian firms. Since domestic banks reduced their

lending, firms then resorted to other sources of credit, among which foreign credit. At the other end, foreign banks may have played a more active role in financing Belgian firms during the crisis. Indeed, they might have exploited the temporary breakdown of Belgian banks to increase their market share in Belgium and targeting specific firm segments in their lending strategies.

In what follows, two tests are conducted to assess which of the above-mentioned hypotheses is predominant. The extensive margin of credit is first computed. Results from the extensive margin are used to study whether foreign banks did change their lending behaviour during the financial crisis. Secondly, a subsample analysis is conducted with domestic banks only. This allows one to observe whether compared to larger domestic banks, smaller domestic banks display differences in lending. If no differences at the extensive margin of credit were detected, the hypothesis of a more “active” lending behaviour from foreign banks would be discarded. Similarly, if a higher growth rate of credit from smaller *vis-à-vis* larger domestic banks is identified, it would imply that it is not foreign banks to act as shock-absorbers during the financial crisis, but any bank segment *other than* larger domestic banks, which were the most hit from the country-specific shock.

## **6.1 Did foreign banks adopt a predatory behaviour?**

### **6.1.1 Extensive Margin of Credit**

To study whether foreign banks took advantage of the negative credit supply shock, the paper analyses foreign banks’ propensity to terminate credit relationships and to start new ones, as compared to domestic banks. If the prevailing hypothesis is that foreign banks acted more aggressively during the crisis than domestic banks, foreign banks are expected to end existing relationships more frequently than domestic banks. At the same time, foreign banks should also be more likely to start new links. If, on the contrary, what is observed is purely the effect of a shrinking in the domestic credit supply, then no change should be detected on foreign banks’ lending strategies.

Two separate equations are estimated. The first for the probability to end existing credit relationships, while the second for the probability to start new relationships. Both equations are estimated using a linear probability model. Columns (1) and (2) of Table 10 report the results for the equation estimating banks’ likelihood to end existing credit relationships, where the dependent

variable,  $p(\text{terminate})$ , is a dummy that takes the value of 1 if a firm-bank relationship that existed at time  $t - 1$  is then terminated at  $t$ .<sup>9</sup> The main variable of interest is, again,  $\text{foreign bank} * \text{crisis}$ : its coefficient is both positive and significant, also after adding  $\text{firm} * \text{time}$  FEs. Results from columns (1) and (2) of Table 10 thus reveal that, compared to domestic banks, after 2008 foreign banks were more likely to cut credit relationships already in place. Columns (3) and (4) of Table 10 show the results for the second equation, where the probability of starting a new bank-firm relationship is estimated. The dependent variable,  $p(\text{newrel})$ , is a dummy that takes the value of 1 if a credit relationship that didn't exist at time  $t - 1$ , is created at time  $t$ , averaging the probability for both the pre-crisis and the crisis period. The coefficient of  $\text{foreign bank} * \text{crisis}$  is positive and significant, implying that foreign banks in the financial crisis were also more likely to start a new credit relationship, compared to domestic banks. Moreover, the likelihood of foreign banks to start new relationships is larger than the likelihood of terminating existing ones. Taken together, these results suggest that during the crisis, foreign banks have changed their behaviour as compared to the pre-crisis period. In particular, they were more resolute in cutting relationships already in place, but also more likely to create new relationships. This evidence suggests that foreign banks adopted a “cherry-picking” behaviour during the crisis, as they became more selective towards their pool of financed firms.

A further step is made in the analysis of the extensive margin of credit, to try to identify if foreign banks were more likely to terminate “bad” relationships and, at the same time, to start new “good” links. A subsample analysis is then run, based on borrowers' quality. Looking at firms' sales growth, firms with low and high sales growth are analysed separately. Results are shown in table 11: while no differential impact of firms' quality is detected on the probability to terminate existing relationships, the magnitude of the coefficient of  $\text{foreign bank} * \text{crisis}$  in column (4) is larger than in column (3), suggesting that foreign banks during the crisis have opened new relationships to a higher extent with better performing firms.

Another set of regressions is then used to study which type of foreign banks, in terms of reliance on the wholesale funding market, were more likely to lend at the extensive margin. Results are displayed in Table 12. Column (1) and (2) show the extensive margin of credit for banks whose level of wholesale funding is below the median; conversely, Columns (3) and (4) report results for banks

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<sup>9</sup> Like in the initial model, this outcome is averaged for both the pre-crisis and the crisis period, in order to obtain consistent standard errors.

with a level of wholesale funding above the median. The coefficient of foreign bank\*crisis appears significant only when banks with high levels of wholesale are considered: only foreign banks relying on the wholesale funding market to a higher extent have been more likely to terminate existing relationships and to start new ones.

Taken together, results from Table 10, 11 and 12 confirm the hypothesis of foreign banks playing an active role in funding Belgian businesses during the financial crisis. After 2008, banks originating from outside the Belgian borders have strengthened their position in a country where the domestic credit supply was temporarily weakened. This holds in particular for foreign banks relying to a higher extent to wholesale funding. A possible explanation is that multinational banks acted more aggressively in a country with weak domestic financial sector, as a means to compensate for potential losses they encountered elsewhere because of their higher reliance on wholesale funding.

### **6.1.2 Large *versus* small domestic banks**

In order to corroborate the hypothesis that foreign banks engaged in a more aggressive lending behaviour in Belgium after the outbreak of the financial crisis in 2008, it is also necessary to prove that the effect detected is precisely driven by a predatory behaviour of foreign banks, and not only by a squeezing in domestic lending from (large) domestic banks. Compared to large domestic banks, small domestic banks (lower assets) have less “functionally-distant” organizational structures, which exposed them less to the country-specific shock (Van der Elst, 2010). Therefore, if the results of this paper only depend upon the distress experienced by big domestic banks, also small domestic banks should be expected to lend to a higher extent during the financial crisis. Conversely, if no significant difference in lending within domestic banks were detected, this would confirm that the results of the paper are driven by foreign banks’ expansive credit supply.

To test this idea, large and small domestic banks are classified based on their size. A dummy “small domestic” for small domestic banks is then selected.<sup>10</sup> A sample of 9,714 firms that were only financed by domestic banks is then obtained. These firms, before the crisis, had established at least

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<sup>10</sup> The three largest domestic banks are classified as “large”; therefore the dummy “small domestic” takes the value of one if the bank’s size is lower than the identified threshold.

one link with both a large domestic and a small domestic bank. The following regression is then estimated, which allows studying whether firms borrowing from small domestic banks have experienced a higher credit growth during the crisis:

$$\Delta \log(\text{credit})_{ijt} = \beta_0 + \beta_1 \text{Small Domestic}_j + \beta_2 (\text{Small Domestic}_j * \text{Crisis}_t) + \alpha_{it} + \varepsilon_{ijt} \quad (2)$$

The main coefficient of interest is  $\text{Small Domestic}_j * \text{Crisis}_t$ , that is the interaction term between the small domestic banks dummy and the crisis period. Results from equation (2) are displayed in Table 13. During the crisis, the loan growth rate for firms borrowing from smaller domestic banks was lower than for firms borrowing from larger domestic banks, although the coefficient of  $\text{Small Domestic}_j * \text{Crisis}_t$  is only statistically significant for drawn credit. Results from Table 13 confirm the hypothesis that foreign banks adopted a predatory behaviour in Belgium after the outbreak of the financial crisis in 2008, for two reasons. First, no increase in lending from small domestic banks during the crisis is detected (on the contrary, the sign of  $\text{Small Domestic}_j * \text{Crisis}_t$  is always negative and similar in magnitude between drawn and authorised credit). Second, and most importantly, the only bank segment that increased its lending during the financial crisis was foreign banks.

## 7. Conclusions

This paper focuses on the effects of the financial crisis hitting specifically Belgian domestic banks, and shows that foreign banks acted as shock absorbers in the country after Lehman Brothers' collapse. The identification strategy used in this paper builds on the heterogeneity in bank ownership in Belgium, and on the different impact the country-specific shock had on domestic *versus* foreign banks. By merging different data sources (Belgian Credit Register, banks' and firms' balance sheets) a novel dataset is built consisting of 82,500 bank-firm relationships that are observed from 2005 to 2010. In order to clearly identify the impact of the financial crisis, only firms that, before 2008, borrowed from at least one domestic and one foreign bank are selected. This allows one to compare lending to the same firms by financial intermediaries that were hit by the crisis to different extents. The main result of this paper is that, after 2008, firms borrowing from domestic banks experienced a significantly stronger credit contraction (minus 1.8 percentage points) than firms borrowing from foreign banks. The robustness of these results is then tested, by analysing foreign banks' branches

and subsidiaries' credit provision separately. Taken together, the findings of this paper show that foreign banks in Belgium, which were not affected by the country-specific shock hitting Belgian credit market, lent more than domestic banks during the crisis years. The used data allow one to test two main competing hypotheses regarding the role of foreign banks during the financial crisis when hosting countries are affected by a country-specific shock. First, higher growth rates of the loans disbursed by foreign banks might simply reflect a substitution effect in the credit lines held by Belgian firms. Since domestic banks reduced their lending, firms then resorted to other sources of credit, among which foreign credit. Second, foreign banks may have played a more active role in financing Belgian firms during the crisis, by exploiting the temporary breakdown of Belgian banks to increase their market share in Belgium and targeting specific firm segments in their lending strategies.

To study which hypothesis is dominant, banks' propensity to either terminate or establish new relationships during the financial crisis is first analysed. Second, only firms that before the crisis borrowed from Belgian domestic banks are selected. This allows one to observe whether significantly different lending strategies could be detected not only between domestic and foreign banks, but also within domestic banks. Results from this test show that there were no differences in credit supply within domestic banks. Thus, the hypothesis of an expansive lending strategies adopted by foreign banks operating in Belgium is confirmed.

Taken together, the results of this paper suggest that foreign banks, during the crisis, have adopted a "cherry-picking" strategy. They interrupted existing lending relationships more frequently but, at the same time, they were also more likely to start new relationships than domestic banks, especially with healthier firms. One potential explanation for this finding is that foreign banks rely more than domestic banks on hard information (e.g. Mian, 2006, Detragiache et al., 2008), which becomes far more important during periods of high-risk aversion. As a consequence, hard information borrowers, which are characterised by better performance indicators than soft information borrowers (who mostly rely on their reputation), have been captured by foreign banks to a higher extent. At the same time, international banks, which may have been hit by the crisis to a larger extent in other foreign markets because of their higher reliance on wholesale funding, adopted a more aggressive lending strategy in countries where domestic banks created a "vacuum" in the credit supply.

All in all, this paper shows that foreign banks acted as a buffer against the negative shock hitting the Belgian credit market. These results thus validate previous studies that document that international banks can play a positive role in the wake of country-specific financial crises (Goldberg et al., 2000; Bofondi et al., 2013).

## References

Albertazzi, U., and M. Bottero (2012), “The Procyclicality of Foreign Bank Lending: Evidence from the Global Financial Crisis”, Bank of Italy, Economic Working Papers, N. 926.

Bertrand, M., Duflo, E., and S. Mullainathan (2004), “How much should we trust differences-in-differences estimates?. Quarterly Journal of Economics, 119(1), 249-275.

Bofondi, M., Carpinelli L., and E. Sette (2013), “Credit Supply During a Sovereign Debt Crisis”, Bank of Italy Temi di Discussione (Working Paper), No. 909.

Bonaccorsi di Patti, E., and E. Sette (2012), “Bank balance sheets and the transmission of financial shocks to borrowers: evidence from the 2007-2008 crisis”, Bank of Italy Temi di Discussione (Working Paper), No. 848

Cetorelli, N., and L.S. Goldberg (2011), “Global banks and international shock transmission: Evidence from the crisis”, IMF Economic Review, 59(1), 41-76.

Cetorelli, N., and L.S. Goldberg (2012). Banking globalization and monetary transmission. The Journal of Finance, 67(5), 1811-1843.

Claessens, S., and N. van Horen (2014), “Foreign Banks: Trends, Impact and Financial Stability”, Journal of Money, Credit and Banking, 46(1), 295-326.

De Haas, R., and I. Van Lelyveld (2011), “Multinational banks and the global financial crisis: weathering the perfect storm?”, Journal of Money, Credit and Banking, 46(1), 333-364.

De Haas, R., and N. van Horen (2013), “Running for the Exit? International Bank Lending during a

Financial Crisis”, *Review of Financial Studies*, 26(1), 244-285

Degryse, H., Masschelein, N., and J. Mitchell (2011), “Staying, dropping, or switching: the impacts of bank mergers on small firms”, *Review of Financial Studies*, 24(4), 1102-1140.

Detragiache, E., Tressel, T., and P. Gupta (2008). “Foreign banks in poor countries: theory and evidence.” *The Journal of Finance*, 63(5), 2123-2160.

Giannetti, M., and L. Laeven (2012). The flight home effect: Evidence from the syndicated loan market during financial crises. *Journal of Financial Economics*, 104(1), 23-43.

Giannetti, M., and S. Ongena (2009). “Financial integration and firm performance: Evidence from foreign bank entry in emerging markets” *Review of Finance*, 13(2), 181-223.

Goldberg, L., Dages, B. G., and Kinney, D. (2000). Foreign and domestic bank participation in emerging markets: lessons from Mexico and Argentina (No. w7714). National bureau of economic research.

Gormley, T. A., and D.A. Matsa, (2014). “Common errors: How to (and not to) control for unobserved heterogeneity”. *Review of Financial Studies*, 27(2), 617- 661.

Kalemli-Ozcan, S., Papaioannou, E., and J.L. Peydro (2013). “Financial regulation, financial globalization, and the synchronization of economic activity”. *Journal of Finance*, 68(3), 1179-1228.

Khwaja, A.I. and, A. Mian (2008), “Tracing the Impact of Bank Liquidity Shocks: Evidence from an Emerging Market”. *American Economic Review*, 98(4), 1413- 1442.

Levine, R. (1996). Foreign banks, financial development, and economic growth. *International financial markets: Harmonization versus competition*, 7, 224-254.

Mian, A. (2006). Distance constraints: The limits of foreign lending in poor economies. *The Journal of Finance*, 61(3), 1465-1505.

National Bank of Belgium (2009), *Financial Stability Overview*

Ongena, S., Peydro, J-L., and N. Van Horen (2012), “Shocks Abroad, Pain at Home? Bank-Firm Level Evidence on Financial Contagion during the Recent Financial Crisis”, Working Paper



Peek, J., and E.S. Rosengren (1997), “The international transmission of financial shocks: The case of Japan”, *American Economic Review*, 87(4), 495-505.

Peek, J., and E.S. Rosengren (2000). *Collateral damage: Effects of the Japanese bank crisis on real activity in the United States*. *American Economic Review*, 30-45.

Popov, A., and G.F. Udell (2012), “Cross-border banking, credit access and the financial crisis”, *Journal of International Economics*, 87, pp. 147-161.

Puri, M., Rocholl, J., and S. Steffen (2011), “Global retail lending in the aftermath of the US financial crisis: Distinguishing between supply and demand effects”. *Journal of Financial Economics*, 100(3), 556-578.

Schnabl, P. (2012), “The international transmission of bank liquidity shocks: Evidence from an emerging market”, *The Journal of Finance*, 67(3), 897-932.

Van der Elst, C. (2010), “Belgian Bank Governance before and after the Financial Crisis”. TILEC Discussion Paper No. 2010-007.

## Appendix

Figure 3: Mean and median loan growth rate at bank level (drawn credit).  
Source: NBB, Credit Register

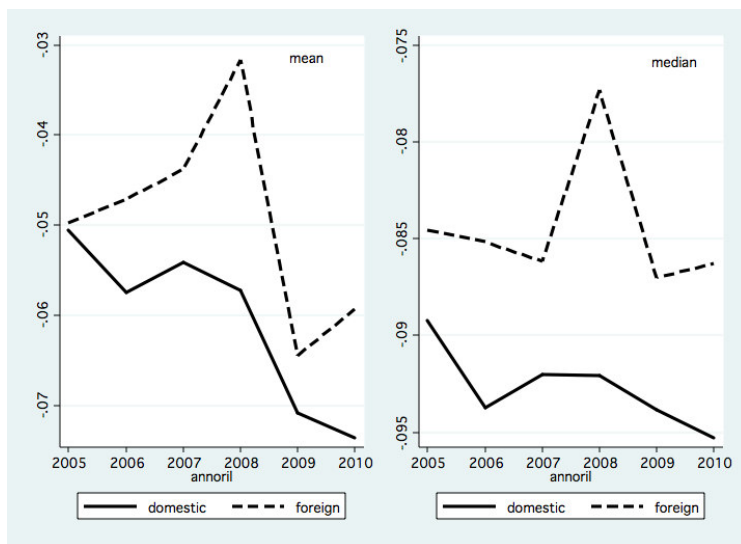


Figure 4: Mean and median loan growth rate at bank level (drawn credit), by firm type.  
Source: NBB, Credit Register

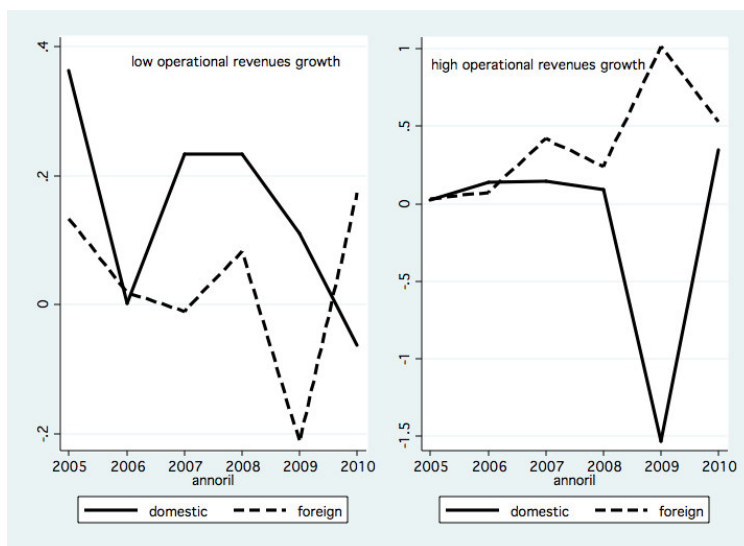


Table 1: Home Country of Banks included in the sample

Country	n. banks	freq.
Belgium	53	55.21%
France	10	10.42%
Germany	6	6.25%
Great Britain	6	6.25%
India	3	3.13%
Japan	2	2.08%
Luxembourg	3	3.13%
Netherlands	8	8.33%
Pakistan	1	1.04%
Spain	2	2.08%
United States	2	2.08%
total	96	100%

Table 2: Foreign and domestic banks included in the sample

Bank type	n. banks	freq.	share credit over total credit
domestic banks	43	44.79%	78.18%
subsidiaries of foreign banks	10	10.42%	13.15%
branches of foreign banks	43	44.79%	8.67%
total	96	100%	100%

Table 3: Balance sheet variables of banks, definition

Variable	Definition	Source
T1 ratio	core equity capital over total risk-weighted assets (RWA), expressed as a % of RWA	BankScope
Wholesale	Non-customers liabilities as a share of total bank liabilities	BankScope
Interbank	Interbank Lending to Interbank Borrowing	BankScope
Size Bank	Total book value of assets, expressed in log - assets expressed in thousands of euros	Schema A
Liquidity	(Cash+net position in the interbank market+short term securities portfolio+government bonds) over assets	Schema A
Deposits	Share of deposits over total funding	BankScope
Bad loans	Nonperforming loans over total loans	Schema A

Table 4: Descriptive statistics of firms, full sample

Variable	Definition	mean	median	sd
loan growth	annual growth rate of drawn credit, firm-bank level	-0.045	-0.086	0.438
size firm	Total book value of assets, expressed in log - assets expressed in thousands of euros	13.484	13.266	1.486
sales growth	Annual growth rate of sales	0.024	0.030	0.483
age	Age of the firms in years	19.36	17	11.79
leverage	Book value of debt over assets	0.727	0.740	0.283
p(foreign)	=1 if bank j is foreign	0.231	0	0.422
share foreign	share of credit borrowed from foreign banks over total credit	0.204	0	0.376
onebanklink	=1 if firm has one bank lending relationship	0.666	1	0.471
Number of firms	214,897			

Table 5: Descriptive statistics of firms, multiple-borrowing firms

Variable	Definition	mean	median	sd
loan growth	annual growth rate of drawn credit, firm-bank level	-0.036	-0.073	0.767
size firm	Total book value of assets, expressed in log - assets expressed in thousands of euros	14.698	14.429	1.697
sales growth	Annual growth rate of sales	0.027	0.036	0.418
age	Age of the firms in years	25.38	23	14.18
leverage	Book value of debt over ssets	0.719	0.739	0.228
p(foreign)	=1 if bank j is foreign	0.423	0	0.494
share foreign	share of credit borrowed from foreign banks over total credit	0.293	0.178	0.319
Number of firms	22,358			

Table 6: Mean difference tests between banks in the sample

Panel A					
crisis = 0	Domestic Banks	sd	Foreign Banks	sd	t-test
tier	11.55	3.49	9.25	1.83	not significant
wholesale	63.32	34.36	57.43	35.54	not significant
interbank	153.85	220.45	101.79	55.42	not significant
log(assets)	14.40	1.83	13.35	2.19	***
liquidity	0.055	0.099	0.034	0.076	not significant
deposits	0.90	0.119	0.86	0.183	not significant
bad loans	0.034	0.135	0.018	0.029	not significant
crisis = 1	Domestic Banks	sd	Foreign Banks	sd	t-test
tier	12.57	2.39	13.87	4.37	not significant
wholesale	57.91	45.88	63.53	43.56	not significant
interbank	154.22	229.84	133.93	137.40	not significant
log(assets)	14.78	1.98	13.52	2.20	***
liquidity	0.051	0.084	0.010	0.032	***
deposits	0.85	0.153	0.84	0.140	not significant
bad loans	0.021	0.040	0.025	0.041	not significant
Panel B					
Foreign = 0	Pre-Crisis	sd	Crisis	sd	t-test
tier	11.55	3.49	12.57	2.39	not significant
wholesale	63.32	34.36	57.91	45.88	not significant
interbank	153.85	220.45	154.22	229.84	not significant
log(assets)	14.40	1.83	14.78	1.98	not significant
liquidity	0.055	0.099	0.051	0.084	not significant
deposits	0.90	0.119	0.85	0.153	**
bad loans	0.034	0.135	0.021	0.040	not significant
Foreign = 1	Pre-Crisis	sd	Crisis	sd	t-test
tier	9.25	1.83	13.87	4.37	**
wholesale	57.43	33.55	63.53	43.56	not significant
interbank	101.79	55.42	133.93	137.40	not significant
log(assets)	13.35	2.19	13.52	2.20	not significant
liquidity	0.034	0.076	0.010	0.032	*
deposits	0.86	0.183	0.84	0.140	not significant
bad loans	0.018	0.029	0.025	0.041	not significant

Note: We report the significance of the mean t-tests as follows:

\* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$

Table 7: Baseline model – multiple borrowing firms

This table reports OLS estimates of the determinants of credit growth using as dependent variable both used credit (Columns (1), (2) and (3)) and authorised credit (Columns (4), (5) and (6)). The variables are obtained by computing the log difference of drawn and authorised credit, respectively. The sample consists of firms that, before the crisis, were borrowing from at least a domestic and a foreign bank. The 1st and 99th percentile for both authorised credit and firm's leverage have also been removed.

dep. var.	drawn credit			authorised credit		
	(1)	(2)	(3)	(4)	(5)	(6)
foreign bank	-0.010** (0.004)			-0.034*** (0.007)		
crisis		-0.065*** (0.005)			-0.062*** (0.006)	
foreign bank*crisis		0.028*** (0.006)	0.028*** (0.007)	0.043*** (0.008)	0.053*** (0.009)	0.055*** (0.010)
Constant	-0.028*** (0.003)	-0.150 (0.468)	-0.767 (0.536)	0.333*** (0.005)	0.714 (0.785)	0.897 (0.938)
Firm Fixed Effects	no	yes	no	no	yes	no
Bank Fixed Effects	no	yes	yes	no	yes	yes
Firm*Time Fixed Effects	no	no	yes	no	no	yes
Observations	82,501	82,501	82,501	82,501	82,501	82,501
R-squared	0.001	0.011	0.007	0.001	0.021	0.023

Robust standard errors in parentheses

\* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$

Table 8: Baseline model – full sample

This table reports OLS estimates of the determinants of credit growth using as dependent variable both used credit (Columns (1), (2)) and authorised credit (Columns (4), (5)). The variables are obtained by computing the log difference of drawn and authorised credit, respectively. The sample consists of all firms included in the Belgian Credit Register. The 1st and 99th percentile for both authorised credit and firm's leverage have also been removed

dep. var.	drawn credit		authorised credit	
	$\Delta\log(\text{credit})$ (1)	$\Delta\log(\text{credit})$ (2)	$\Delta\log(\text{credit})$ (4)	$\Delta\log(\text{credit})$ (5)
foreign bank	0.026*** (0.003)		0.001 (0.002)	
crisis	-0.032*** (0.002)	-0.060*** (0.002)	-0.017*** (0.001)	-0.069*** (0.001)
foreign bank*crisis	0.024*** (0.004)	0.040*** (0.004)	0.009*** (0.002)	0.012*** (0.003)
Constant	0.216*** (0.002)	0.589 (0.432)	-0.042*** (0.001)	0.104 (0.287)
Firm Fixed Effects	no	yes	no	yes
Bank Fixed Effects	no	yes	no	yes
Observations	425,033	425,033	425,033	425,033
R-squared	0.001	0.025	0.001	0.018

Robust standard errors in parentheses

\* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$

Table 9: Branches and subsidiaries - multiple borrowing firms

This table reports OLS estimates of the determinants of credit growth for branches and subsidiaries of foreign banks, considering firms that were borrowing from at least a foreign and a domestic bank. Columns (1) shows estimates for branch and subsidiaries together, including banks' size and liquidity. Column (2) shows estimates for subsidiaries of foreign banks only, while Column (3) shows estimates for branches of foreign banks only.

dep. var.	drawn credit			authorised credit		
	(1)	(2)	(3)	(4)	(5)	(6)
foreign bank*crisis	0.038*** (0.006)	0.037*** (0.006)	0.064* (0.006)	0.063*** (0.011)	0.062*** (0.010)	-0.040 (0.072)
log assets (bank)	-0.019 (0.016)	-0.050*** (0.018)	-0.052** (0.021)	-0.034 (0.027)	-0.026 (0.030)	-0.085* (0.041)
log assets (bank)*crisis	0.009*** (0.003)	0.004 (0.003)	0.013*** (0.005)	0.006 (0.005)	0.001 (0.005)	0.004 (0.009)
Constant	-0.640 (0.571)	-0.233 (0.582)	-0.291 (0.604)	1.224 (0.982)	1.177 (0.972)	1.841 (1.155)
Bank Fixed Effects	yes	yes	yes	yes	yes	yes
Firm*Time Fixed Effects	yes	yes	yes	yes	yes	yes
Observations	81,853	80,241	48,630	81,853	80,241	48,630
R-squared	0.001	0.011	0.007	0.001	0.021	0.023

Robust standard errors in parentheses

\* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$



Table 10: Extensive margin of credit

This table reports OLS estimates of the extensive margin of credit for firms that, before the crisis, were borrowing from at least a foreign and a domestic bank. Columns (1) and (2) show estimates using as dependent variable the probability that, in year  $t$ , an existing relationship is terminated. Conversely, columns (3) and (4) report estimates using as dependent variable that probability that, in year  $t$ , a relationship that didn't exist at time  $t - 1$  is created. We then averaged these probabilities by period (before and after the financial crisis).

dep. var.	p(terminate) (1)	p(terminate) (2)	p(newrel) (4)	p(newrel) (5)
foreign bank	-0.019*** (0.002)		0.030*** (0.002)	
foreign bank*crisis	0.005* (0.002)	0.005* (0.002)	0.034*** (0.004)	0.035*** (0.004)
share firm bank	-0.315*** (0.004)	-0.312 (0.004)		
Constant	0.267*** (0.001)	0.867*** (0.127)	0.240*** (0.001)	-0.206 (0.183)
Bank Fixed Effects	no	yes	no	yes
Firm*Time Fixed Effects	yes	yes	yes	yes
Observations	183,697	183,697	183,697	183,697
R-squared	0.203	0.245	0.007	0.034

Robust standard errors in parentheses

\* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$

Table 11: Extensive margin of credit (subsample analysis with firms' growth rate of sales)

This table reports OLS estimates of the extensive margin of credit for firms that, before the crisis, were borrowing from at least a foreign and a domestic bank. Columns (1) and (3) show estimates using as dependent variable the probability that, in year  $t$ , an existing relationship is terminated. Conversely, columns (2) and (4) report estimates using as dependent variable that probability that, in year  $t$ , a relationship that didn't exist at time  $t-1$  is created. We then averaged these probabilities by period (before and after the financial crisis). In particular, we distinguish between firms with a growth rate of sales below the median (estimates for this subsample are reported in Column (1) and (2)) and firms with a growth rate of sales above the median (Columns (3) and (4))

dep. var.	growth rate of sales below median		growth rate of sales above median	
	p(terminate) (1)	p(newrel) (2)	p(terminate) (4)	p(newrel) (5)
foreign bank*crisis	0.006 (0.007)	0.022*** (0.008)	-0.002 (0.006)	0.034*** (0.008)
share firm bank	-0.376*** (0.005)		-0.252*** (0.004)	
Constant	0.580*** (0.249)	-0.249 (0.313)	0.220 (0.272)	0.658* (0.392)
Bank Fixed Effects	yes	yes	yes	yes
Firm*Time Fixed Effects	yes	yes	yes	yes
Observations	33,652	33,652	33,652	33,652
R-squared	0.254	0.051	0.172	0.030

Robust standard errors in parentheses

\* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$

Table 12: Extensive margin of credit (subsample analysis with banks' wholesale funding)

This table reports OLS estimates of the extensive margin of credit for firms that, before the crisis, were borrowing from at least a foreign and a domestic bank. Columns (1) and (3) show estimates using as dependent variable the probability that, in year  $t$ , an existing relationship is terminated. Conversely, columns (2) and (4) report estimates using as dependent variable that probability that, in year  $t$ , a relationship that didn't exist at time  $t-1$  is created. We then averaged these probabilities by period (before and after the financial crisis). In particular, we distinguish between banks whose level of wholesale funding is below the median (estimates for this subsample are reported in Column (1) and (2)) and banks whose level of wholesale funding is above the median (Columns (3) and (4))

dep. var.	wholesale below median		wholesale above median	
	p(terminate) (1)	p(newrel) (2)	p(terminate) (4)	p(newrel) (5)
foreign bank*crisis	-0.010 (0.012)	0.017 (0.018)	0.019** (0.007)	0.114*** (0.011)
share firm bank	-0.402*** (0.004)		-0.203*** (0.003)	
Constant	0.348*** (0.014)	0.337*** (0.021)	0.206*** (0.002)	0.185*** (0.003)
Bank Fixed Effects	yes	yes	yes	yes
Firm*Time Fixed Effects	yes	yes	yes	yes
Observations	70,673	70,673	70,673	70,673
R-squared	0.277	0.019	0.135	0.041

Robust standard errors in parentheses

\* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$

Table 13: Test with domestic banks only

This table reports OLS estimates of the determinants of credit growth using as dependent variable both used credit (Columns (1), (2) and (3)) and authorised credit (Columns (4), (5) and (6)). The variables are obtained by computing the log difference of drawn and authorised credit, respectively. The sample consists of firms that, before the crisis, were borrowing from at least a small domestic and a large domestic bank, being this distinction determined by banks' assets. The 1st and 99th percentile for both authorised credit and firm's leverage have also been removed

dep. var.	drawn credit			authorised credit		
	$\Delta\log(\text{credit})$	$\Delta\log(\text{credit})$	$\Delta\log(\text{credit})$	$\Delta\log(\text{credit})$	$\Delta\log(\text{credit})$	$\Delta\log(\text{credit})$
	(1)	(2)	(3)	(4)	(5)	(6)
small domestic	-0.084*** (0.012)			-0.034*** (0.007)		
crisis	-0.011* (0.006)	-0.045*** (0.006)		-0.028*** (0.008)	-0.048*** (0.009)	
small domestic*crisis	-0.072*** (0.006)	-0.040*** (0.008)	-0.035*** (0.009)	0.015 (0.012)	-0.020 (0.013)	-0.020 (0.015)
Constant	-0.040*** (0.004)	-0.026*** (0.007)	-0.048*** (0.006)	0.281*** (0.007)	0.297*** (0.011)	0.276*** (0.011)
Firm Fixed Effects	no	yes	no	no	yes	no
Bank Fixed Effects	no	yes	yes	no	yes	yes
Firm*Time Fixed Effects	no	no	yes	no	no	yes
Observations	32,414	32,414	32,414	32,414	32,414	32,414
R-squared	0.004	0.021	0.017	0.004	0.050	0.052

Robust standard errors in parentheses

\* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$

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