

# Can foreign banks act as shock-absorbers?

## Evidence from the Great Recession

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### Abstract

This paper shows that foreign banks can act as shock-absorbers when domestic banking sectors face large liquidity problems. I focus on Belgium, a country where, given its macroeconomic conditions at the outbreak of the Great Recession, the domestic banking sector was “too big to be rescued” by the national authorities. I exploit the different exposure to the financial crisis of Belgian domestic banks vis-à-vis foreign banks operating in the country to study differences in their lending strategies. Using Belgian Credit Register data, I find that after 2008 foreign banks lent more than domestic banks, but only to larger and more profitable firms. Foreign banks were more likely to start new relationships and more likely to terminating existing ones. This behaviour only holds for larger foreign banks. Findings from this paper suggest that foreign banks acted as a buffer against negative credit supply shocks, but only for better-performing, healthier firms.

JEL Codes: G21, G32, F34

Keywords: Foreign banks, Financial Crisis, Credit Supply

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## 1. Introduction

Foreign banks have been identified as a major source of diffusion of financial crises, through at least two distinct mechanisms.<sup>1</sup> First, they can transmit shocks from their home country to foreign countries where their cross-border affiliates operate (e.g. Peek and Rosengreen, 2000). Second, they tend to be intrinsically riskier because they rely to a larger extent on the wholesale funding market (De Haas and Van Lelyveld, 2011), which is more volatile.

Following the collapse of the US housing market and the bankruptcy of the American bank Lehman Brothers in 2008, foreign banks contributed to diffuse the financial crisis to their host countries. 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), which exacerbated the consequences of the financial turmoil.<sup>2</sup>

Despite an extensive empirical literature showing that foreign banks act as shock propagators, from a theoretical perspective they can also offer a buffer against negative credit supply shocks in the host country when domestic banks are in higher distress (Levine, 1996). This paper validates this theory by showing that foreign financial intermediaries can act as shock absorbers during financial crises. However, this finding only holds for loans towards for more profitable firms, and is driven by large foreign financial intermediaries.

I use Credit Registry and balance-sheet data from the universe of firms and banks in Belgium to compare the lending behaviour of domestic vis-à-vis foreign banks in this country before and after

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<sup>1</sup> See Giannetti and Laeven (2012) for a review.

<sup>2</sup> Against this background, many recent papers used the bankruptcy of Lehman Brothers or exposure to American mortgage markets as a natural experiment to identify exogenous negative credit supply shocks. Indeed, because precisely the shock is external to the host credit market, the US crisis can provide an exogenous shifter in credit supply.

the 2008-2009 Financial Crisis.

The main assumption underlying my identification strategy is that Belgian domestic banks suffered the consequences of the financial crisis to a larger extent than foreign banks operating in this country. After having shown that foreign and domestic banks were similar on observables at the start of the Great Recession, I then compare the growth and the size of the loans provided by domestic vis-à-vis foreign banks, before and after the year 2008.

As widely documented both in the academic literature and the popular press, at the beginning of October 2008, many large European banks, including the main Belgian ones, experienced strong distress which led to a large credit contraction. Most European countries rescued their domestic banking sector at the cost of important liquidity injections or recapitalization.<sup>3</sup> However Belgium's macroeconomic conditions at the time – the relative size of the major domestic banks on the national GDP; the high leverage of Belgian domestic banks; the country's high level of public debt to GDP<sup>4</sup> - made its domestic banking sector “too big to be rescued” by the national authorities. This, in turn, amplified the consequences of the financial crisis for domestic banks. As I will detail in the next sections, such macroeconomic conditions did not hold in similar, neighbouring countries, where the largest share of foreign banks lending to Belgian firms originates (mainly France, Germany, the Netherlands and the United Kingdom, see Table 1). It follows that foreign banks operating in Belgium were not affected by this “amplification” of the financial crisis. As a consequence, domestic and foreign banks in Belgium adopted different lending strategies following 2008.

I test this hypothesis using data from a sample of almost 600,000 non-financial firms and 96 banks, both domestic and foreign, for the period 2004-2010. I study both the intensive and the extensive

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<sup>3</sup> Among many examples, ING (the Netherlands) received a liquidity injection of €10bn, Dexia was recapitalized by France for €3bn, while Royal Bank of Scotland was bail-out and nationalized for a cost of €45 bn.

<sup>4</sup> The Belgian context will be discussed in detail in the next sections.

margin of credit and relate banks' lending behaviour to borrowers' characteristics.

The core result of my analysis is that in Belgium, foreign banks lent more than their domestic counterparts in the years 2008-2010. After the outbreak of the Great Recession, credit granted from foreign banks in Belgium grew by 2 percentage points more than from domestic banks.<sup>5</sup> Similarly, loan volume increased by 5 percentage points more for foreign than domestic banks. This is robust after controlling for banks' balance sheet variables and for credit demand, using the Khwaja and Mian (2008)'s within-firm estimator. Heterogeneity analysis based on firms' characteristics reveals that foreign banks lent more to larger and high-sales firms.

I then look at the extensive margin of lending and find that, during the financial crisis, foreign banks were more likely than domestic banks to terminate existing relationships but also to start new ones. This result is driven by larger foreign banks: it suggests that foreign banks whose size – and potentially organizational structure – was most similar to domestic banks changed their lending strategies and became more selective during the Great Recession.

All in all, this paper casts new light on the role of foreign financial institutions during financial crises, by showing that foreign banks can provide a buffer against negative credit supply shocks, in countries where the domestic banking sector has weakened, at least momentarily – but only to a selected set of firms. Moreover, these effects are mainly driven by large foreign banks.

Findings from this paper add to the literature on the role of foreign banks during financial crises, along at least two dimensions. First, they show that foreign banks may act as shock-absorbers. In this sense, our results expand Goldberg et al. (2000) and Bofondi et al. (2018), who have highlighted the key

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<sup>5</sup> In conducting the analysis, only resident banks are considered. Domestic banks are classified as those originating in Belgium; conversely, foreign banks include 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.

lending role of foreign banks when countries face country-specific shocks – as it was the case of the tequila crisis in Mexico or the sovereign debt crisis in Italy. We show that foreign banks can mitigate credit crunches also during systemic shocks. Second, and most importantly, the use of granular firm-, bank-, and loan data, allows us not only to control for both credit and demand supply, but also to exploit firms' and banks' heterogeneity to comprehensively study and assess differences in lending strategies between foreign and domestic banks.

The paper is organised as follows: the review of the literature on the role of foreign banks during financial crises is presented in section 2. Section 3 describes the Belgian credit market context, while 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. Related Literature**

This paper relates to the stream of literature that asks under which conditions international banks may act as shock propagators or shock absorbers in domestic markets, especially during financial downturns.

The role of foreign banks as a source of financial instability has been widely documented in emerging economies. On the one hand, foreign banks tend to transmit shocks from their home country to foreign countries where their cross-border affiliates operate (Peek and Rosengreen, 2000; Ongena et al., 2012; Cetorelli and Goldberg, 2011; Popov and Udell 2012, among others). On the other hand, foreign banks have been shown to rely on more volatile sources of funding (De Haas and Van

Lelyveld, 2014) which further contributes to their fragility. Finally, international banks have 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 (De Haas and Van Horen, 2013). This, in turn, amplifies the transmission of financial shocks.

Despite the extensive evidence of foreign banks as shock propagators, foreign financial intermediaries have been also shown to act as a buffer against negative shocks for domestic firms. As Goldberg et al. (2000) document, foreign banks displayed higher rates of credit growth than domestic banks after the Tequila crisis in Mexico and Argentina. Goldberg et al. (2000)'s results suggest that when the domestic credit market is damaged by a country-specific shock, healthy foreign banks provide 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. (2018) find that domestic banks have tightened credit to a higher extent than foreign banks. My paper builds on this stream of literature by showing that foreign banks can act as shock absorbers even during systemic financial crises, in which such intermediaries are typically said to amplify shocks.

From a data-related and methodological perspective, my study is also close to a number of papers which employ loan-level data to control for credit demand, thus mitigating concerns of firms' selection into banking relationships (Bonaccorsi di Patti and Sette, 2012; Albertazzi and Bottero, 2012; Puri et al., 2011; Schnabl, 2012). In a similar spirit, the use Credit Registry data allows me to employ the Khwaja and Mian's loan-level estimator to control for firms' unobserved heterogeneity. At the same time, I construct a novel dataset that comprises both loan-level data and firms' and banks' balance-sheet variables. I use these granular data to perform a number of heterogeneity analyses on the type of firms funded by foreign banks, as well as on which foreign banks' characteristics drive

their lending behaviour.

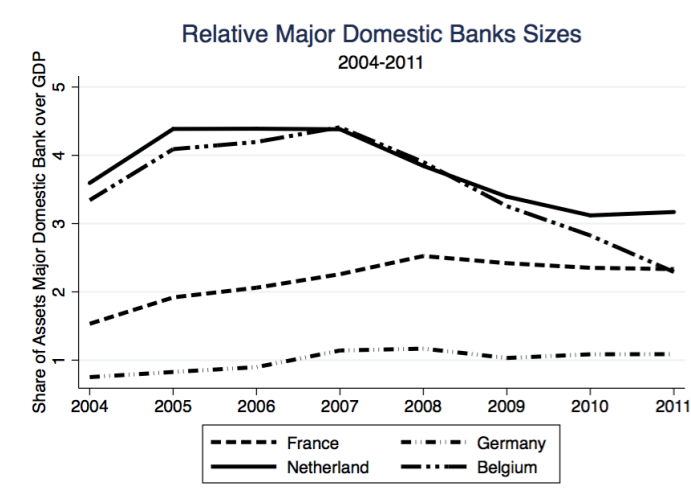
### **3. The Belgian Credit Landscape in 2004 – 2010.**

This section details how Belgian domestic banks suffered the consequences of the Great Recession to a larger extent than foreign banks operating in the country, and how this can be used as an identification-strategy assumption for my analysis.

A few weeks after Lehman Brothers' default, Fortis, one of the largest Belgian domestic banks 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, the third largest bank in the country at the time, although managed to survive thanks to a liquidity injection from both the Belgian and the French Government, was ultimately dismantled in 2011.

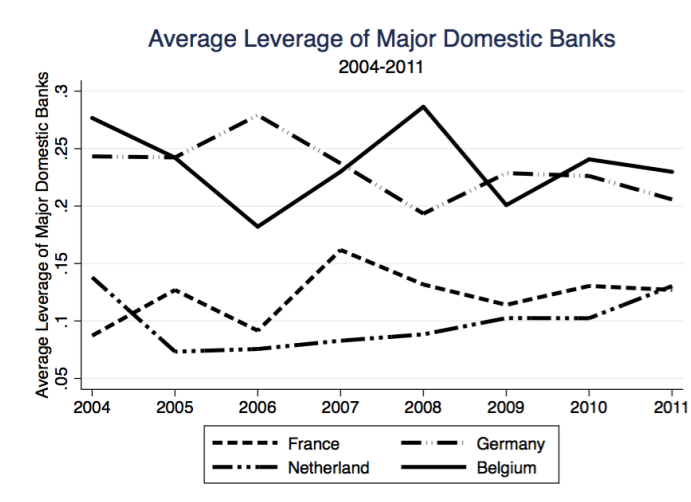
As already mentioned, the impact of the financial crisis on the Belgian domestic market was severe, but not significantly more severe than for other countries (National Bank of Belgium, 2012). However, compared to other similar, and neighbouring countries, Belgium was characterised by a series of very different macroeconomic conditions: First, a disproportionately large domestic banking sector compared to the national economy. In the years 2004 – 2007, before the outbreak of the financial crisis, the total assets of Dexia, KBC and Fortis accounted for more than three times the Belgian national GDP (Figure 1). This figure is only comparable with the Netherlands -- over the same years, the domestic banking sector was about as twice as big, and as big as, national GDP for France and Germany, respectively. This implies that the losses experienced by the major Belgian domestic banks were extremely heavy for the national economy, and their rescue very difficult for the Belgian authorities.

Figure 1: Share of Assets of Major Domestic Banks (USD millions) over national GDP (USD millions)



Second, Belgian domestic banks’ leverage – measured as banks’ average ratio of long-term debt holdings to total assets – was higher than German, French and Dutch banks, especially between 2007 and 2008 (see Figure 2).

Figure 2: Average leverage of Major Domestic Banks (ratio of long-term debt holding over total assets)

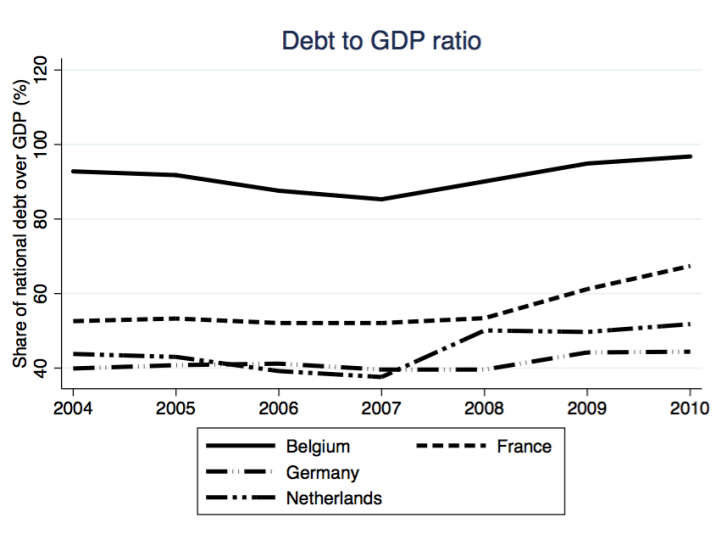


In addition, one must notice that, before 2008, the level of public debt to GDP in Belgium was very high (around 90%), and again higher than in France, Germany and The Netherlands, as shown in Figure 3. This suggests that the conversion of private debt into public debt to rescue such a very large



domestic banking sector would have further compromised Belgium’s macroeconomic stability. It follows that, when the Belgian banking sector was hit by the 2008 financial shock, the extent and the implications of the liquidity injection needed to rescue the domestic banks were far more (too) important in Belgium than in other countries.

Figure 3: National debt (USD million) over GDP (USD million)



All in all, given the Belgian context during the financial crisis, with the largest domestic banks being “too big to be rescued” by national authorities, it is not difficult to imagine that foreign banks have played a central role in lending to firms – especially since foreign banks operating in Belgium did not experience the consequences of the financial crisis to the same extent as domestic banks. Moreover, Belgium is characterised by a very large presence of foreign banks, compared to other European countries (see Claessens and Van Horen, 2013): this, in turn, might have further facilitated foreign lending to domestic firms. I build on this set of assumptions for my identification strategy, which compares and assesses differences in the growth and the size of the loans provided by domestic vis-à-vis foreign banks, before and after the year 2008.

## 4. Banking Environment and Data Sources

### 4.1 Banking Environment

To distinguish banks into foreign or domestic, I adopt the definition generally used in the literature, 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>6</sup> My final sample consists of 96 banks operating in Belgium, of which more than 50% are foreign. This share is relatively high, compared to other OECD countries (data from Claessens and Van Horen, 2014).<sup>7</sup>

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 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 these, 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, 33.51 per cent of the total credit comes from subsidiaries of foreign banks, while only 6.84 per cent from branches of foreign banks. Another aspect to be acknowledged is that Fortis, one

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<sup>6</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>7</sup> Still, other small-sized countries in Europe are characterised by high shares of foreign banks presence: Ireland, Poland, and the Netherlands are among these countries (Claessens and Van Horen, 2014).

of Belgium's main domestic banks that changed ownership in 2009, has been classified as domestic for the scope of this analysis. This is because of at least three reasons. First, the change in the ownership of Fortis took place only in 2009; second, including Fortis in my dataset as a foreign-owned bank, even only after 2009, would be conceptually wrong and may ultimately bias the estimates of this paper.<sup>8</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.

#### **4.2 Data Sources and Descriptive Statistics**

This paper relies on a novel dataset I built by merging five different data sources: (1) The Belgian Credit Register, where all granted 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 2004 to 2010; (2) Firm Balance Sheets: these data come from firms' annual balance sheet filings, during the period 2004-2010; (3) Bank Balance Sheets: these data come from banks' annual balance sheet filings, as per the Supervisory Report Scheme, during the period 2004-2010; (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.

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<sup>8</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.

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  $t = 2004, 2005, \dots, 2010$ . 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. The final dataset consists of 96 banks and 599,848 firms, for a total of more than 3 million loans disbursed across seven years. Among the firms I observe borrowing from the credit registry, 88% of them (about 528,000 firms) are engaged in only one bank lending relationship. Restricting the focus on multiple borrowing firms that before the crisis were granted a loan by both a domestic and a foreign bank, I end up with a sample of 15,303 firms. These firms are then employed in a set of robustness checks that allow me to control for firms' unobserved heterogeneity, in a similar spirit as Khwaja and Mian (2008).

Table 4 and Table 5 present descriptive statistics for the entire universe of firms and for the smaller sample of multiple-borrowing firms, respectively. In particular, compared to the full sample, multiple-borrowing firms are older, larger in size, more profitable in terms of sales and more likely to borrow from foreign banks. The median annual loan growth rate of credit is -0.029 for multiple borrowing firms, compared to -0.062 for the full sample. In addition, multiple-borrowing firms take larger loans than single-borrowing firms: the median loan size (expressed in log) is 6.7 for the former and 4.6 for the latter.<sup>9</sup>

Finally, I look at differences before and during the crisis of foreign and domestic loan growth. To this end, a crucial 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

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<sup>9</sup> I also study differences across balance-sheet characteristics and relationship lending variables between single- and multiple-borrowing firms by means of t-tests that take into account differences in the sample size across the two groups. Results from all the t-tests show that these differences are always statistically significant.

assumption is obtained by looking at Figure 4, which compares the mean of (granted) loan growth between domestic and foreign banks, averaged by year, respectively. Both growth rates have similar trends, with the loan growth rate by foreign banks being always higher than the growth rate of domestic loans. Yet, starting from 2008, one can observe the gap between foreign and domestic credit further widening. Figure 5 shows differences in the (log of) loan volume between domestic and foreign banks, which is another outcome variable I will study. Although the average loan size increases with time, foreign banks give larger loans than domestic banks, this difference slightly widening during the crisis.

In order to study ex-ante differences between foreign banks and domestic banks, I run a set of balancing checks by estimating the following regression equation:

$$\overline{banks\ characteristics}_{j2004-2007} = \beta_0 + \beta_1 Foreign_j + \varepsilon_j \quad (1)$$

Where, as dependent variable, I use bank  $j$ 's characteristics – size, measured as log of assets; operational costs; share of non-performing loans; liquidity; share of deposits; interbank ratio; TIER 1 ratio; wholesale funding – averaged over the years 2004-2007 (pre-crisis period). Results from equation (1) are shown in Table 6. I find that foreign and domestic banks do not differ along any dimension, except for size. Results from Table 6 suggest that there are no major ex-ante differences between foreign and domestic banks that could predict differences in their lending behaviour: banks' characteristics are not correlated with the bank nationality. This corroborates the hypothesis that any heterogeneity in lending supply across foreign and domestic banks must be related to a different exposure to the financial shock after 2008.

## 5. Identification Strategy

In order to identify differences in lending conditions during the financial crisis between foreign and domestic banks, I estimate 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 2004 and 2007, and years between 2008 and 2010, respectively).<sup>10</sup> This is shown in Equation (2):

$$y_{ij\tau} = \beta_0 + \beta_1 \text{Crisis}_\tau + \beta_2 \text{Foreign Bank}_j + \beta_3 (\text{Foreign Bank}_j \times \text{Crisis}_\tau) + \alpha_i + \gamma_j + \varepsilon_{ij\tau} \quad (2)$$

I estimate (2) with two dependent variables:  $\Delta \log(\text{credit})_{ij\tau}$ , the difference in the log of granted credit by bank  $j$  to firm  $i$  in period  $\tau$ ;  $\log(\text{credit})_{ij\tau}$ , the log of granted credit lent by bank  $j$  to firm  $i$  in period  $\tau$ . The dummy  $\text{Foreign Bank}_j$  equals 1 if bank  $j$  is classified as foreign, and zero if the bank is domestic. The main variable of interest, the interaction term  $\text{Foreign Bank}_j \times \text{Crisis}_\tau$  is computed as the interaction between the dummy  $\text{Foreign Bank}_j$  and the dummy  $\text{Crisis}_\tau$ , the latter being equal to 1 in year 2008, 2009 or 2010, and zero in year 2004, 2005, 2006, 2007. I first estimate (2) using the full sample of firm-bank relationship, adding firm- ( $\alpha_i$ ) and bank- ( $\gamma_j$ ) fixed effects, respectively.

I also estimate (2) with the sample of multiple-borrowing firms. This allows me to use the Khwaja and Mian (2008)'s estimator, with firm-period fixed effects,  $\alpha_{i\tau}$ , as a robustness check, to control for demand shocks.

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<sup>10</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.

## 6. Results

Results from equation (2) are reported in Table 7. Estimates shown in this table include the universe of firms from the Credit Register (both single- and multiple-borrowing). Robust standard errors are double clustered at the bank and at the firm level to account for within firm and within bank serial correlation. The dependent variable in columns (1) to (3) is the growth of granted credit, while the size of granted loans is estimated in columns (4) to (6). Column (1) and (4) report estimates for the baseline model without fixed effects, while bank and firm 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 granted by foreign banks grew by 1.7 percentage points more than domestic banks, as the coefficient of foreign bank reveals. Compared to the pre-crisis period, however, during the crisis the growth rate of credit has slowed down by 1.4 percentage point. The coefficient of the interaction term  $Foreign\ Bank_j \times Crisis_\tau$  is, instead, positive and significant: during the financial-crisis years, loans by foreign banks have increased by 1.6 percentage points more than domestic banks. It follows that, after 2008, the loan growth by foreign bank offset entirely the loan deceleration caused by the negative shock. Similarly, as shown in column (4), the loan volume granted by foreign banks increased by 1.3 percentage points more than the loan volume from domestic banks.

I then estimate the same regression with both bank and firm fixed effects. The use of bank fixed effects absorbs the foreign-bank dummy, which therefore does not appear in Column (2) and (3) for loan growth and (5) and (6) for loan volume. The coefficient of  $Foreign\ Bank_j \times Crisis_\tau$  remains positive and significant. In particular, its magnitude increases, in both regressions. Taken together, results from Table 7 reveal that, during the financial crisis, foreign banks have lent more, both in terms

of loan growth and volume, than domestic banks. This is also in line with the graphical analysis shown in Figure 4 and Figure 5.

To complement results from Table (7), I estimate equation (1) for different samples of firms: low- and high-sales firms, as well as smaller vis-à-vis larger firms. Results for loan growth are shown in Table 8 and 9, respectively. The coefficient of  $Foreign\ Bank_j \times Crisis_t$  is only significant for high-sales (column 4 to 6, Table 8) and larger firms (column 4 to 6, Table 9), even after controlling for both Firm and Bank Fixed Effects: During the financial crisis, loan growth rate by foreign banks vis-à-vis domestic banks has been 2.3 percentage points larger for high-sales firms and 2 percentage points for larger firms (column 6 of both Table 8 and 9). At the same time, I detect no statistically-significant differences in loan growth rates between foreign and domestic banks for less profitable and smaller firms (column 3, Table 8 and 9). This suggests that the results from Table (7) are entirely driven by larger, higher-revenue firms. In addition, the coefficient of  $Foreign\ Bank_j$  is positive and significant in Column 1 of both Table 8 and 9, while it is negative and significant in column 4 of both Table 8 and 9. This suggests that, before the outbreak of the financial crisis, foreign banks were significantly less likely than domestic banks to fund larger and more profitable firms, but their lending behaviour reversed after 2008.

I then perform a series of robustness checks to validate my results. I first run the same regression as in (2) using the subsample of multiple-borrowing firms, and, more precisely, those firms that before the financial crisis borrowed from at least one domestic and one foreign bank. This leaves me with a sample of 15,303 firms. Restricting the analysis to multiple-borrowing firms allows me to use Khwaja and Mian (2008)'s estimator. By plugging firm $\times$ time fixed effects in my regression, I study firms in a cross-sectional dimension and analyse how the same firm, borrowing from both a domestic and a foreign lender, has substituted domestic credit with foreign credit. This allows me to purge my



regressions from any demand-driven unobserved heterogeneity. Results from this regression are shown in Table 10. The coefficient of  $Foreign\ Bank_j \times Crisis_t$ ,  $\beta_3$ , is always positive and significant, for both credit growth and volumes, and the magnitudes remain quite stable, thus confirming results from Table 7. When indeed firm×time fixed effects are included, the growth rate of granted credit from foreign banks is 1.2 percentage points higher than from domestic banks (Column 3 of Table 10). Similarly, loan volume is 4.9 percentage points higher for foreign banks (Column 6 of Table 10).

I then conduct two other checks to confirm the robustness of my results. First, I disaggregate foreign banks into branches and subsidiaries. I thus run equation (2) with branches and subsidiaries of foreign banks included as separate dummies. These estimates are reported in the Appendix, Table A.1. Columns (1) and (3) display results for the full sample of firms, while Columns (2) and (4) show regressions estimated with the subsample of multiple-borrowing firms (which again allows me to include firm×time fixed effects). The dependent variable is the growth rate of granted credit (columns 1 and 2) and log of granted credit (column 3 and 4). Subsidiaries of foreign banks have lent more than domestic banks during the crisis, both in terms of loan growth and volumes. Branches of foreign banks, instead, have lent to a lower extent than domestic banks in terms of growth rate of credit, although they have lent larger loans – this result is only significant in the case of multiple-borrowing firms. All in all, Table A.1 suggests that results shown in Table 7 are mainly driven by subsidiaries of foreign banks. Branches of foreign banks instead appear to lend to a very small set of borrowers,<sup>11</sup> to which they give larger loans. This is consistent with the view of branches of foreign banks serving “niche market segments” as discussed by Cerutti et al., 2007. Subsidiaries of foreign banks, instead,

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<sup>11</sup> Results are not shown here. However, they can also be inferred by comparing the magnitude of the coefficient of *foreign branch* × crisis and *foreign subs* × crisis in column (1) of Table A.1 with the magnitude of the overall coefficient of *foreign* × crisis in column (1) of Table 7.

tend to be in direct competition with more local banks, as they are more likely than branches to focus on retail customers. As a second robustness check, I only select one year before (year 2007) and one year after the crisis (year 2009) to estimate regression (2). This allows me to study whether estimates remain unchanged when, instead of taking averages by period, I only select two specific points in time. I still find the coefficient of  $Foreign\ Bank_j \times Crisis_\tau$  positive and significant, with a similar magnitude than in Table 7. Results are shown in Appendix A.2.

Taken together, findings from Table 7, 8 and 9 show that foreign banks in Belgium lent more than domestic banks during the crisis years, and especially to larger, more profitable firms. This seems to suggest that foreign banks acted as shock absorbers rather than shock propagators during the Great Recession. But are these results driven by a selective behaviour of foreign banks – which started targeting better-performing firms during the financial crisis –, or are they rather an effect of changes in domestic banks' lending, which heavily reduced their credit supply during the Great Recession?

The main hypothesis I make is that, since they suffered the liquidity contraction to a lower extent than domestic banks for the above-mentioned reasons, foreign lenders *actively* targeted larger and more profitable firms, which typically would be customers of domestic banks. This hypothesis is supported by findings from Table 8 and 9 showing that, before the financial crisis, domestic banks were more likely than foreign ones to fund more profitable and larger firms. However, because domestic banks could not fund such firms at the same rate as before the financial crisis, foreign banks compensated this funding “gap”, but only for firms they valued worth to be funded.

The alternative hypothesis is that results for the intensive margin of credit only reflect the shrinking in domestic credit, rather than an active lending behaviour by foreign financial intermediaries. If this is the case, foreign banks should not have changed their lending behaviour during the Great Recession.

## 6.1 Did foreign banks adopt a selective lending behaviour after 2008?

To study whether foreign banks took advantage of the domestic banking sector's temporary weakness, in this paragraph I analyse foreign banks' propensity to both terminate existing credit relationships and start new ones, with respect to domestic banks. If the prevailing hypothesis is that foreign banks changed their lending strategies during the financial crisis to fund healthier firms, then we should observe a re-allocation of foreign credit. In terms of the extensive margin of credit, this should translate in foreign banks ending some of their existing relationships, but also starting new banking relationships, to a higher extent than domestic banks. If, on the contrary, my results are purely driven by a shrinking in the domestic credit supply, then no change should be detected on foreign banks' lending strategies vis-à-vis domestic ones after 2008.

Two separate equations are thus estimated building on Equation (2). 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 11 report the results for the equation estimating banks' likelihood to end existing credit relationships, where the dependent variable,  $p(terminate)_{ijt}$ , 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>12</sup> The main variable of interest is, again,  $Foreign_j \times Crisis_\tau$ : its coefficient is both positive and significant, also after adding firm and bank FEs. Results from columns (1) and (2) of Table 11 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 11 show the results for the second equation, where the probability of starting a new bank-firm relationship is estimated. The dependent variable,  $p(newrel)_{ijt}$ , is a dummy that takes the value of 1

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<sup>12</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. The maximum value across each period is taken.

if a credit relationship that didn't exist at time  $t - 1$ , is created at time  $t$  – this is constructed in a similar way as  $p(\text{terminate})_{ijt}$ . The coefficient of  $\text{Foreign Bank}_j \times \text{Crisis}_t$  is positive and significant, implying that foreign banks during 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, suggesting that foreign banks have created additional lending relationships during the Great Recession. Taken together, these results show that during the financial 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. Table 12 complements results from Table 11 by linking banks' size with the extensive margin of credit. I find that the extensive margin results shown in Table 11 are entirely driven by larger foreign banks. Since domestic banks are on average larger than foreign ones in Belgium (Table 6), this suggests that only foreign banks who could compete with the domestic banking sector on the dimension margin could actively substitute domestic credit.

All in all, results from both Table 11 and 12 suggest that foreign banks adopted a more targeted lending behaviour during the financial crisis. This leads to reject the hypothesis that differences in lending strategies between domestic and foreign banks were simply driven by a change in the behaviour of domestic banks, while strengthening the hypothesis that (large) foreign banks acted as shock-absorbers by creating new banking links during the financial crisis and lending at the intensive margin to a higher extent than domestic banks.

## 7. Conclusions

This paper finds that foreign banks may act as shock absorbers in countries where the domestic

banking sector has suffered disproportionately the consequences of the financial crisis, due to the national authorities' inability to fully rescue a "too large" banking sector.

Using a novel dataset that merges data from the Belgian Central Bank Credit Registry with firms' and banks' balance sheet information, I study both the intensive and the extensive margin of credit. I find that foreign banks lent more than their domestic counterparts during the financial crisis, and particularly to more profitable and larger firms. I also observe foreign banks being more resolute than domestic banks to cut existing lending relationships during the Great Recession, but also being keener on adding new lending relationships. These results are driven by large foreign banks, which can potentially compete with the domestic banking sector to a higher extent.

This paper contributes to the literature on the role of foreign banks during the financial crisis by showing that, although foreign banks have cut credit growth in many countries during the Great Recession (Cetorelli and Goldberg, 2011; 2012), there are cases in which they have increased their lending particularly to healthier firms that are typically customers of domestic banks.

From a policy perspective, this paper suggests that foreign banks are not always shock transmitters, as commonly thought. Instead, they can play a shock-absorbing even during systemic crises as the Great Recession. Results from this paper may apply to other small open economies (like the Netherlands, Ireland, and similar-sized European economies, including Poland) with a remarkable weight of the domestic banking sector on the national economy and a large foreign banks' presence. In these countries, foreign financial intermediaries could act as "shock absorbers" in times when the domestic banking sector weakens – thus, their role might be re-considered by national authorities.

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## Figures and Tables

Figure 4: Mean loan growth rate, firm-bank level, averaged by year – granted credit  
Source: NBB, Credit Register

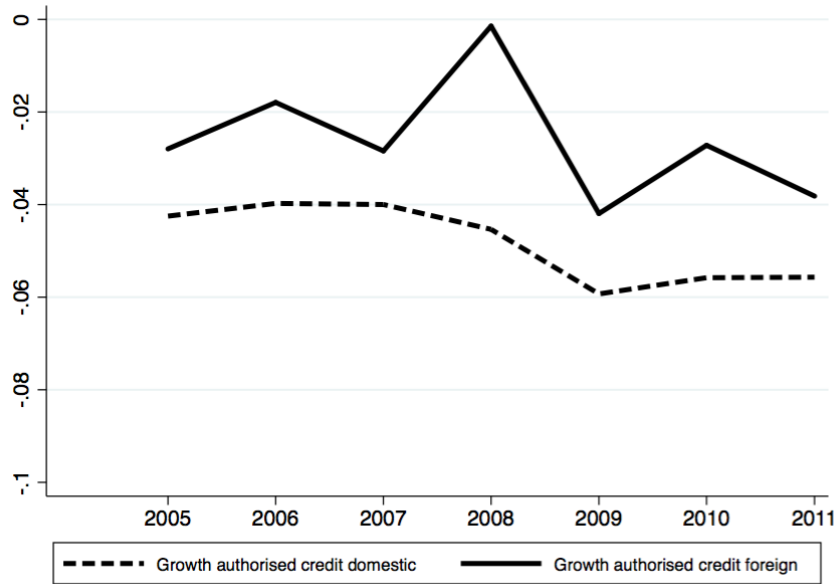


Figure 5: Mean loan volume (in log), firm-bank level – granted credit  
Source: NBB, Credit Register

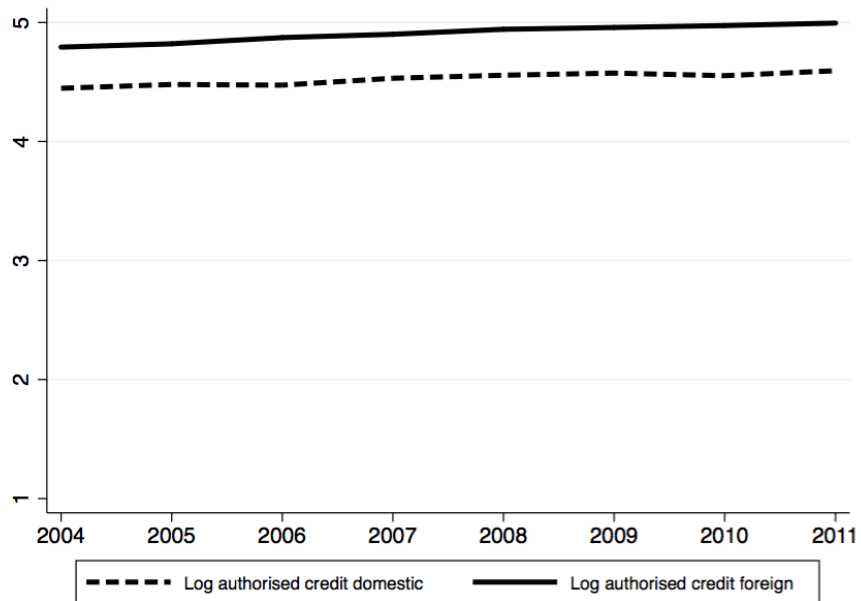


Table 1: Home Country of Banks included in the sample

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%	59.65%
subsidiaries of foreign banks	10	10.42%	33.51%
branches of foreign banks	43	44.79%	6.84%
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 average growth rate of granted credit, firm level	-0.031	-0.062	0.451
loan size	annual average loan size, firm level, expressed in log	4.632	4.415	1.543
size firm	Total book value of assets, expressed in log	13.484	13.266	1.486
sales	Total book value of sales, expressed in log	13.485	13.207	2.016
age	Age of the firms in years	18.443	17	10.482
p(foreign)	probability of being funded by foreign banks	0.196	0	0.377
onebanklink	=1 if firm has one bank lending relationship	0.876	1	0.329

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

Variable	Definition	mean	median	sd
loan growth	annual average growth rate of granted credit, firm level	-0.022	-0.029	0.455
loan size	annual average loan size, firm level, expressed in log	6.660	6.452	1.705
size firm	Total book value of assets, expressed in log	14.698	14.429	1.697
sales	Total book value of sales, expressed in log	15.573	16.067	1.588
age	Age of the firms in years	26.641	24	12.023
p(foreign)	probability of being funded by foreign banks	0.422	0.5	0.203

Table 6: Balancing checks: Banks' characteristics, domestic *versus* foreign banks

This table reports OLS estimates for balancing checks between foreign and domestic banks. All dependent variables are computed as averages, at the bank level, before 2008.

dep.var.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	log(assets)	op. costs	bad loans	liquidity	deposits	interbank	TIER 1	wholesale
foreign banks	-1.481*** (0.613)	-0.001 (0.027)	-0.001 (0.009)	-0.013 (0.022)	-0.030 (0.042)	-48.002 (51.347)	-1.513 (1.635)	1.154 (13.135)
Mean of domestic banks	14.657*** (0.356)	0.068*** (0.016)	0.018** (0.008)	0.052*** (0.016)	0.905 (0.019)	169.774*** (48.902)	11.244*** (1.025)	61.861*** (7.229)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	420	346	204	281	263	166	70	181
R-squared	0.229	0.066	0.007	0.013	0.016	0.013	0.046	0.001

Robust standard errors in parentheses

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

Table 7: Intensive Margin of Credit – Full Sample

This table reports OLS estimates of the determinants of credit growth using as dependent variable both loan growth (Columns (1), (2) and (3)) and loan volume, expressed in log (Columns (4), (5) and (6)). The dependent variables are obtained by computing the log difference and the log of granted credit, respectively. The sample consists of all firms included in the Belgian Credit Register (single and multiple borrowing firms).

	(1)	(2)	(3)	(4)	(5)	(6)
dep. var.	$\Delta\log(\text{credit})$	$\Delta\log(\text{credit})$	$\Delta\log(\text{credit})$	$\log(\text{credit})$	$\log(\text{credit})$	$\log(\text{credit})$
foreign bank	0.017*** (0.001)			0.396*** (0.005)		
crisis	-0.014*** (0.001)	-0.017*** (0.001)	-0.067*** (0.001)	0.069*** (0.002)	0.071*** (0.002)	-0.050*** (0.002)
foreign bank*crisis	0.016*** (0.002)	0.015*** (0.002)	0.021*** (0.002)	0.013*** (0.005)	0.023*** (0.004)	0.054*** (0.004)
Sample	Single+Multiple	Single+Multiple	Single+Multiple	Single+Multiple	Single+Multiple	Single+Multiple
Firm Fixed Effects	no	no	yes	no	no	yes
Bank Fixed Effects	no	yes	yes	no	yes	yes
Observations	824,537	824,536	646,946	980,484	980,484	781,223
R-squared	0.001	0.010	0.394	0.012	0.113	0.871

Robust standard errors in parentheses

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

Table 8: Intensive Margin of Credit – subsample analysis with firms’ sales

This table reports OLS estimates of the determinants of credit growth using as dependent variable loan growth, for low-sales (Columns (1), (2) and (3)) and high-sales firms (Columns (4), (5) and (6)). The dependent variable is obtained by computing the log difference of granted credit, respectively. The sample consists of all firms included in the Belgian Credit Register (single and multiple borrowing firms) for which information on total sales is available.

	low-sales firms			high-sales firms		
	(1)	(2)	(3)	(4)	(5)	(6)
dep. var.	$\Delta\log(\text{credit})$	$\Delta\log(\text{credit})$	$\Delta\log(\text{credit})$	$\Delta\log(\text{credit})$	$\Delta\log(\text{credit})$	$\Delta\log(\text{credit})$
foreign bank	0.021*** (0.004)			-0.012*** (0.010)		
crisis	-0.024*** (0.003)	-0.026*** (0.004)	-0.065*** (0.004)	-0.046*** (0.003)	-0.046*** (0.003)	-0.072*** (0.004)
foreign bank*crisis	0.001 (0.004)	-0.001 (0.005)	-0.006 (0.007)	0.034*** (0.007)	0.030*** (0.007)	0.023*** (0.008)
Sample	Single+Multiple	Single+Multiple	Single+Multiple	Single+Multiple	Single+Multiple	Single+Multiple
Firm Fixed Effects	no	no	yes	no	no	yes
Bank Fixed Effects	no	yes	yes	no	yes	yes
Observations	68,719	68,716	60,378	85,333	85,329	82,315
R-squared	0.002	0.011	0.429	0.736	0.750	0.769

Robust standard errors in parentheses  
 \* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$

Table 9: Intensive Margin of Credit – subsample analysis with firms’ size

This table reports OLS estimates of the determinants of credit growth using as dependent variable loan growth, for small (Columns (1), (2) and (3)) and large firms (Columns (4), (5) and (6)). The dependent variable is obtained by computing the log difference of granted credit, respectively. The sample consists of all firms included in the Belgian Credit Register (single and multiple borrowing firms) for which information on total assets is available.

dep. var.	small firms			large firms		
	(1)	(2)	(3)	(4)	(5)	(6)
	$\Delta\log(\text{credit})$	$\Delta\log(\text{credit})$	$\Delta\log(\text{credit})$	$\Delta\log(\text{credit})$	$\Delta\log(\text{credit})$	$\Delta\log(\text{credit})$
foreign bank	0.021*** (0.002)			-0.007*** (0.003)		
crisis	-0.004*** (0.001)	-0.006*** (0.002)	-0.049*** (0.002)	-0.053*** (0.002)	-0.055*** (0.002)	-0.081*** (0.004)
foreign bank*crisis	0.002 (0.003)	0.0001 (0.002)	0.001 (0.005)	0.026*** (0.004)	0.025*** (0.004)	0.020*** (0.008)
Sample	Single+Multiple	Single+Multiple	Single+Multiple	Single+Multiple	Single+Multiple	Single+Multiple
Firm Fixed Effects	no	no	yes	no	no	yes
Bank Fixed Effects	no	yes	yes	no	yes	yes
Observations	181,086	181,081	153,296	228,495	228,491	217,563
R-squared	0.001	0.010	0.442	0.004	0.008	0.334

Robust standard errors in parentheses

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

Table 10: Intensive Margin of Credit – Multiple borrowing firms

This table reports OLS estimates of the determinants of credit growth using as dependent variable both loan growth (Columns (1), (2) and (3)) and loan volume, expressed in log (Columns (4), (5) and (6)). The dependent variables are obtained by computing the log difference and the log of granted credit, respectively. The sample consists of firms that, before 2008, borrowed from at least one domestic and one foreign bank.

	(1)	(2)	(3)	(4)	(5)	(6)
dep. var.	$\Delta\log(\text{credit})$	$\Delta\log(\text{credit})$	$\Delta\log(\text{credit})$	$\log(\text{credit})$	$\log(\text{credit})$	$\log(\text{credit})$
foreign bank	0.001 (0.004)			-0.019* (0.010)		
crisis	-0.059*** (0.004)	-0.060*** (0.004)		0.007 (0.006)	0.002 (0.006)	
foreign bank*crisis	0.013** (0.006)	0.013** (0.006)	0.012* (0.006)	0.040*** (0.010)	0.036*** (0.010)	0.049*** (0.010)
Sample	Multiple	Multiple	Multiple	Multiple	Multiple	Multiple
Firm Fixed Effects	yes	yes	no	yes	yes	no
Bank Fixed Effects	no	yes	yes	no	yes	yes
Firm*Time Fixed Effects	no	no	yes	no	no	yes
Observations	70,457	70,470	69,008	74,780	74,776	73,379
R-squared	0.214	0.221	0.381	0.736	0.750	0.769

Robust standard errors in parentheses  
 \* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$



Table 11: Extensive margin of credit

This table reports OLS estimates of the extensive margin of credit. 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. I then average these probabilities by period (before and after the financial crisis).

	(1)	(2)	(3)	(4)
dep. var.	p(terminate)	p(terminate)	p(newrel)	p(newrel)
crisis	0.001*** (0.000)	0.007*** (0.000)	-0.057*** (0.001)	-0.252*** (0.001)
foreign bank*crisis	0.004*** (0.001)	0.005*** (0.001)	0.018*** (0.002)	0.021*** (0.003)
Sample	Single+Multiple	Single+Multiple	Single+Multiple	Single+Multiple
Firm Fixed Effects	no	yes	no	yes
Bank Fixed Effects	yes	yes	yes	yes
Observations	1,009,770	806,333	1,009,770	806,333
R-squared	0.002	0.444	0.058	0.500

Robust standard errors in parentheses  
 $*p < 0.10$ ;  $**p < 0.05$ ;  $***p < 0.01$

Table 12: Extensive margin of credit, by banks' size

This table reports OLS estimates of the extensive margin of credit. 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, for small and large banks, respectively. I then average these probabilities by period (before and after the financial crisis).

dep. var.	Banks's size below median		Banks's size above median	
	(1)	(2)	(3)	(4)
	p(terminate)	p(newrel)	p(terminate)	p(newrel)
crisis	-0.001 (0.002)	-0.417*** (0.008)	0.007*** (0.000)	-0.250*** (0.001)
foreign bank*crisis	0.004 (0.006)	-0.080*** (0.018)	0.005*** (0.001)	0.021*** (0.003)
Sample	Single+Multiple	Single+Multiple	Single+Multiple	Single+Multiple
Firm Fixed Effects	yes	yes	yes	yes
Bank Fixed Effects	yes	yes	yes	yes
Observations	27,548	27,548	771,468	771,468
R-squared	0.002	0.444	0.058	0.500

Robust standard errors in parentheses  
\* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$

## Appendix

Table A.1: Intensive Margin of Credit - Branches and subsidiaries

This table reports OLS estimates of the determinants of credit growth using as dependent variable both loan growth (Columns (1) and (2)) and loan volume, expressed in log (Columns (3) and (4)). The dependent variables are obtained by computing the log difference and the log of authorised credit, respectively. Branches of foreign banks and subsidiaries of foreign banks are analysed separately. Column (1) and (2) report estimates for the full sample, while Column (3) and (4) for multiple-borrowing firms.

	(1)	(2)	(4)	(5)
dep. var.	$\Delta\log(\text{credit})$	$\Delta\log(\text{credit})$	$\log(\text{credit})$	$\log(\text{credit})$
crisis	-0.067*** (0.001)		-0.050*** (0.002)	
foreign branch*crisis	-0.042* (0.023)	-0.093** (0.039)	0.025 (0.027)	0.099* (0.058)
foreign subs*crisis	0.023*** (0.002)	0.019*** (0.006)	0.055*** (0.004)	0.045*** (0.010)
Sample	Multiple+Single	Multiple	Multiple+Single	Multiple
Firm Fixed Effects	yes	no	yes	no
Bank Fixed Effects	yes	yes	yes	yes
Firm*Time Fixed Effects	no	yes	no	yes
Observations	646,946	69,008	781,223	73,379
R-squared	0.394	0.382	0.871	0.769

Robust standard errors in parentheses  
 \* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$

Table A.2: Intensive Margin of Credit – Full Sample, 2007 and 2009 only

This table reports OLS estimates of the determinants of credit growth using as dependent variable both loan growth (Columns (1), (2) and (3)) and loan volume, expressed in log (Columns (4), (5) and (6)). The dependent variables are obtained by computing the log difference and the log of granted credit, respectively. The sample consists of all firms included in the Belgian Credit Register (single and multiple borrowing firms).

	(1)	(2)	(3)	(4)	(5)	(6)
dep. var.	$\Delta\log(\text{credit})$	$\Delta\log(\text{credit})$	$\Delta\log(\text{credit})$	$\log(\text{credit})$	$\log(\text{credit})$	$\log(\text{credit})$
foreign bank	0.012*** (0.002)			0.370*** (0.006)		
crisis	-0.019*** (0.001)	-0.020*** (0.001)	-0.064*** (0.002)	0.043*** (0.002)	0.040*** (0.002)	-0.061*** (0.002)
foreign bank*crisis	0.006*** (0.003)	0.007*** (0.003)	0.014*** (0.004)	0.014*** (0.005)	0.030*** (0.004)	0.051*** (0.004)
Sample	Single+Multiple	Single+Multiple	Single+Multiple	Single+Multiple	Single+Multiple	Single+Multiple
Firm Fixed Effects	no	no	yes	no	no	yes
Bank Fixed Effects	no	yes	yes	no	yes	yes
Observations	649,558	649,555	521,949	767,748	767,745	628,744
R-squared	0.001	0.005	0.406	0.010	0.105	0.881

Robust standard errors in parentheses

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