

The Procyclicality of Foreign Bank Lending: Evidence from the Global Financial Crisis*

Ugo Albertazzi[†] and Margherita Bottero[‡]

26 September 2012

Abstract

We exploit highly disaggregated bank-firm level data to investigate the dynamics of foreign vs. domestic credit supply in Italy around the period of the Lehman collapse, which brought a sudden and unexpected deterioration of economic conditions and credit risk. Taking advantage of the presence of multiple lending relationships to effectively control for credit demand and risk at the individual-firm level, we show that foreign lenders have restricted credit supply (to the same firm) more heavily than their domestic counterparts. We document that such procyclicality does not derive from an effort to offset balance sheet shocks suffered at the headquarters' level, nor from organizational aspects typical of very large intermediaries, although these two factors help explaining the intensity with which credit supply is restricted. Rather, in explaining the procyclicality of foreign banks' lending supply we find a prominent role for portfolio-reallocation decisions taken by functionally distant banks, for which risk management in the host country is likely to be particularly costly in financially turbulent times.

Keywords: foreign banks lending channel, credit crunch, crisis transmission

JEL classification: G15, E44, G14, G21

*We are grateful to Ginette Eramo for her assistance with the data. We thank Nicola Cetorelli, Paolo Del Giovane, Stefano Neri and participants to the Bank of Italy Lunch seminar series and the conference on Intra-European Imbalances, Global Imbalances, International Banking, and International Financial Stability, Berlin (Germany) for helpful comments.

[†]Bank of Italy, Economic Research and International Relations, Economic Outlook and Monetary Policy Department. Email: ugo.albertazzi@bancaditalia.it

[‡]Bank of Italy, Economic Research and International Relations, Economic Outlook and Monetary Policy Department. Email: margherita.bottero@esterni.bancaditalia.it

1 Introduction

Opening national markets to foreign penetration is known to deliver higher efficiency gains than autarky, as the resulting increase in competition among financial intermediaries leads to better and less expensive access to credit, greater financial depth, and steadier growth (see Levine 2005 and references therein). The events following the 2007/2009 global financial crisis, however, challenged this broad consensus.¹ In the aftermath of the Lehman collapse, in fact, the general view came to regard multinational banks as cross-border propagators of financial distress, arguing that these intermediaries put in action a sudden and sizeable retrenching of capital flows away from the foreign host markets and towards the headquarters.²

Few recent papers have indeed investigated foreign intermediaries' behavior during the global crisis of 2007/2009 and documented that these banks have tightened credit standards by more than domestic banks (Cetorelli and Goldberg 2011, 2012; Popov and Udell 2012; De Haas and Lelyveld 2011). With this paper, we contribute to the understanding of foreign banks' behavior during the global financial crisis along the following dimensions. First, unlike most of the existing papers focusing on developing and transition economies, we explore the case of an industrialized economy - Italy - and study lending to firms rather than intra-group credit transactions from the parent bank to its foreign affiliates (Cetorelli and Goldberg 2011; Hameter et al. 2012).³ Second, we apply a robust methodology to control for the effects on lending dynamics of credit demand and borrowers' risk. This methodology, first employed in Gan (2007) and Kwhaja and Mian (2008), exploits the fact that firms usually borrow from several banks simultaneously, and its implementation is here made possible by our unique matched bank-borrower, loan-level dataset. Third, our objective is to assess if foreign banks differ from their domestic counterparts in responding to a *common* deterioration in credit risk, which in Italy, as in other countries, was brought about by the collapse of Lehman Brothers, and to test a few alternative determinants of such behavior. In this sense, our work complements most of the literature, which focuses on foreign banks in order to estimate the bank-lending channel of shock-transmission, namely the extent to which shocks that are realized at the parent bank balance sheet/country level are transmitted to otherwise healthy host markets (see Schnabl 2012).⁴ Here we study a case in which both type of institutions have

¹Although already in 2000, Stiglitz was raising concerns about the large volatility typically associated with highly integrated financial markets and the influx of foreign capital.

²Such behavior is commonly argued to have been prompted by the need to consolidate recent balance-sheet losses. Indeed, the financial crisis has been certainly capable of deteriorating the financial health of large and well-diversified banks (Peek and Rosengren 1997; Chava and Purnanandam 2011; Schnabl 2012; Acharya and Schnabl 2010; Puri et al. 2009). See Popov and Smets (2011) for a discussion on financial markets procyclicality.

³The first part of the comment does not apply to Cetorelli and Goldberg (2012), who look on foreign lenders operating in US.

⁴However, among the hypotheses we advance, we include the possibility that foreign banks behavior

suffered the same shock (i.e. a deterioration in credit risk) but have reacted differently to it, and we evaluate competing explanations for such differential behavior.⁵

More specifically, our paper evaluates the role played by three factors in determining the higher procyclicality in lending supply displayed by foreign banks, which are (i) unexpected shocks to the balance sheet of foreign banks' headquarters, or to the economy where these intermediaries are based (*international propagation of shocks*); (ii) strategic choices taken by these banks in accordance with their *business model*; and (iii) the (*functional*) *distance* of foreign intermediaries from the Italian market, which is taken to be a proxy for the costs needed from part of a foreign bank to manage risk in the host market. In principle, after the Lehman collapse, any of the factors above could have prompted a more severe response by the foreign intermediaries. Evidently, the three hypotheses above are neither mutually exclusive nor exhaustive of the various possible explanations, but they are broad enough to capture important determinants of a bank's behavior (own balance sheet and headquarters' country macroeconomic conditions, business orientation, risk management costs).

We exploit a dataset consisting of (a randomized draw of) all credit relations entertained by Italian firms with both foreign and domestic banks before and after the Lehman's collapse. The global financial crisis, culminated in the Lehman's collapse, determined an unexpected and abrupt economic downturn in the Italian economy, which was an intense shock for both foreign and domestic banks. Importantly, this shock is exogenous to the market under study, as it is not ascribable to the lending policies applied in Italy by domestic or foreign banks.

Our results confirm that in the post Lehman period foreign lenders operating in Italy have indeed restricted credit supply more than their domestic counterparts, both in terms of the total amount granted and of new lines of credit opened (i.e. both in the intensive and extensive margins). At the same time, we find that this procyclicality is almost entirely induced by branches (local offices) rather than by subsidiaries (proper banks controlled by a foreign group) of foreign intermediaries. Concerning the determinants of the procyclicality, we do not find evidence that foreign banks cut credit supply by more than domestic intermediaries because their balance sheets underwent a more severe deterioration compared to that of domestic banks, or in response to a more acute worsening of the economic outlook of their own country. Moreover, our evidence is not consistent with the hypothesis the higher procyclicality of foreign banks depends on strategic choices motivated by their business model. Rather, our empirical results show that it was more

can be explained by the severity of the shock that hit individual banks (international propagation of shocks hypothesis), which includes the possibility that foreign banks have been hit more severely than their domestic counterparts.

⁵However, among the hypotheses we advance, we include the possibility that foreign banks behavior can be explained by the severity of the shock that hit individual banks (international propagation of shocks hypothesis), which includes the possibility that foreign banks have been hit more severely than their domestic counterparts.

functionally distant banks that more than others chose to reallocate their portfolio away from Italy. This finding suggests that the higher procyclicality observed for foreign banks can be explained as their response to the increase in credit risk brought about by the Lehman event, which, although common to domestic intermediaries as well, meant for foreign banks a larger increase in monitoring and managing costs due to their distance from the local borrowers. In fact, if we restrict the comparison above (between foreign and domestic intermediaries) to foreign and *domestic multinational* banks, we find that the latter displayed a much less procyclical behavior than their foreign counterparts, which, we argue, reflects their "zero functional distance" from the domestic market as the two classes of intermediaries are arguably similar otherwise. Looking at the demand side of the credit market, we find that Italian firms were able to compensate only partially the contraction of lending supply by foreign banks, through a greater recourse to credit from domestic intermediaries.

The analysis of the interaction between the geographic proximity of a foreign lender and the economic conditions of the country where it is headquartered allows us to draw some more normative considerations. In particular, our findings show that foreign banks from closer countries have restricted credit supply the more, the more severely their own country was hit by the global crisis; on the contrary, when looking at banks situated in more distant areas, it was the banks in countries whose economy was only little hit by the crisis that restricted credit flows by most. Assuming that flows were redirected at home, this evidence is compatible with the idea that banks in countries that are geographically close manage in implementing some kind of risk sharing scheme, so that, once the crisis hit, flows were directed where the situation was worse. On the contrary, for banks from distant countries it appears to be the case that flight-to-quality phenomena drove capital flows away, rather than towards, countries hit by the crisis.

The remaining of the paper is organized as follows. Section 2 reviews the relevant literature. Section 3 discusses the impact of the Lehman's bankruptcy on the Italian credit market, the aggregate response of foreign banks and its possible determinants. Section 4 explains our empirical methodology in detail. Section 5 presents the dataset, which was constructed specifically for this work. Section 6 illustrates the empirical results. Section 7 concludes.

2 Review of the literature

Our work nests in the literature that studies the lending behavior of foreign banks in periods of financial turmoil, following up the seminal contribution of Peek and Rosengren (1997), who document how the unexpected decline in Japanese stock values between 1989 and 1992 provoked a sizeable, direct restriction in the lending supply of Japanese banks'

branches operating in the US.⁶

In the aftermath of the Lehman collapse, a number of papers resumed this line of research with a more specific focus on the global financial crisis. Taken together, these works provide consistent evidence that capital flows from foreign intermediaries to their affiliates (intra-group lending) and from foreign affiliates to borrowers in the host market came to a sudden halt during that period. For instance, Cetorelli and Goldberg (2011) study the behavior of foreign affiliates operating in European, Asian and Latin American emerging markets, and find sizeable effects both for what concerns intra-group lending and lending to local borrowers. Similarly, the authors show (2012) that the Lehman event prompted also foreign intermediaries operating in the US to implement large intra-group withdrawals of liquidity from their affiliates operating in the United States, which translated in the restriction of local lending from these banks. These findings are in line with what is documented by Claessens and Van Horen (2011), who analyze the behavior of a rather large sample of foreign banks, and show that during the global crisis these intermediaries have contracted their credit supply more than domestic intermediaries, especially when their share of the market was not predominant. Evidence supporting foreign-banks' quick funds withdrawal from host-markets is also provided by Allen et al. (2011), De Haas and Van Lelyveld (2011) and others. There exist also papers looking at the effect of the global financial crisis on foreign banks' loan-application rejection rates. Popov and Udell (2012) show for instance that a decrease in equity ratio, in Tier 1 capital ratio or severe losses on financial assets have caused a 55% increase in the probability that a firm active in the same locality as the foreign bank, and hence presumably borrowing from it, will have its credit application rejected.⁷

Compared with these works, our paper focuses on the case of foreign lending in a developed country (Italy), and it improves greatly on the methodology employed to control for the effects on lending dynamics of credit demand and borrowers' risk, by including time-varying borrower fixed effects, which capture all observable and unobservable, time-varying and time-invariant demand effects. From this methodological perspective, the work closest to ours is Schnabl (2012), who also exploits multiple lending relations to control for credit demand and risk. Schnabl, however, estimates the impact of the Russian 1998 crisis on credit supply in Peru, and his main objective is to isolate the existence and the extent of the bank balance sheet channel (which happened to be stronger for foreign affiliates, as, while their parent banks were hit by the Russian crisis, domestic Peruvian banks were relatively unaffected by it). Unlike Schnabl and large part of the literature surveyed above, our main objective is to assess if foreign banks differ from their domestic counterparts in responding to a common shock, represented by the deterioration in credit

⁶More precisely, the authors find that a 1% decline in the parent bank's risk-based capital ratio resulted in a statistically significant decline in total loans at US branches of nearly 4% of assets, measured in annual terms.

⁷Unfortunately, the authors do not know with certainty whether a specific bank/firm pair entertains a credit relations, and they use geographical proximity as a proxy for its likelihood.

risk unexpectedly brought about in Italy by the Lehman collapse.

Besides quantifying the extent to which foreign banks have behaved procyclically in the aftermath of the global crisis, the literature has also investigated which bank characteristics are mainly related with the documented credit flows' restrictions. Allen et al. (2011a) focus on the role played by the headquarters' balance sheets on the intensity of the transmission of distress between the headquarters and their offices abroad. The authors find that higher loan loss provisioning and dependence on the interbank market at the parent bank level increase the likelihood of credit tightening at the affiliate level. Ongena et al. (2011) add to these findings by investigating more in depth the relationship between foreign banks' reliance on international wholesale liquidity and their credit supply. The authors find that foreign banks cut back on lending the more the less they are funded with retail deposits. Claessens and Van Horen (2012) find that foreign banks have continued lending in those host markets where they relied most on host-country deposit funding.

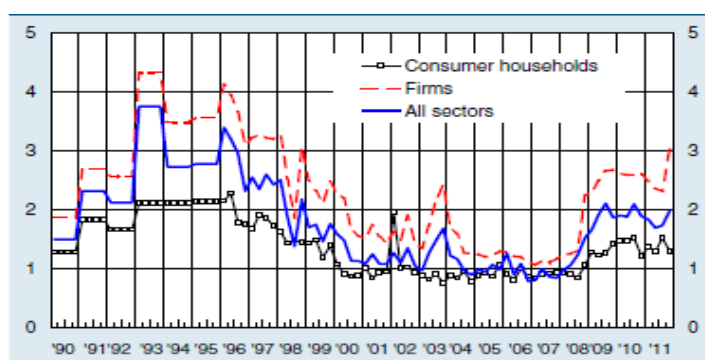
In a similar spirit, a few works focus on how factors related to the functional distance between the headquarters and the host country have affected the dynamics of foreign lending. De Haas and Van Horen (2011) use data on syndicated loans taken from the Dealogic Loan Analytic database and document that during the recent crisis banks were better able to keep lending to countries (i) that are geographically close, (ii) in which they are well integrated in a network of co-lenders, and (iii) in which they have experience with borrowers. Presbitero et al. (2012) confirm this finding by studying the case manufacturing firms in Italy over the period 2008-2009. The authors find evidence that functionally distant banks have displayed a larger restriction in credit to local borrowers than domestic banks. Further, they find that such restriction is not suggestive of with flight-to-quality phenomena, as it is generalized to the whole market. Finally, De Haas et al. (2012) investigate the impact of ownership structure and government support (in particular, the Vienna initiative) in stabilizing bank lending during the crisis. The results show that those intermediaries that took part to the Vienna initiative have been more stable lending sources compared to those that did not.

Rather than studying single determinants of foreign banks' behavior separately, here we appraise their importance in a comprehensive and unified framework. In particular, we corroborate the finding that a bank's interbank exposure and its liquidity ratio, as well as its size (measured by total assets), are statistically correlated with the intensity with which foreign banks have restricted their credit supply. Most importantly, we document that the procyclicality which is not explained by balance sheet data and organizational/business characteristics can instead be shown to result from a bank's functional distance from the Italian market, as measured by its geographical distance as well as by its funding gap (at the affiliate's level). Finally, as far as we are aware, our study is the first that tests empirically some preliminary normative considerations about the efficiency of the behavior of foreign intermediaries.

3 Lehman’s bankruptcy, foreign banks and the Italian credit market

In Italy, the Lehman bankruptcy has marked the beginning of a severe and largely unexpected recession period.⁸ This was accompanied by a sizeable deterioration in lending risk, as can be seen by the dynamics of the ratio of new bad debts to outstanding loans to firms, which almost tripled in the year following the bankruptcy, though remaining lower than the previous peak reached in 1993, mainly reflecting the large differences in the level of interest rates between the two crisis periods (see Figure 1).

Figure 1. Ratio of new bad debts to outstanding loans



Sources: Supervisory statistical reports and Central Credit Register.
(1) Quarterly flow of adjusted bad debts in relation to the stock of loans at the end of the previous quarter; annual data up to the fourth quarter of 1995. Seasonally adjusted where necessary and annualized.

Note: per cent; Financial Stability Review, Bank of Italy, April 2012.

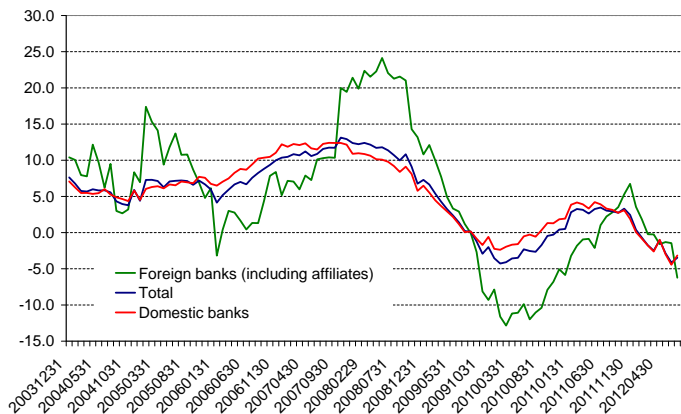
Many other loan quality indicators abruptly decreased over the turn of the year, and did not show significant improvements over the two subsequent years (see Financial Stability Reports, Bank of Italy, n. 1 and 2).

Foreign banks have responded to this deterioration in the credit market with a much stronger contraction of their lending compared to their domestic counterparts (Figure 2). As can be seen, after the Lehman event, foreign intermediaries have displayed a contraction in credit far more severe than that ascribable to domestic banks. On average, the 12-month rate of growth of lending dropped from 11.0% over the period 2007Q4-2008Q4 to -0.5% during 2009Q1-2010Q4. Over the same period, the rate of credit growth displayed by domestic institutions collapsed from 9.7% to 0.4%, while foreign banks contracted credit supply from 19.7% in the pre-Lehman window to a staggering -4.0%. This evidence suggests that also in Italy, on the aggregate, foreign intermediaries have behaved

⁸For a more detailed analysis of the way the global financial crisis reverberated on the Italian economy, see Caivano et al. (2009).

more procyclically than their foreign counterparts in the aftermath of the crisis; aggregate time series such as those displayed by Figure 2, however, do not take into account that firms borrowing from foreign banks may be systematically different from the others (for example, they could be more export oriented). Accordingly, a more thorough econometric analysis is needed to isolate supply from demand effects.

Figure 2. Lending to firms in Italy: by type of lender



Note: monthly data; 12-month percentage change

To explain this different behavior, we advance three hypotheses. The first (and more standard) explanation we advance moves from acknowledging that foreign banks, or their own country's economy, may have received shocks which did not hit domestic banks as intensely. For instance, foreign banks may have had portfolios more exposed than domestic banks to those segments of the market that were hit more intensely by the crisis (e.g. the subprime mortgage market). As already suggested in the literature, the head management may have decided to hoard liquidity from the local affiliates in an effort to mend the balance sheet losses at home, or to handle the local economic downturn. Accordingly, the documented procyclicality in the host market lending-supply, would have reflected a genuine international propagation of shocks.⁹

The second hypothesis relates to a bank's business model. It moves from considering that foreign intermediaries may differ from their domestic counterparts in the way they conduct their business. For instance, if foreign intermediaries have to deal with comparatively higher agency costs, arising from informational asymmetries between the headquarters and the local offices (as in Stein 2002), they may opt for adopting heavily bureaucratized internal procedures, in the hope to keep the interests of the headquarters and of the local officers aligned. Following the Lehman event, such ample reliance on hard information may have resulted in a massive restriction in credit supply, as the de-

⁹This encompasses the bank's balance sheet channel the studies cited above focus on.

terioration of credit risk was fed into standardized decision procedures. Alternatively, it could be the case that foreign banks, as opposed to domestic banks, have a preference for funding smaller, and riskier, startups, or, conversely, more stable firms, and either market segment may have been comparatively more hit by the crisis. To test these conjectures we measure a bank's business model by its size and by pre-Lehman balance-sheet indicators. We conjecture that both proxies may capture important differences between the business orientation of the two types of intermediaries we consider.

Finally, our third explanation moves directly from the consideration that in Italy the Lehman bankruptcy brought about a sizeable deterioration in credit risk. Accordingly, to keep selecting profitable investment opportunities, monitoring borrowers and managing defaulted or deteriorated credit, banks had to face an increase in overall lending costs. Such increase can be expected to have been directly proportional to the bank's "functional" distance, a term that we use to capture both geographical and cultural distances, from the local Italian market. Thus, the third hypothesis we advance to explain the differential between foreign and domestic behavior is the functional distance hypothesis, which assumes that the more a bank is (functionally) distant from Italy the higher would have been the increase in its lending costs, and hence the more convenient to suspend lending rather than paying for it.

4 Empirical strategy

To estimate whether, and in case to what extent, foreign banks have reacted differently from domestic intermediaries to the exogenous and largely unexpected shock represented by the Lehman collapse, we compare lending decisions of the two types of banks before and after the crisis. This difference-in-difference (DD) approach results in

$$\Delta L_{bft} = a_{0t} + a_1 \text{foreign}_b + a_2 \text{lehman}_t + a_3 \text{FOLE} + b_{ft} + u_{bft} \quad (1)$$

where ΔL_{bft} is a measure of credit growth from bank b to firm f between periods $t-1$ and t ; foreign is a dummy indicating whether bank b is an affiliate of a foreign bank (either a subsidiary or a branch, unless otherwise specified); lehman is a dummy that takes value 1 if the period t is after the collapse of Lehman Brothers, FOLE is the interaction term FOreign*LEhman , namely it is a dummy that takes value 1 when the observation refers to a firm that is foreign and to a period that is after the collapse of Lehman; b_{ft} represents the firm-quarter fixed-effect; and finally u_{bft} is an idiosyncratic error term.

The fixed effects, which we can introduce thanks to the presence of multiple lending relationships, allow us to control for all firms' time-invariant and time-varying characteristics, irrespective of their being observable or unobservable. As emphasized by Gan (2007) and by Khwaja and Mian (2008), the presence of such fixed effects is crucial to control for credit demand and risk. By failing to include them, in fact, the estimated foreign

banks' procyclicality, as captured by the coefficient a_3 , could simply reflect a different credit demand pattern between the firms borrowing from foreign versus domestic lenders.

For what concerns the interpretation of the coefficients, a_1 captures the factors that explain the difference in lending behavior between foreign and domestic banks before the crisis takes place, while a_2 accounts for the time trend of credit supply that is common to both foreign and domestic banks. The coefficient on *FOLE* captures the foreign lenders' procyclicality, that is, how foreign banks differed from their domestic counterparts following the Lehman shock.¹⁰

We use the specification in (1) to address the question of whether foreign banks have displayed a behavior different from their domestic counterparts. A positive value of the coefficient for *FOLE* would mean that foreign banks have restricted credit supply less (or increased by more) than domestic banks (an indicator of counter-cyclicality), while a negative value indicates that they have restricted supply by more, and thus behaved procyclically.

Next, we move on to investigating whether the three hypotheses we have discussed above can explain, and if so to what extent, such differential behavior. To do so, we consider in turn each hypothesis, and proceed in two steps. First, we add to specification (1) the vector of covariates Z_{bt} which captures all the variables relevant to test the hypothesis we are considering (we discuss at length below what are our choices). In practice, for each of our three hypotheses, we estimate the following regression equation

$$\Delta L_{bft} = a_{0t} + a_1 \text{foreign}_b + a_2 \text{lehman}_t + a_3 \text{FOLE} + b_{ft} + a_4 Z_{bt} + u_{bft} \quad (2)$$

If the hypothesis under study has some explanatory power on the credit supply schedule, the coefficient a_4 should be found to be significant. Further, if the inclusion of covariate to the specification affects the magnitude of the coefficient a_3 , it would suggest that it has indeed some explanatory power over the procyclical behavior otherwise generically captured by *FOLE*.

Second, in order to corroborate the results that we find with this method, and to better understand the joint dynamics of the covariates Z_{bt} with the regressor *FOLE*, we examine further interaction terms. In particular, we proceed by following the structure of a DDD (difference-in-difference-in-difference) approach and interact Z_{bt} with the dummies *foreign_b*, *lehman_t* and *FOLE*. More precisely, we run the following

$$\begin{aligned} \Delta L_{bft} = & a_{0t} + a_1 \text{foreign}_b + a_2 \text{lehman}_t + a_3 \text{FOLE} \\ & + a_4 Z_{bt} + a_5 Z_{bt} * \text{foreign}_b + a_6 Z_{bt} * \text{lehman}_t + a_7 Z_{bt} * \text{FOLE} + u_{bft} \end{aligned} \quad (3)$$

If the coefficients a_3 or a_7 turn out to be significant we can reject the hypothesis that

¹⁰With regard to the identification of b_1 and d_1 , in our dataset more than 60 per cent of borrowers in our sample borrow both from foreign and domestic banks in each quarter (these observations are those used to identify the coefficients).

Z_{bt} can explain the procyclicality displayed by foreign banks. Depending on the sign and significance of a_7 , however, we will be able to infer whether the effect of *FOLE* is heterogenous along the range of the covariates considered by the hypothesis under study.

5 Definition of variables and description of data

We have constructed an original dataset that comprises data on loans originated by foreign-owned and domestic banks to Italian firms over the period 2007Q4-2010Q4, and matched to it balance sheet statements for both banks and borrowers.¹¹ The sample covers over a thousand intermediaries (1112), of which roughly ten per cent (88) are affiliates of foreign banks, namely either subsidiaries or branches, and over two hundred-fifty thousand borrowers (263800), for a total of several millions of quarterly observations. For computational reasons, however, we carried out all the regression on a random sample consisting of 10 per cent of the total data.

To measure credit supply we refer to the information that banks operating in Italy are mandated to transmit monthly to the Bank of Italy's credit register (*Centrale dei Rischi*, CR hereafter). These information summarize a bank's current credit relations, and, prominently, they display the amount granted to (*accordato*) and used by (*utilizzato*) each of their borrowers at a monthly frequency. These data pretty much cover the universe of loans granted to those firms that have borrowed from foreign affiliates banks at least once in the period considered.¹² Table 1 presents some relevant summary statistics regarding the volumes of credit granted and utilized over the sample period by domestic and foreign banks respectively. While the mean volumes for the two groups are comparable, the medians suggest that foreign banks have handled comparatively smaller volumes of credit than their domestic counterparts. The table also displays the percentages of credit granted by either type of intermediary in the form of short-term credit, collateralized credit and credit in foreign currency. Over the period under study, foreign banks have granted on average less short-term, more collateralized and more foreign-currency credit. The medians, however, differ only for what concerns the credit horizon, as local banks granted twice as much short-term credit than foreign intermediaries. The last row of table 1 shows the percentage of deteriorated credit by type of intermediary: over the sample period, foreign banks appear to have handled on average more deteriorated credit than their Italian counterparts, although the median across the two groups of intermediaries is

¹¹In particular, we started out with the set of borrowers that borrowed at least once over that period from a foreign bank. Then, for this set of borrowers, we downloaded data regarding all credit relation that they entertained over the period considered.

¹²Data exclude only credit amounting to less than 30.000 euro.

the same.

Table 1. Summary statistics - credit supply

Variable	Domestic			Foreign		
	Obs.	Mean	Median	Obs.	Mean	Median
credit granted	905067	1361204	200500	264914	1299677	81759
credit utilized	905067	924373	140669	264914	850065	66882
short-term	751162	66%	100	190937	51%	50.6
collateralized	751162	13%	0	190937	28%	0
in foreign currency	751162	.52%	0	190937	2.3%	0
past due	751162	20%	0	190937	31%	0

Note: quarterly data, mil EUR, otherwise percentage of the total credit granted

We use two measures of credit growth, aggregated at a quarterly frequency. We look at the delta of the log exposure of a bank toward a borrower between quarter t and $t + 1$,

$$\Delta \ln(L) = \begin{cases} \ln(\text{cred.granted}_t) - \ln(\text{cred.granted}_{t-1}) & \text{if } t > 0 \\ \text{[n.a.]} & \text{if } t = 0 \end{cases}$$

This specification correctly captures the growth dynamics of a credit relation, but it does not allow to calculate the variation corresponding to the first period of existence of the loan. Arguably, however, the difference from having no loans and having one, of whatever size, contributes in a non negligible way to credit dynamics (see also Albertazzi and Marchetti 2010). We account for this concern by considering the delta in the levels of credit granted,

$$\Delta L_{fillin} = \begin{cases} \text{cred.granted}_t & \text{if } t = 0 \\ \text{cred.granted}_t - \text{cred.granted}_{t-1} & \text{if } t > 0 \\ -\text{cred.granted}_T & \text{if } t = T + 1 \end{cases}$$

Note that for this variable we "fill in" the variation induced by the reimbursement of the credit line, which is an event not recorded in CR.

To investigate the determinants of banks' behavior, we collect several balance-sheet data. For Italian banks, the information comes from the Bank of Italy own database, while balance sheet information for foreign intermediaries have been downloaded from Bankscope. All data are at the consolidated level.¹³ In table 2, we present a few summary statistics for the largest five domestic intermediaries and foreign banks.

¹³Later in the paper, we will test for the explanatory power of the funding gap. In that case, we will impute to foreign intermediaries the "local", unconsolidated funding gap. Furthermore, as foreign affiliates appear to be behaving as domestic banks, we download for these institutions also their unconsolidated (from the foreign headquarters) balance sheet.

Table 2. Summary statistics - Bank characteristics

Variable	Domestic - Largest 5			Foreign		
	Obs.	Mean	Median	Obs.	Mean	Median
total assets (mln)	110	184048	145837	947	776105	680675
interbank ratio	110	94	78	781	245	1.4
liquidity ratio	110	46	30	929	38.1	34.9
funding gap	110	821	147	906	908.	132

Note: quarterly data. Each observation is at bank/quarter level (i.e. for the biggest 5 domestic banks, we have 110 observations, corresponding to 22 quarterly observations for each bank).

Due to different prudential regulatory regimes, comparisons based on the statistics displayed in table 2 have to be taken with a pinch of salt. However, foreign banks appear to be larger banks that borrow far more on the interbank market than their domestic counterparts, although, as the median suggests, the distribution of this ratio is particularly skewed for the group of foreign banks. In terms of liquidity and funding gap, instead, the differences at the consolidated level are less striking.

Finally, we collect borrowers' balance sheet information using the Italian database Cerved. Since not all of the borrowers in our sample are also present in Cerved, where only a random draw of borrowers is analyzed, we may have to address potential sample bias issues.

Table 3. Summary statistics - Borrower characteristics

Variable	Obs.	Cerved		Obs.	sample	
		Mean	Median		Mean	Median
assets	698922	32.7	3.3	169449	36.2	7
self-financing	560600	1.6	.11	158285	2.2	.216
return on equities	552785	-.22	.057	160706	-.01	.005
rating	735663	5.12	5	165755	5	5.30

Table 3, however, dismisses these concerns, as mean statistics for that part of our sample that is also in Cerved and the Cerved universe are comparable.¹⁴

¹⁴We carry this comparison out only for a subsample of our dataset (year 2006), as the data load of managing more than twelve months of Cerved observations is rather high.

6 Results

6.1 The procyclicality of foreign intermediaries

We start off with presenting in table 4 the results of estimating the baseline regression (1). The three columns allow us to compare the results obtained with and without the borrower/quarter fixed effects that permit to control for the unobservable demand effects.¹⁵ As expected, the results based on OLS estimation, column (1), and those obtained with the fixed-effects specification, column (2), differ substantially, with the former underestimating the true effect. Note also that the fixed effects estimates are robust to alternative and more severe choices of clustering, column (3). We interpret the sign and significance of the *FOLE* coefficient as indicating that foreign banks have behaved procyclically, as they restricted credit growth more than domestic counterparts in the post Lehman period. More precisely, according to our estimates, during the period considered foreign banks have on average restricted their credit supply by eight percentage points (on a quarterly basis) more than what domestic banks did.

Table 4. The procyclicality of foreign lending

	(1)	(2)	(3)
Dep. variable	$\Delta \ln L$	$\Delta \ln L$	$\Delta \ln L$
foreign	.001	.005**	.005***
	(.001)	(.002)	(.001)
FOLE	-.000	-.008***	-.008***
	(.001)	(.002)	(.001)
Lehman	-.014***	omitted	omitted
	(.000)		
constant	-.003***	-.012***	-.012***
	(.000)	(.000)	(.000)
Fixed effects	no	firm/quarter	firm/quarter
Obs.	1071645	1071645	1071645
R squared	0.0004	0.0001	0.0001

Errors clustered by firm/quarter (2), by firm (3). Std. errors in parentheses.
 *p<0.1 **p<0.05 ***p<0.01

We conduct a number of exercises to test the robustness of the coefficient on *FOLE*, and find that our baseline results remain highly significant and negative (Appendix, tables A1-A4). First, we compare the results obtained for $\Delta \ln L$ by considering in turn the change in levels of credit, ΔL , and the ΔL_{fillin} variable that accounts also for the variation

¹⁵Note how here and elsewhere where the fixed effects are taken at the firm/quarter level, the dummy Lehman is omitted because of collinearity.

induced by the reimbursement of a credit line. Further, we add to the estimation of (1) a whole battery of bank-specific dummies to control for bank-fixed effects, along with the firm-quarter ones that we already accounted for.

The coefficient on *FOLE* remains highly significant and negative. In a similar spirit, we also run regression (1) on the basis of credit utilized instead of credit granted. Moreover, since it may be argued that identifying the "post Lehman" period with the two years after the actual bankruptcy may be too crude to isolate the effect of the global financial crisis as it allows for other sources of financial distress, we refine the Lehman dummy into four separate windows of three quarters each.¹⁶ Again, the results confirm that foreign credit supply significantly halted with comparison to domestic supply after the Lehman event and it did evenly so over the following two years.

Finally, we consider different clustering of the error term. The errors u_{bft} in estimating (1) are not likely to be independently and identically distributed, but rather correlated across observations in unknown ways. To be conservative, we cluster errors at firm/quarter level: namely, we allow correlation across errors for *different* observations for the *same* firm/quarter. However, such clustering does not allow errors to be correlated either (i) between the observations for the same firm at two different quarters, or (ii) for the same firm/bank relation at different quarters. As a wrong clustering may distort the standard errors and impair inference, we test the robustness of the *FOLE* coefficient to alternative clustering specification. Precisely, we cluster errors both at the firm level and at the firm/quarter *and* bank level.¹⁷ The results (table 4, column 3 and Appendix, table A4) confirm that clustering does not affect our main result.¹⁸

6.1.1 Transmitters and receivers

Next, we investigate whether branches and subsidiaries of foreign banks have displayed the same lending pattern or not. The two organizational forms, in fact, are rather different from one another, as subsidiaries are proper local banks that belong to a foreign group, but compile and submit a complete balance sheet to the host country regulators, while branches are local offices of foreign banks that are subject to less stringent controls in the host country. Further, subsidiaries are more similar to domestic banks in terms of retail funding and presence on the territory (see Barba Navaretti et al. 2010).

¹⁶Most prominently, one of such confounding event could be the sovereign debt crisis, which exploded in May 2011.

¹⁷This procedure is known as "double clustering" (Gelbach et al., 2008), and it allows to cluster both by firm/quarter and bank, as each firm/quarter appears several times for different banks, so clustering only by bank would be impossible, as firms are not nested within banks (as they entertain more than one relation simultaneously with several banks).

¹⁸In particular, note how, by applying double clustering (table A4 - column 3), we get results comparable to the fixed effects estimation (table 5 - column 3), with the only difference that *FOLE* loses a star in terms of significance.

Table 5 confirms our hypothesis that branches and subsidiaries of foreign banks have behaved differently, as by interacting *FOLE* with a dummy that takes value 1 if the foreign intermediary is a branch (dummy *branch*), the resulting estimates show that the restriction in credit captured by *FOLE* is largely ascribable to foreign branches (columns 1 and 2). To corroborate this finding, in columns (3) and (4) we present the estimates of (1) that we obtain by coding foreign subsidiaries as domestic banks.

Table 5. Foreign lending by affiliate's type

	(1)	(2)	(3)	(4)
Dep. variable	$\Delta \ln L$	ΔL_{fillin}	$\Delta \ln L$	ΔL_{fillin}
foreign	.006*** (.002)	.003*** (.001)	.001 (.004)	.009*** (.001)
branch	-.005 (.005)	.006*** (.002)		
FOLE	-.004 (.002)	-.000 (.001)	-.015*** (.005)	-.014*** (.001)
branch*FOLE	-.011** (.005)	-.014*** (.002)		
constant	-.012*** (.000)	.000*** (.000)	-.012*** (.000)	-.000*** (.000)
Fixed effects	firm/quarter	firm/quarter	firm/quarter	firm/quarter
Obs.	1071645	1211183	1071645	1211183
R squared	0.0001	0.0000	0.0001	0.0002

Errors clustered by firm/quarter. Std errors in parentheses. *p<0.1 **p<0.05
***p<0.01

As can be seen, the *FOLE* effects for the group of sole foreign branches becomes even stronger. For this reason, in the rest of the paper, unless otherwise specified, subsidiaries of foreign banks will be coded as domestic banks, and findings regarding foreign intermediaries should be interpreted as referring to foreign branches only.

Before proceeding with investigating the determinants of the *FOLE* interaction, we study whether the slow-down in credit supply was generalized to all types of credit, or rather targeted to some special categories. Similarly, we also investigate whether banks displayed the same behavior towards all types of borrowers, or perhaps only to the riskier. We do so by computing a new rate of growth for the subcategories of credit granted that we want to study, namely short-term and collateralized credit. To get a sense of the results we do the same for the symmetric classes of long-term and non-collateralized credit.

Table 6. Foreign lending by loan characteristics

	(1)	(2)	(3)	(4)
Dep. variable	$\Delta \ln L_{sh-t}$	$\Delta \ln L_{long-t}$	$\Delta \ln L_{collat.}$	$\Delta \ln L_{n-coll.}$
foreign	-.056* (.031)	-.292 (.193)	-.063 (.206)	-.141*** (.048)
FOLE	-.188*** (.039)	1.22*** (.217)	-.436* (.241)	-.454*** (.059)
constant	.006*** (.000)	-.298*** (.005)	.012* (.006)	.030*** (.001)
Fixed effects	firm/quarter	firm/quarter	firm/quarter	firm/quarter
Obs.	431530	471542	29572	749612
R squared	0.0005	0.0005	0.0030	0.0010

Errors clustered by firm/quarter. Subsidiaries coded as domestic. Std. errors in parentheses. *p<0.1 **p<0.05 ***p<0.01

The estimates in table 6 suggest that the effect of Lehman is concentrated on the short-term credit, while we find no evidence of targeting with respect to the other categories.

Table 7. Foreign lending by borrower's type

	(1)	(2)	(3)
Dep. variable	$\Delta \ln L$	$\Delta \ln L$	$\Delta \ln L$
foreign	.002 (.007)	-.000 (.008)	-.002 (.004)
FOLE	-.019** (.008)	-.019** (.009)	-.015*** (.004)
borrower char.*foreign	-.000 (.003)	-.021 (.023)	.000 (.000)
borrower char.*FOLE	-.000 (.003)	.018 (.023)	.000 (.000)
constant	-.015*** (.000)	-.014*** (.001)	-.012*** (.000)
Fixed effects	firm/quarter	firm/quarter	firm/quarter
Obs.	560911	525725	1071645
R squared	0.0001	0.0001	0.0002

Errors clustered by firm/quarter. Std. errors in parentheses. Subs. coded as domestic. *p<0.1 **p<0.05 ***p<0.01

In table 7, we study how different types of borrowers were impacted by the Lehman

event. In particular, we want to test whether foreign intermediaries have restricted credit supply more for riskier borrowers, that we identify by looking at assets (column 1; the smallest the total assets, the higher the riskiness), at the return on equities (column 2; ROE, also negatively related to a borrower’s riskiness), and at a variable that measures for each quarter the percentage of the total credit exposition that is deteriorated (column 3).

As can be seen, the DDD analysis does not support a flight to quality hypothesis for any of the three measures of borrower’s quality that we consider. Our results are in line with what documented by Presbitero et al. (2012).

6.2 The extensive margin

The dependent variable we used so far, $\Delta \ln L$, captures both the intensive and the extensive margin of credit, namely the dynamics of the volumes of (existing) credit lines and the opening/closing of (new) lines of credit. Here, we focus solely on the extensive margin of credit, by estimating a linear probability model, with the usual firm/quarter fixed effects, for the variable ext_{itc} which we construct as the ratio between the two following quantities. At the numerator, there is a dummy taking value 1 if and only if firm i has received a new loan in quarter t by a bank of category c , where c is one of these three categories (i) domestic banks, (ii) foreign subsidiaries and (iii) foreign branches. The denominator of ext_{itc} is instead given by the number of banks in category c in quarter t . Accordingly, the variable ext_{itc} can be interpreted as the propensity of banks of category c to extend new loans in quarter t .

Importantly, we compute this variable for *any possible* triple $\langle i, t, c \rangle$, that is, for any bank category, any firm in the sample and any quarter in the sample period covered (2007Q4-2010Q4). This is meant to take into account also all new loans that could in principle have been extended and which have not. In principle, one could have done so by defining the dependent variable $ext_{i,t,c}$ not for bank categories but simply for each bank in the sample. However, such approach would have complicated the estimation, by leading to an uncontrolled expansion of the dataset, and delivering a dependent variable with a very small mean.¹⁹

Dependent variable aside, the regression model is very much similar to that adopted for the baseline regressions. The results, reported in table 8, show that the procyclicality of branches of foreign lenders is detected even when focussing on the extensive margin of lending supply. The coefficient for the interaction *branch*lehman* is negative and significant (column 1). Differently from what we have seen in the baseline model, we also detect some procyclical pattern for local subsidiaries of foreign lenders, as shown by the negative and significant coefficient for *subsidiary*lehman* (column 2).

¹⁹Moreover, by doing so one would also have considered as possible matches which are actually not (for example, it would not be plausible to suppose that a small firm in northern Italy may apply for a loan with a small bank operating in the southern part of the country).

Table 8. Estimating FOLE on the extensive margin

	(1)	(2)
Dep. variable	<i>ext_{itc}</i>	<i>ext_{itc}</i>
branch	−.078	−.079*** (.000)
subsidiary		−.077*** (.000)
branch*lehman	−.019*** (.000)	−.099*** (.000)
subsidiary*lehman		−.095*** (.000)
constant	.114*** (.000)	.114*** (.000)
Fixed effects	firm/quarter	firm/quarter
Obs.	1434498	1434498
R squared	0.0345	0.0345

Errors clustered by firm/quarter. Std. errors in parentheses.
*p<0.1 **p<0.05 ***p<0.01

Even in these regressions, however, branches of foreign lenders display a more exacerbated contraction in the post Lehman period, compared to local subsidiaries (the difference is small but statistically significant).

6.3 The determinants of the foreign lenders' procyclicality

6.3.1 The *international shock propagation hypothesis*

In this section we analyze the international shock propagation hypothesis, and study whether the behavior of foreign banks after the crisis has reflected (i) shocks to the headquarters' balance sheet or (ii) economy-wide shocks that may have hit the country wherein the intermediary is headquartered. Both hypotheses conjecture that foreign banks weakened by the crisis or resident in countries which economy has been more severely disrupted by the crisis may have redirected the credit flows back home and away from Italy. As explained in section 4, we proceed in two steps. First, we take a covariate approach and run the DD specification, which we used so far to estimate foreign banks' procyclicality, adding to it a proxy that measures the intensity of shocks to a bank's own balance sheet/country of residence (as shown in equation (2)). Secondly, we discuss the DDD estimates, which take into explicit consideration the interaction of a bank's exposure to shocks with the dummies *FOLE*, *lehman* and *foreign* (as described in equation (3)).

We start off by analyzing the impact that shocks to an individual foreign bank's balance sheet had on its lending policies abroad. Precisely, we investigate the effect of shocks to (i) three indicators of bank's liquidity (interbank ratio, liquidity ratio, funding gap); (ii) a profitability indicator (ROA) and (iii) three risk attitudes indicators (risk weighted assets to total assets, the ratio of impaired loans to total loans, and the total capital ratio). We present the results in table 9.

Table 9. The international shock propagation hypothesis: balance sheet channel

Dep. variable	(1) $\Delta \ln L$	(2) $\Delta \ln L$	(3) $\Delta \ln L$	(4) $\Delta \ln L$
foreign	.006 (.003)	.007* (.004)	.006 (.010)	.007 (.026)
FOLE	-.017*** (.004)	-.016*** (.004)	-.017** (.008)	-.016* (.009)
assets	-.0000	-.0000	-.0000	-.0000
liquidity ratio	-.0001***	-.00009***	-.0001	-.0000
funding gap	-.0000**	-.000**	-.0000	-.0000
interbank ratio	-.0000	-.0000	-.0000	-.0000
rwa to total assets	-.0012***	-.0010***	-.0012*	-.0010*
impaired loans	-.0000	.0000	-.0000	.0000
total capital ratio	.0005***	.0004***	.000	.0004
ROA	.008***	.008***	.008***	.009***
constant	-.005 (.003)	-.006** (.003)	-.005 (.013)	-.006 (.014)
Fixed effects	firm/quarter	firm/quarter	firm/quarter	firm/quarter
Obs.	791897	877904	791897	877904
R squared	0.0007	0.0007	0.3427	0.3377

Errors clustered by firm/quarter in (1) & (2); by bank otherwise. Subs. coded as domestic. Std. errors in parentheses. *p<0.1 **p<0.05 ***p<0.01

Note that as we code foreign subsidiaries as domestic, it is unclear whether it is correct to attribute them the consolidated balance sheet at the level of the foreign group, given the relatively large degree of decisional autonomy that these banks have from the headquarters. To account for this concern, in (2) and (4) we display the results obtained by imputing to foreign subsidiaries their national, unconsolidated balance sheet instead. Results remain robust to this test.

Adding covariates that account for potential shocks to a bank's balance sheet, then, does not alter the sign or the significance of the coefficient on *FOLE*. The estimates show however that balance sheet indicators do have an impact on the lending dynamics,

although this does not explain the procyclicality displayed by foreign banks during the Lehman aftermath.

We have further tested these results, by focusing only on four main indicators, and by performing a DDD analysis, as reported in the Appendix, table A5.²⁰ The estimates confirm that the *FOLE* effect cannot be fully explained by the addition of balance-sheet covariates, but they show that the effect has been less strong for banks with a higher liquidity ratio and a lower funding gap.

Wrapping up the estimates of tables 9 and A5, foreign procyclicality does not appear to be explainable by the deterioration in the banks' balance-sheet that followed the collapse of Lehman. These indicators, however, correlate with the intensity with which the procyclicality is transmitted by banks differently affected by the crisis.

Table 10. The international shock propagation hypothesis: economic outlook

	(1)	(2)	(3)	(4)
Dep. variable	$\Delta \ln L$	$\Delta \ln L$	$\Delta \ln L$	$\Delta \ln L$
foreign	.004 (.004)	.004 (.004)	.003 (.004)	.003 (.003)
FOLE	-.014*** (.005)	-.015*** (.004)	-.012*** (.005)	-.015*** (.003)
rsi	-.032*** (.005)	-.027** (.012)	-.018 (.014)	-.026 (.034)
rsi*FOLE			-.018 (.015)	-.000 (.036)
constant	-.012*** (.000)	-.012*** (.000)	-.012*** (.001)	-.012*** (.000)
Fixed effects	firm/quarter	firm/quarter	firm/quarter	firm/quarter
Obs.	1071556	1071556	1071556	1071556
R squared	0.0001	0.0002	0.0001	0.0002

Errors clustered by firm/quarter. rsi computed on the basis of stock index prices in (1) and (3); GDP levels in (2) and (4). Std. errors in parentheses. Subs. coded as domestic.
*p<0.1 **p<0.05 ***p<0.01.

We move on with testing the conjecture that foreign banks' procyclicality results from the response of these intermediaries to the deterioration in the economic outlook of the country where they are headquartered. To do so, we construct two indicators of the relative severity with which a foreign country has been hit by the crisis (*rsi*, or relative severity index). The first is the dummy, *rsi_{BP}*, that takes value 1 if a foreign bank is

²⁰The four indicators have been selected as they capture main aspects of the balance sheet, and are the (i) capital requirements ratio; (ii) liquidity ratio; (iii) ratio of impaired loans and finally (iv) funding gap.

from a country more hit by the crisis (than Italy) on the basis of a comparison between the developments of banks' stock price indices; the second is the dummy rsi_{GDP} that similarly takes value 1 if a foreign bank is from a country more severely hit by the crisis on the basis of a comparison between the developments of GDP.²¹

The results of both the DD and the DDD analysis (table 10, columns 1 and 3 refer to rsi_{BP} , while the remaining two are for rsi_{GDP}) show that the *FOLE* coefficient remains significant; the interaction $rsi*FOLE$ takes up a negative sign which is however not significant.

Overall, the results in this section indicate that we can reject the procyclicality captured by *FOLE* in the baseline estimation cannot be explained by the international shock propagation hypothesis.

6.3.2 The *business model* hypothesis

Here we investigate the business model hypothesis. Table 11 displays the results of this exercise when we proxy a bank's reliance on a hard-information-based business model with its size. The addition of the size proxy leaves the baseline results on *FOLE* unchanged (column 1), and we cannot detect any significance of a bank's total assets on its lending decisions. Also in the DDD analysis, column (3), the interaction of total assets with *FOLE* and *lehman* leaves the *FOLE* coefficient highly significant and negative across the entire distribution of assets, suggesting that foreign procyclicality does not reflect organizational aspects of large banks' lending strategy. Note however that we have to drop (column 3) the interaction term between total assets and the *foreign* dummy, as the two are highly collinear, as shown by the results in column (2).

The DDD analysis, however, delivers some more information on how a bank's size has mediated the effect of *FOLE*. The positive sign of triple interaction $FOLE*assets$ (column 3) informs us that the impact of *FOLE* is less strong for larger banks. This lends support to the hypothesis that larger banks can deal with risk better than smaller banks, and thus need not to restrict credit supply as much. According to these results, to the extent that a bank's reliance on standardized procedures is captured by its size, we have to reject the conjecture that larger banks have displayed a higher restriction in

²¹More precisely, to calculate rsi_{BP} we used Datastream information to compute the delta in banks' stock prices index between 2008Q4 and 2010Q4. Next, we assigned value one to those countries that experienced a larger decrease than Italy (Spain, the Netherlands, Iceland, the US, the UK and Japan). The dummy rsi_{GDP} , instead, assigns value 1 to those countries more hit by the crisis in terms of their GDP performance. This is done by also taking into account structural differences in the rate of growth of the countries involved. In particular, countries are first divided in two groups, UE-area and Others. Secondly, a country is assigned $rsi_{GDP} = 1$ if its real GDP growth over the period 2009/2010 is lower than its group's median.

credit flows because of their reliance on automatized lending decisions.

Table 11. The business model hypothesis

Dep. variable	(1) $\Delta \ln L$	(2) $\Delta \ln L$	(3) $\Delta \ln L$
foreign	-.002 (.005)	-.012 (.044)	-.001 (.005)
FOLE	-.013*** (.005)	-.050 (.047)	-.061*** (.023)
assets	.000 (.000)	-.000 (.000)	-.000 (.000)
assets*foreign		.000 (.003)	
assets*lehman		.000 (.000)	.000 (.000)
assets*FOLE		.002 (.003)	.003** (.001)
constant	-.009*** (.006)	-.008 (.007)	-.008 (.007)
Fixed effects	firm/quarter	firm/quarter	firm/quarter
Obs.	938151	938151	938151
R squared	0.3208	0.3208	0.3208

Errors clustered by bank. Std. errors in parentheses. Subs. coded as domestic.
*p<0.1 **p<0.05 ***p<0.01

To test further the business model hypothesis, we consider some other proxies that may capture different business choices among different intermediaries. So far we have looked at a bank's size, which we argue captures the extent to which an intermediary relies on standardized rather than arm's length lending procedures. Now, we measure a bank's organizational form by looking at a few of its pre-Lehman (2007Q4-2008Q3) mean balance-sheet values, which may reflect the structural and business choice of the bank's management.²² These means, in fact, capture to some extent a bank's business direction: consider for instance that a bank more oriented to funding smaller start-ups may have a higher ratio of impaired loans to total loans, displaying the lower risk aversion of the intermediary in question. The reason why we compute the pre-Lehman mean values is to isolate the "business" aspects of a bank's balance sheet from its "health" dimension, which has been studied in the previous section as a measure of how much the intermediary

²²These are a capital requirement ratio (total regulatory capital), a liquidity ratio (securities/securities and gross loans), the ratio of impaired loans to all loans, and the funding gap (gross loans/total customer deposits).

was impaired by the crisis.

The results, which are for convenience displayed in the Appendix (table A6) are aligned with what previously found. The addition of the balance sheet pre-Lehman mean values as a covariate to the baseline regression does not tilt the sign and significance of the *FOLE* coefficient. Accordingly, we can confirm that an intermediary's organizational form, as measured by its balance-sheet indicators, does not explain the stronger procyclicality displayed by foreign banks, although it affects the degree to which it is transmitted.

Based on Tables 11 and A6 we conclude that foreign banks did not behave differently from domestic banks following the Lehman bankruptcy for reason connected with their business management.

6.3.3 The *functional distance hypothesis*

Here we investigate whether the procyclicality displayed by foreign banks can be attributed to a functional distance motive (as also documented by De Haas and Van Horen 2011). By functional distance, we mean the overall costs that banks "distant" from the Italian credit market face when managing credit risk locally. Such notion is wide enough to encompass differences between close and distant banks in terms of knowledge of the quality of local borrowers, regulatory differences in home and host markets, differences in the functioning of the judicial system that disciplines insolvency cases, and possibly cultural factors as well.

To capture these aspects, we study three types of covariates. First, we split the *foreign* dummy into three dummies that single out foreign banks according to their belonging to a certain economic area ($FOLE_{EUROarea}$, $FOLE_{EuropeanUnion}$ and $FOLE_{Other}$). The hypothesis is that foreign banks headquartered in the same economic area as Italy face lower credit risk management costs than foreign banks that are not. Secondly, we look at "cultural distance" covariates that are meant to account for those social and cultural factors that may represent an impediment in credit risk management. Straightforwardly, the ampler the cultural gap between the country of residence of the foreign country and Italy, the higher the costs of managing credit in the Italian market. Finally, we look at a foreign banks' "local" funding gap, namely the ratio of loans to deposits computed at the affiliates' balance sheet level. We argue that a lower local funding gap ratio indicates a higher involvement of the foreign bank with the local customers, and, accordingly, a better capacity to manage risk on the territory.

Table 12 presents the results obtained by testing the effect of foreign banks' belonging to closer economic areas on the procyclicality that they transmitted.

Table 12. The functional distance hypothesis: economic area

	(1)	(2)
Dep. variable	$\Delta \ln L$	$\Delta \ln L$
foreign _{EUROarea}	-.036** (.016)	-.006*** (.002)
foreign _{EuropeanUnion}	-.038 (.027)	-.007 (.023)
foreign _{Other}	-.034** (.016)	.001 (.004)
FOLE _{EUROarea}	.027 (.019)	.004* (.002)
FOLE _{EuropeanUnion}	-.021 (.030)	-.044 (.024)
FOLE _{Other}	-.001 (.001)	-.012** (.005)
constant	.005 (.012)	-.009*** (.001)
Fixed effects	firm/quarter	firm/quarter
Obs.	1071645	1071645
R squared	0.0003	0.0000

Errors clustered by firm/quarter. Std. errors in parentheses. Subs. coded as domestic in (2). *p<0.1 **p<0.05 ***p<0.01

Each interacted dummy, FOLE_{EUROarea}, FOLE_{EuropeanUnion} and FOLE_{Other}, captures the extent to which foreign banks headquartered in each area have transmitted the procyclicality in the post Lehman. The results show that foreign banks resident in a country affiliated to the Euro Area, which is the "functionally closest" according to our scale, did increase, or reduce less, credit supply in the post Lehman period. Further, according to these estimates, the procyclicality is induced by intermediaries resident in the farthest of the affiliation that we consider. Coding the subsidiaries as domestic reinforces the results, column (2) we code them as domestic.

We also consider two indicators of "cultural distance", which are meant to account for those social and cultural factors that may represent an impediment in credit risk management. Taking advantage of the Doing Business database we first add to the baseline regression (1) a measure of the difference in the investors' protection index and days taken to resolve insolvencies between the country of residence of the foreign intermediary and Italy. As reported in table A7 in the Appendix, both indicators show that the larger such difference the more negative the impact on local credit supply. When we add further interaction terms, it turns out that in the post Lehman, credit was restricted the more

the higher the difference in the time taken in resolving insolvencies between the foreign headquarters' country and Italy. Although our cultural distance variables are not sufficient to explain the procyclicality displayed by foreign banks, they are nonetheless found to be important dimensions alongside foreign banks take their lending decisions.

Table 13. The functional distance hypothesis: local funding gap

Dep. variable	(1) $\Delta \ln L$	(2) $\Delta \ln L$	(3) $\Delta \ln L$	(4) $\Delta \ln L$
foreign	.005 (.004)	-.004 (.005)	.005 (.005)	-.004 (.004)
FOLE	-.012** (.006)	-.005 (.004)	-.012** (.005)	-.005 (.005)
"local" funding gap	-.008*** (.001)	-.008*** (.001)	-.008*** (.000)	-.008*** (.000)
funding gap*foreign		.006 (.005)		.006* (.003)
funding gap*lehman		.000 (.001)		.000 (.000)
funding gap*FOLE		-.004 (.004)		-.004 (.004)
constant	-.002 (.002)	-.002 (.002)	-.002*** (.000)	-.002*** (.000)
Fixed effects	firm/quarter	firm/quarter	firm/quarter	firm/quarter
Obs.	935275	935275	935275	935275
R squared	0.3238	0.3238	0.0014	0.0014

Errors clustered by bank in (3) and (4); by firm/quarter otherwise. Std. errors in parentheses. Subs. coded as domestic. *p<0.1 **p<0.05 ***p<0.01

Finally, we explore the functional distance hypothesis by proxy-ing a foreign bank's proximity to the local market, and hence its ability to manage increased credit risk, by its level of "local" funding gap, namely the ratio of loans to deposits computed at the affiliates' balance sheet level. The results, presented in table 13, show that according to the DD analysis (columns 1 and 3) the *FOLE* coefficient remains highly significant and negative, but it is almost equalled along both dimension by the coefficient on the funding gap variable.

More importantly, according to the DDD analysis (columns 2 and 4), the funding gap indicator variable is by itself sufficient to explain the dynamics of foreign credit, as neither the dummy *FOLE* nor the interaction *funding gap*FOLE* result significant.

We interpret the results presented in tables 12, 13 and A7 as strong evidence in favor of the functional distance hypothesis. In particular, the results agree in pointing out that

the foreign banks' procyclicality which we documented in the baseline regressions reflects the reaction of these intermediaries to the sudden and unexpected deterioration of local credit risk, and the subsequent sharp increase in credit management costs.

6.3.4 The case of Italian multinationals

The results presented so far suggest that foreign banks have redirected the credit flows away from the Italian market following an increase in local credit risk management costs. This interpretation is consistent both with the finding that it was more functionally distant banks that withdrew funds more intensely, as well as with the result that the procyclicality was induced by banks that did not need to mend their own weakened balance sheets.

To corroborate further this conjecture, we focus on the case of multinational banks resident in Italy. These intermediaries are similar to foreign banks in that they can easily reallocate their portfolio across the border, while they differ as they have zero functional distance from the Italian market. To test our conjecture, we run our analysis comparing directly the behavior of domestic multinationals and foreign banks.

Table 14. The behavior of Italian multinationals

Dep. variable	(1) $\Delta \ln L$	(2) $\Delta \ln L$
multinational	.000 (.003)	.003 (.016)
multinational*lehman	.011*** (.003)	.019 (.014)
constant	-.011*** (.000)	-.018*** (.004)
Fixed effects	firm/quarter	firm/quarter
Obs.	394111	232908
R squared	0.0000	0.6911

Errors clustered by firm/quarter in (1), by bank in (2). Control group is foreign banks.
Subs. coded as domestic. Std. errors in parentheses. *p<0.1 **p<0.05***p<0.01

In table 14, we present the results obtained by applying the familiar DD approach of equation (1) to compare the lending behavior displayed by Italian multinationals with respect to foreign banks. Here the dummy *foreign*, which captured the trend in credit supply that were peculiar to foreign banks, is substituted by the dummy *multinational*, which assigns value 1 to Italian multinational banks, 0 to foreign banks, while it is missing for domestic, non multinational banks, which are accordingly excluded from the regression sample. Just like in the standard specification (see Section 4) the dummy *multinational* picks up the effect that "being a domestic multinational" has on credit supply. The co-

efficient on the interaction term *multinational*lehman*, instead, estimates the extent to which multinational Italian banks restricted/increased credit supply by more with respect to what foreign banks did.

Interestingly, the results show that, compared to foreign banks, domestic multinationals did not restrict as much credit supply in the post Lehman period, and possibly increased it. This is compatible with the view that as multinational banks have a better knowledge of the territory (in our terminology, they have zero functional distance) they are also able to monitor investments at a lower cost than foreign banks. Thus, while foreign intermediaries have retrenched their credit supply away from Italy because of the cost increase brought about by the crisis, Italian multinationals have kept on investing locally.

6.4 The efficiency of foreign lending

From a policy perspective, it is difficult to evaluate the efficiency of foreign lending, especially if one wants to take into account the benefits accruing from increased competition in times of financial stability. While we do not aim at providing a fully-fledged answer to such crucial question, in this section we present a simple econometric exercise that sheds some light on the issue.

In particular, we advance two normative readings of the reduction of foreign lending that we have documented for the post Lehman period. According to the first, cross-border activities are engaged in virtue of some (implicit or explicit) contractual scheme ensuring that, in case of a financial or real shock hitting one of the countries participating in the contract, the flows will be directed there. This type of foreign lending flows are ex-ante welfare-improving, as they allow risk sharing among countries. Alternatively, international lending flows could be the outcome of ex post capital reallocations induced by idiosyncratic shocks to the expected returns in individual countries (capital is redirected away from a hit country, towards less risky, and possibly more profitable, areas). In such case, foreign lending flows, even when ex-post efficient, prevent risk sharing and may even end up exacerbating the effects of the initial shocks.

According to table 10, both our measures of relative shock intensity for the headquarters' countries, *rsi*, is not significant in explaining the *FOLE* effect. However, that table estimated only the average effect for the whole group of foreign countries. Here, we take advantage of the results in table 12, and we repeat the exercise for groups of countries differently distant, in a functional sense, from Italy. Our hypothesis is that functionally distant and close countries may respond to different type of incentives, and be differently efficient. In particular, we expect that countries that are functionally closer may possibly be able to sustain an ex-ante efficient scheme, while this may not be the case for

functionally farther away countries.

Table 15. The efficiency of foreign lending

	(1)	(2)	(3)	(4)
Dep. variable	$\Delta \ln L$	$\Delta \ln L$	$\Delta \ln L$	$\Delta \ln L$
foreign	.002 (.005)	.038 (.026)	.003 (.003)	.038 (.026)
FOLE	-.010** (.005)	-.070** (.028)	-.013*** (.003)	-.070** (.028)
rsi	-.017 (.015)	-.035 (.035)	-.026 (.039)	-.035 (.035)
rsi*FOLE	-.028* (.016)	.088** (.043)	-.010 (.040)	.088*** (.043)
Funct. Distance	UE	other	UE	other
constant	-.012*** (.000)	-.012*** (.000)	-.012*** (.000)	-.012*** (.000)
Fixed effects	firm/quarter	firm/quarter	firm/quarter	firm/quarter
Obs.	1067610	996810	1067610	996810
R squared	0.0001	0.0000	0.0002	0.0000

Errors clustered by firm/quarter. rsi computed on the basis of stock index prices in (1) and (2); GDP levels in (3) and (4). Std. errors in parentheses. Subs. as domestic.
*p<0.1 **p<0.05***p<0.01

Table 15 presents the results of this hypothesis testing, by displaying how the interaction $rsi*FOLE$, which relates the intensity of procyclicality with the relative severity with which the shock hit the foreign headquarters' country, varies with functional distance.

In columns (1) and (2) we use the rsi measure of financial distress, while in (3) and (4) we look at that capturing GDP dynamics. For both types of indicator, the results confirm that functionally closer countries have restricted credit the more, the more they were themselves hit by the crisis. On the contrary, more functionally distant countries have restricted credit supply especially when they were less hit by the shock.

We interpret this as evidence that functionally closer countries have indeed implemented some contractual scheme that implied ex ante efficiency, as, once the shock hit, the flows were reverted to those countries that mostly needed them. Foreign intermediation from more distant countries, instead, is only ex post efficient, as it was the healthier countries that recalled the flows of credit back from Italy, presumably to invest them where the economic conditions were more suitable, and in particular in the domestic market.²³

²³A more complete reading of our results about ex-post and ex-ante efficiency should take into account that, at least in principle, the flows from a healthy country to a hit country due to risk sharing (though ex-ante efficient) may generate financial contagion, that is, they may transmit financial instability from

6.5 The substitutability of foreign credit

As discussed in the Introduction, even heavily procyclical foreign lenders may not have an impact on the real economy, provided that borrowers are perfectly able to substitute out shrinking funding sources with other, more available, ones. To assess the extent to which Italian firms have been able to substitute foreign credit with other funding sources, we regress total credit growth at the firm level (i.e. pooling together all credit lines that the firm has in a given period) on the percentage of total credit which was granted to that firm by foreign banks in the preceding period ($foreign_exposure_{ft-1}$). If firms have not been able to fully substitute the reduction in foreign funding sources we have documented for the post Lehman period, then the estimated a_2 coefficient should be negative.

Conducting this exercise encounters the same identification issues discussed above. Precisely, if some firms select into borrowing from foreign instead of domestic banks, $foreign_exposure$ could be correlated with unobservable demand shocks and an estimation of a_1 which does not take into account demand conditions would be biased. We address this issue by including in the regression the estimated fixed effects \hat{d}_{ft} , which were introduced in (1) precisely to capture credit demand factors. Summing up, we estimate the following regression,

$$\begin{aligned} \Delta L_{ft} = & a_{0t} + a_1 foreign_exposure_{ft-1} \\ & + a_2 foreign_exposure_{ft-1} * lehman_t + a_3 lehman_t + a_4 \hat{d}_{ft} + u_{ft} \end{aligned} \quad (4)$$

Table 16 presents the relevant OLS estimates. The results in columns (1) and (3), which differ in how subsidiaries are coded, evidently suffer from omitted variable bias, as we can no longer control for the unobservable demand.²⁴ To circumvent this problem, we add to the OLS regression the borrower/quarter fixed effects that have been estimated by running the DD equation (1) and which were used precisely to control for time varying and unvarying firm specific credit demand and risk (see table 4). Once we do so, the coefficient of $expo_{ft-1} * lehman$, which measures the effect of the previous period exposition towards foreign credit ($expo_{ft-1}$) in the post Lehman period on current credit growth rate becomes negative and significant.

The sign and significance of the results suggest that borrowers have not been able to fully compensate the contraction in foreign lenders' supply by borrowing more from domestic banks. On average, a borrower with a reliance on foreign credit lines in the 25th

the former to the latter economy. For example, it could be the case that the outflows from banks heavily exposed to a country hit by a shock may induce bank runs in the healthy economy, with consequences worse than those implied by the direct exposure. As separating out these two aspects requires much additional work that goes beyond the aim of this paper, here we limit ourselves to point out the issue, while leaving it to future research.

²⁴Now in fact we have only one observation per quarter for each borrower, as we have collapsed all contemporaneous credit relations in one to compute the borrower's total exposition ($expo$) in a give quarter and the percentage of that which is from a foreign intermediary.

percentile (0 per cent of total credit) shows a post Lehman total credit growth which is roughly 2 percentage points, in annual terms, larger than that experienced by a borrower in the 75th percentile (67 per cent of the total credit).²⁵

Table 16. Substitutability of foreign credit

Dep. variable	(1) $\Delta \ln L_{AVG}$	(2) $\Delta \ln L_{AVG}$	(3) $\Delta \ln L_{AVG}$	(4) $\Delta \ln L_{AVG}$
expo_{ft-1}	-.0001*** (.000)	-.0000 (.000)	-.00002 (.000)	-.00002 (.000)
$\text{expo}_{ft-1}^*\text{lehman}$.00004 (.000)	-.00005*** (.000)	-.0000 (.000)	-.00008*** (.000)
lehman	-.0090*** (.001)	-.0006 (.001)	-.0080*** (.001)	-.0007 (.000)
D proxy	no	.780*** (.015)	no	.780*** (.014)
constant	.014*** (.001)	-.008*** (.000)	.009*** (.001)	-.009 (.000)
Obs.	347611	323896	347611	323896
R squared	0.33687	0.3867	0.33691	0.3865

Subs. coded as domestic in (3) and (4). Std. errors in parentheses. *p<0.1 **p<0.05 ***p<0.01

7 Conclusions

In this work, we have investigated whether, during the global financial crisis, the supply of credit from foreign banks was more procyclical (i.e. it underwent a stronger tightening) than that from domestic lenders, and what could have driven such dissimilarity. Thanks to a very disaggregated dataset and a robust identification methodology, we show that, after the Lehman's bankruptcy, foreign lenders operating in Italy have contracted credit supply significantly more than their domestic counterparts, in both the intensive and extensive margin. This result is robust to a number of tests, including (i) the use of alternative definitions of the dependent variable; (ii) the choice of different lengths of the after-Lehman time window; (iii) the addition of bank fixed effects and (iv) different ways of clustering the standard errors, including double clustering at the firm/quarter and bank

²⁵This may not be a negligible effect as it might look, in particular if one takes into account the following caveat. As the borrower/quarter fixed effects are obtained from the estimation of another regression, they are measured with some noise (generated regressor problem). The sign of the estimated coefficients for both D proxy and $\text{expo}_{ft-1}^*\text{lehman}$ (columns 2 and 4 of Table 15) and the negative correlation between these two regressors (-0.0061***) suggest that we might be over-estimating the coefficient for $\text{expo}_{ft-1}^*\text{lehman}$. Our exercise would therefore only provide an upper bound of the extent to which firms have been able to compensate the reduction of credit supply by foreign banks.

level. Importantly, our analysis shows that the procyclicality is almost entirely transmitted by those foreign banks that operate in the host economy through a local branch and as such do not engage fully in the financial tissue of the host country (as discussed also in Cetorelli and Goldberg 2012). Quite differently, local affiliates of foreign multinational banks do not exhibit, at least for what concerns the intensive margin of credit supply (i.e. the volumes), any such procyclicality compared to domestic intermediaries. We also find robust evidence that the documented procyclicality is not targeted to particular segments of the market, neither in terms of type of credit or type of borrowers (i.e. we find no evidence of flight-to-quality).

As for the possible explanations, we do not find support for the hypothesis that the procyclicality displayed by foreign intermediaries reflects a response to a deterioration in their headquarters' balance sheet, or in the financial/macroeconomic outlook of the country where these banks are headquartered. The behavior of foreign intermediaries is also not explained by the business orientation of this type of banks, which could have prompted them to react to the Lehman event by cutting credit as a strategic choice. Rather, our results show that banks which have cut supply more severely are those which can be considered more distant in a "functional" sense. These are banks that are farther from Italy in an economic, geographic and cultural sense, as well as banks that are little involved in dealing with Italian debtors. This result is also confirmed by the finding that when we restrict the analysis by comparing the behavior displayed by foreign banks and by Italian multinationals, which are the domestic intermediaries more similar to foreign banks in terms of size and business model, we find that the latter, which have a "zero" functional distance from the local market, have restricted credit provision significantly less.

From a more normative point of view, we find that functional distance and the international propagation of shocks interact. In particular, the results show that functionally closer banks (headquartered in geographically closer countries) have restricted credit supply the more the harder their own countries were hit by the crisis; on the contrary, more functionally distant banks (headquartered in countries farther away) have restricted credit supply especially when their countries were less hit by the shock, probably to redirect resources to less risky economies, such as the domestic one. Based on this evidence we argue that risk sharing is implementable among banks headquartered in functionally close countries, while it is less so when the intermediation is operated across functionally distant economies.

To conclude, financial integration looks more desirable when it entails a steady presence in the host-country, with such commitment measurable by the extent to which the bank interfaces itself with retail customers and is subject to the host-country's supervision and regulation. Foreign intermediation is also more desirable when it is operated by banks which are functionally closer, namely, headquartered in areas that are geographically and possibly culturally close to the host market, as proximity relates to a better ability to

handle unexpected increase in risk, and hence to less elastic responses to shocks.

8 References

Acharya, V. V. and P. Schnabl, 2010. Do global banks spread global imbalances? Asset-backed commercial paper during the financial crisis of 2007–09. *IMF Economic Review*, 58, 37–73.

Albertazzi, U. and D. Marchetti Jr., 2010. Credit crunch, flight to quality and ever-greening: an analysis of bank-firm relationships after Lehman. Bank of Italy Temi di Discussione, No. 756.

Allen, F., Hryckiewicz, A., Kowalewski, O., and G. Tumer-Alkan, 2011. Transmission of the bank liquidity shocks in loan and deposit markets: the role of interbank borrowing and market monitoring. Wharton Financial Institutions Center Working Paper, No. 10-28.

Allen, F., Gu, X. and O. Kowalewski, 2011a. Corporate governance and intra-group transactions in European bank-holding companies during the crisis. Mimeo, University of Pennsylvania.

Barba Navaretti, G., Calzolari, G., Pozzolo, F. A. and M. Levi, 2010. Multinational banking in Europe: financial stability and regulatory implications. Lessons from the crisis. *Economic Policy*, 25, 703–753.

Caivano, M., Rodano, L. and S. Siviero, 2009. La trasmissione della crisi finanziaria globale all'economia italiana. Un'indagine controfattuale, 2008-2010. Bank of Italy, Occasional Papers, No. 64.

Cetorelli, N. and L. S. Goldberg, 2011. Global banks and international shock transmission: evidence from the crisis. *IMF Economic Review*, 59, 41-76.

_____, 2012. Follow the money: quantifying domestic effects of foreign bank shocks in the Great Recession. Federal Reserve Bank of New York, Staff Report No. 545.

Chava, S., and A. Purnanandam, 2011. The effect of a banking crisis on bank-dependent borrowers. *Journal of Financial Economics*, 99, 116-135.

Claessens, S. and N. Van Horen, 2011. Foreign banks: trends, impact and financial stability. De Nederlandsche Bank Working Paper, No. 330

_____. Foreign banks and the global financial crisis: Investment and lending behavior. *VoxEU.org*, 31 January 2012.

De Haas, R. and I. Van Lelyveld, 2011. Multinational banks and the global financial crisis: weathering the perfect storm? De Nederlandsche Bank Working Paper, No. 322.

_____ and N. Van Horen, 2011. Running for the exit: international banks and crisis transmission. DNB Working Paper, No. 279.

_____, Korniyenko, Y., Loukoianova, E. and A. Pivovarsky, 2012. Foreign banks and the Vienna initiative: turning sinners into saints? IMF Working Paper, No. 12/117.

Gan, J., 2007. The real effects of asset market bubbles: loan- and firm-level evidence of a lending channel. *Review of Financial Studies*, 20, 1941-1973.

Gelbach, J. B., Cameron, A. C. and D. L. Miller, 2008. Bootstrap-based improvements for inference with clustered errors. *Review of Economics and Statistics*, 90, 414-27.

Hameter, M., Lahnsteiner, M. and U. Vogel, 2012. Intra-group cross-border credit and roll-over risks in CSEE - Evidence from Austrian banks. Financial Stability Report, Oesterreichische Nationalbank No. 23,.

Khwaja, A., and A. Mian, 2008. Tracing the impact of bank liquidity shocks: Evidence from an emerging market. *The American Economic Review*, 30, 1413-1442.

Levine, R., 2005. Finance and growth: Theory and evidence. Handbook of economic growth. Elsevier.

Ongena, S., Popov, A. and G. F. Udell, 2011. Bank lending standards abroad: does host-country regulation and supervision matter? European Banking Center Discussion Paper, No. 2011-007.

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

Popov, A., and F. Smets, 2011. Financial markets: productivity, procyclicality, and policy. Mimeo, European Central Bank.

_____ and G. F. Udell, 2012. Cross-border banking, credit access, and the financial crisis. *Journal of International Economics*, 87, 147-161-

Presbitero, A. F., Udell, G. F. and A. Zazzaro, 2012. The home bias and the credit crunch: a regional perspective. Mimeo, Università Politecnica delle Marche.

Puri, M., Rocholl, J. and S. Steffen, 2009. The impact of the U.S. financial crisis on global retail lending. Mimeo, Fuqua School of Business Duke University, Durham NC.

Schnabl, P., 2012. Financial globalization and the transmission of credit supply shocks: evidence from an emerging market. *Journal of Finance*, 67, 897-932.

Stein, J. C., 2002. Information production and capital allocation: decentralized versus hierarchical firms. *Journal of Finance*, 57, 1891-1921.

Stiglitz, J., 2000. What I learned at the world economic crisis. *Globalization and the poor: Exploitation or equalizer*, Idea Eds.

9 Appendix

Table A1 presents the results obtained by considering in turn the change in levels of credit, ΔL , and the ΔL_{fillin} variable that accounts also for the variation induced by the reimbursement of a credit line.

Table A1. Robustness: disbursement and reimbursement

Dep. variable	(1) ΔL	(2) ΔL_{fillin}
foreign	.002*** (.001)	.005*** (.000)
FOLE	-.002** (.001)	-.004*** (.001)
constant	-.003*** (.000)	-.000*** (.000)
Fixed effects	firm/quarter	firm/quarter
Obs.	1077487	1211183
R squared	0.0000	0.0000

Errors clustered by firm/quarter. Std. errors in parentheses.
*p<0.1 **p<0.05 ***p<0.01

Table A2 displays the estimates of the FOLE effect on the dynamics of credit utilized rather than granted (columns (1) and (2)).

Table A2. Robustness: utilized credit & bank fixed effects

Dep. variable	(1) $\Delta \ln L_{uti}$	(2) $\Delta \ln L_{uti}$	(3) $\Delta \ln L$	(4) $\Delta \ln L$
foreign	.070*** (.014)	.070** (.027)	-.013 (526.1)	-.026*** (.006)
FOLE	-.074*** (.015)	-.074** (.030)	-.014*** (.004)	-.014** (.006)
bank FE	no	no	yes	yes
constant	-.000 (.000)	-.000 (.002)	.001 (.001)	.001 (.001)
Fixed effects	firm/quarter	firm/quarter	firm/quarter	firm/quarter
Obs.	1088281	1088281	949195	949195
R squared	0.0000	0.2770	0.0035	0.3216

Errors clustered by firm/quarter in (1) and (3); by bank otherwise. Subs. coded as domestic. Std. errors in parentheses. *p<0.1 **p<0.05 ***p<0.01

Table A3 splits the dummy Lehman in, t_1 (2007Q4-2008Q2), t_2 (2008Q3-2009Q1), t_3 (2009Q2-2009Q4) and t_4 (2010Q1-2010Q3).

Table A3. Robustness: defining the post Lehman

	(1)	(2)	(3)	(4)
Dep. variable	$\Delta \ln L$	$\Delta \ln L_{fillin}$	$\Delta \ln L$	$\Delta \ln L_{fillin}$
foreign	-.000 (.002)	.005*** (.001)	.002 (.005)	.009*** (.002)
foreign* t_1	.004 (.003)	-.000 (.001)	[omitted]	[omitted]
foreign* t_2	[omitted]	[omitted]	-.006 (.007)	-.004* (.002)
foreign* t_3	-.004 (.003)	-.007*** (.001)	-.016*** (.005)	-.013*** (.002)
foreign* t_4	-.001 (.002)	-.004*** (.001)	-.021*** (.005)	-.016*** (.002)
constant	-.012*** (.000)	-.000*** (.000)	-.012*** (.000)	-.000* (.000)
Fixed effects	firm/quarter	firm/quarter	firm/quarter	firm/quarter
Obs.	1071645	1211183	1071645	1211183
R squared	0.0001	0.0001	0.0001	0.0001

Errors clustered by firm/quarter. Subs. as domestic in (3) and (4). Std. errors in parentheses. *p<0.1 **p<0.05 ***p<0.01

Table A4 displays the results from applying different clusters for the errors.

Table A4. Robustness: clustering

	(1)	(2)	(3)
Dep. variable	$\Delta \ln L$	$\Delta \ln L$	$\Delta \ln L$
foreign	.005* (.002)	.005** (.002)	.001 (.004)
FOLE	-.008* (.004)	-.008*** (.002)	-.015** (.006)
constant	-.012*** (.002)	-.012*** (.000)	-.012*** (.001)
Fixed effects	firm/quarter	firm/quarter	firm/quarter
Obs.	1071645	1071645	1071645
R squared	0.2717	0.2717	0.2717

Errors clustered by bank in (1), (3); by firm/quarter in (2). Std. errors in parentheses. Subs. as domestic in (3). *p<0.1 **p<0.05 ***p<0.01

In table A5, we presents the DD (column 1) and DDD (column 2) analysis on four main balance sheet indicators

Table A5. The international shock propagation hypothesis

Dep. variable	(1) $\Delta \ln L$	(2) $\Delta \ln L$
foreign	.006**	.0014
FOLE	-.009***	.0004
capital requir.	.0001	-.00009
capital requir.*foreign		-.0001
capital requir.*lehman		.0005**
capital requir.*FOLE		-.0015
liquidity ratio	-.00008***	.0001**
liquidity ratio*foreign		-.0001
liquidity ratio*lehman		-.0004***
liquidity ratio*FOLE		.0006***
impaired loans	-.0004***	-.0003***
impaired loans*foreign		.0011
impaired loans*lehman		.0004**
impaired loans*FOLE		-.0024
funding gap	-.0000***	-.0000
funding gap*foreign		.000**
funding gap*lehman		000***
funding gap*FOLE		-.00001**
constant	-.0070***	-.008
Fixed effects	firm/quarter	firm/quarter
Obs.	903814	903814
R squared	0.0001	0.0003

Errors clustered by firm/quarter otherwise *p<0.1 **p<0.05 ***p<0.01

In the interest of space, we do not report the standard errors.

Table A6 presents the estimates obtained by measuring a bank's business model with the mean of its pre-Lehman balance sheet values. In column (2), as subsidiaries are coded as domestic, unconsolidated balance sheet data are imputed to them.

Table A6. The business model hypothesis - balance sheet data

Dep. variable	(1) $\Delta \ln L$	(2) $\Delta \ln L$
foreign	.003 (.002)	.002 (.004)
FOLE	-.009*** (.002)	-.018*** (.005)
capital requirements	-.00002 (.000)	.000 (.000)
liquidity ratio	-.00005** (.000)	-.0001*** (.000)
impaired loans	-.0003** (.000)	-.0001** (.000)
funding gap	-.000 (.004)	-.000 (.000)
constant	-.005*** (.000)	-.005*** (.000)
Fixed effects	firm/quarter	firm/quarter
Obs.	931866	930993
R squared	0.0001	0.0002

Errors clustered by firm/quarter. Std. errors in parentheses. Subs. coded as domestic in (2). *p<0.1 **p<0.05 ***p<0.01

Table A7 displays the results obtained by considering two indicators of “cultural distance”, which are meant to account for those social and cultural factors that may represent an impediment in credit risk management.

Table A7. The functional distance hypothesis: cultural distance

	(1)	(2)	(3)	(4)
Dep. variable	$\Delta \ln L$	$\Delta \ln L$	$\Delta \ln L$	$\Delta \ln L$
foreign	-.026*** (.008)	-.013 (.010)	-.001 (.026)	.010 (.024)
FOLE	-.007*** (.002)	-.015*** (.005)	-.043* (.025)	-.045* (.024)
resolution of controversies	-.007*** (.001)	-.000 (.001)	.000 (.005)	.007 (.005)
resolution of contr.*FOLE			-.008 (.005)	-.009* (.005)
investor protection	-.002* (.001)	-.006*** (.002)	-.005 (.005)	-.005 (.006)
investor protection*FOLE			-.002 (.003)	-.002 (.006)
constant	-.012*** (.000)	-.012*** (.000)	-.012*** (.000)	-.012*** (.000)
Obs.	1071502	1071502	1071502	1071502
R squared	0.0002	0.0001	0.0002	0.0001

Errors clustered by firm/quarter. Std. errors in parentheses. Subs. as domestic in (2) and (4). *p<0.1 **p<0.05 ***p<0.01