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

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Abstract

We exploit highly disaggregated bank-firm level data to investigate the dynamics of foreign vs. domestics 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. Based on a number of exercises which test alternative explanations for such procyclicality, we document that it mainly reflects the (functional) distance between a foreign bank's headquarters and the Italian credit market.

Keywords: foreign banks lending channel, credit crunch, crisis transmission, bank balance sheet channel, bank business model, relationship lending, funtional distance

JEL classification: G15, E44, G14, G21

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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 and the general view came to regard multinational banks as the main cross-border propagators of financial distress. In particular, it was argued that foreign intermediaries' unexpected retrenching away from the host markets contributed in a non-negligible way to heighten the procyclicality of financial markets in the host countries.[1]

Indeed, according to a few recent empirical works, multinational banks that received large liquidity and funding shocks during the global crisis operated a credit restriction in the host countries that was tighter than that by domestic banks, typically less directly affected by the crisis (Cetorelli and Goldberg 2011, 2012; De Haas and Lelyveld 2011; Puri and Rocholl, 2011; Popov and Udell 2012). With the present paper we investigate this issue by analyzing credit supply of both domestic and foreign lenders operating in Italy in the aftermath of the collapse of Lehman Brothers.[2] In doing so, we contribute to the existing literature along the following dimensions.

First, thanks to our detailed dataset on bank-firm credit relationships, we can apply a robust methodology to isolate the procyclicality of foreign lending (i.e. the restriction in credit supply operated by foreign banks on top of that also operated by their domestic counterparts) from that part of lending dynamics that reflects credit demand and borrowers' risk. This methodology, first employed by Gan (2007) and Kwhaja and Mian (2008) in a context not related to the issue of multinational banks, crucially exploits the fact that firms borrow simultaneously from several banks. Here we take advantage of the fact that among the banks from which firms borrow there may be both foreign and domestic intermediaries.

Secondly, and perhaps most importantly, while we also consider the possibility that foreign banks' larger credit restriction results from the transmission of financial distress from the headquarters to local affiliates, we also explore other channels. In particular, given that Lehman's collapse induced an unexpected and sharp downturn of the Italian economy, we study if the related quick deterioration of the credit quality prompted different reactions from part of the two types of lenders. We advance three hypotheses: (*i*) the *organizational form* and business model of foreign intermediaries, arguably different from that of the average domestic bank, may be connected with a different sensitivity of lending supply to credit quality shocks; (*ii*) as mentioned, foreign banks' larger credit tightening may have resulted from the transmission of unexpected shocks to the consolidated balance sheet of foreign banks, or to the economy where these intermediaries are based (*international propagation of shocks*[3]); (*iii*) finally, we conjecture that foreign intermediaries' behavior could have reflected their ampler (functional) *distance* from the

[1] Symmetrically, Borio et al. (2011) have also pointed out how, during boom periods, cross-border sources of credit tend to outgrow overall credit. For a broader discussion on financial markets procyclicality, see Panetta et al. (2009).

[2] For a comprehensive study on the retail activity of foreign banks in Italy see Infante and Rossi (2009).

[3] The literature has also referred to this channel as the international bank-lending channel.

Italian market, which is a factor influencing the ability of an intermediary to manage credit risk (Stein 2002; Ruckes 2004; Hauswald and Marquez, 2006; Alessandrini et al. 2009; De Haas and Van Horen 2013).

We investigate these hypotheses by exploiting a dataset consisting of all credit relations entertained by Italian firms with both foreign and domestic banks before and after the collapse of Lehman Brothers. We opt for focusing on the pre- and post-Lehman periods as the outburst of the global financial crisis, which was fully unexpected and certainly exogenous to the development in credit supply in Italy -either from domestic or from foreign lenders-, provides a quasi-experimental framework.

Our findings confirm that the post-Lehman contraction of the credit extended by foreign banks, sharper than that of their domestic competitors, reflects less favorable supply dynamics and does not (just) result from a stronger weakening of the demand side. This is true both when we look at the total amount of credit granted and at the openings of new credit lines (i.e. the intensive and extensive margins). The harsher contraction of lending supply operated by foreign banks is rather widespread across borrowers, although it did not concern very large borrowers as well as very high-quality firms.

Concerning the determinants of such procyclicality, our findings suggest that the hypotheses related to the organizational form and the international propagation of shocks do not fully explain the observed procyclicality displayed by foreign banks. Instead, we find that the restriction reflects the functional distance between the headquarters and Italy. We show that the credit restriction has been predominantly operated by lenders with a higher ratio of loans extended in Italy to deposits also raised locally (the local funding gap), banks which can be thought of as less deeply involved with the local economy. In a similar vein, we also demonstrate that the procyclicality is almost entirely induced by branches of foreign banks rather than by foreign subsidiaries. To corroborate the interpretation of these findings in terms of distance, we also show that foreign lenders' procyclicality was stronger for credit relationships in which the (foreign) bank is not the main lender of the borrowing firm.

We show that distance also influences the relationship between the financial condition of an intermediary's country of origin and lending supply in Italy. More precisely we document that among banks headquartered in distant countries the lending restriction operated in Italy was more intense for those intermediaries based in economies less hit by the crisis, while the opposite is true for closer economies. We argue that this evidence provides interesting normative indications, as it suggests that the cross-border flows of credit among functionally close countries are coherent with some notion of risk sharing.

Finally, 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 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.

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. These works provide 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 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 a restriction of local lending from these banks (Cetorelli and Goldberg 2012). These findings are in line with what is documented by Claessens and Van Horen (2012), 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. Evidence supporting foreign banks' quick asset transfers away from host markets is also provided by Allen et al. (2011), De Haas and Van Lelyveld (2011), Puri et al. (2011), Ongena et al. (2013). Popov and Udell (2012) demonstrate that after the crisis foreign banks increased their rejection rates of loan-applications.

Part of the literature has focused on investigating more in depth which bank balance-sheet items are mainly related with the documented credit flows' restrictions. Allen et al. (2011a) find that higher loan loss provisioning as well as higher dependence on the interbank market at the headquarters' level increase the likelihood of credit tightening at the affiliate level. 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, and especially when their share of the market was predominant. De Haas and Van Horen (2013) use data on syndicated loans and show that foreign banks operated less of a restriction in lending to countries geographically closer, and in countries where the bank had a well-established experience with co-lenders and borrowers, suggesting that factors related to the functional distance between the headquarters and the host country have affected the dynamics of lending.

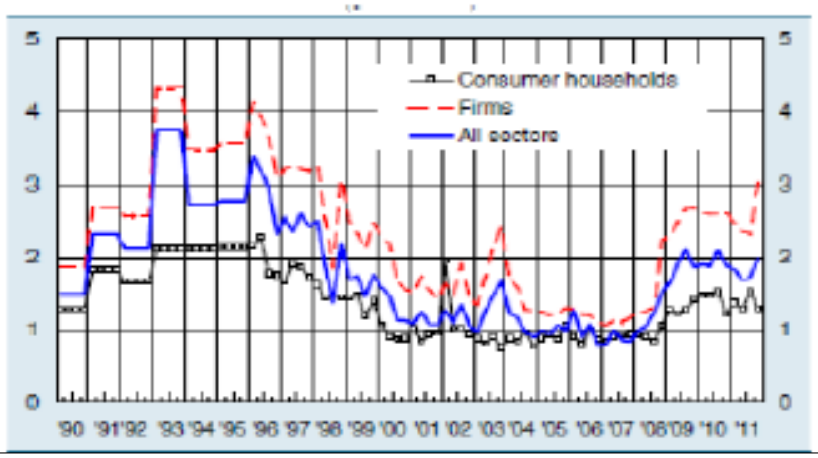
Compared with these works, our paper improves on the methodology employed to control for the effects on lending dynamics of credit demand and borrowers' risk, by including time-varying borrower fixed effects, which capture all observable and unobservable, time-varying and time-invariant demand effects. 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 in his case happened to be stronger for foreign affiliates (while their parent banks were hit by the Russian crisis, domestic

Peruvian banks were relatively unaffected by it). Besides the crisis period and the credit market analyzed, our study differs form Schnabl's as we try to investigate if lending policies of foreign banks have exhibited procyclical patterns beyond what can be explained by the balance-sheet channel hypothesis.[4] In doing so, we emphasize the role of foreign banks' business model and their distance from the Italian credit market.

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

In Italy, the bankruptcy of Lehman Brothers has marked the beginning of a severe and unexpected recession period, which brought about a sizeable deterioration in lending risk, as can be seen by looking at Figure 1, which shows how the ratio of new bad debts to outstanding loans to firms almost tripled in the year following the bankruptcy.[5]

Figure 1. Ratio of new bad debts to outstanding loans



Note: 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. Source 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 credit quality with a much stronger contraction in lending than domestic banks (Figure 2). Comparing credit growth over the period 2007Q4-2008Q4 to that over the two subsequent years, the overall growth rate of lending dropped from 11 per cent to −0.5 per cent and that of lending granted

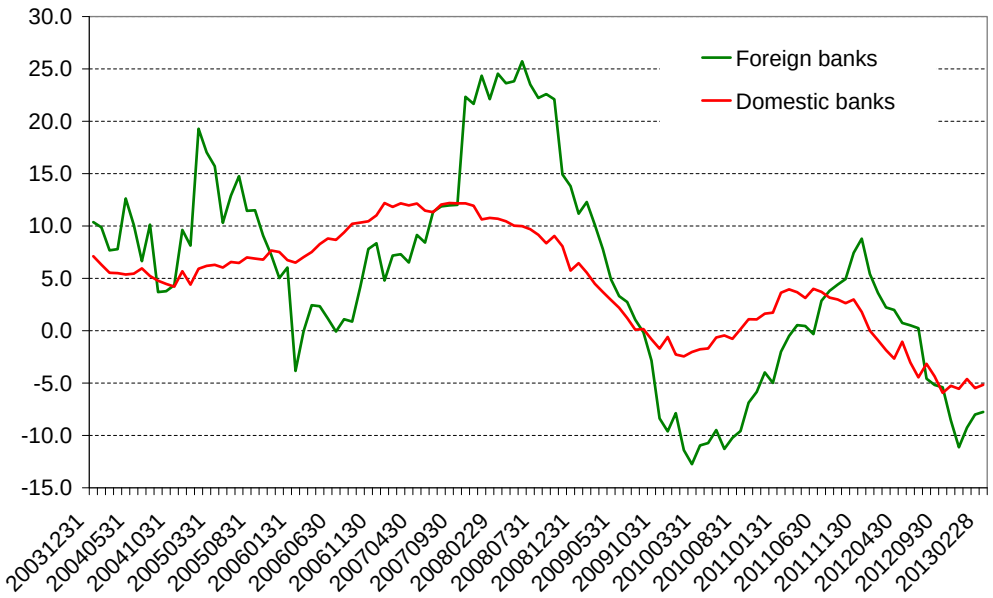
[4] The same considerations apply to Bofondi, Carpinelli and Sette (2013), who conduct a similar exercise with Italian data and study lending supply during the sovereign debt crisis period, showing how foreign lenders, less involved in the financial market tensions, have been better able than domestic intermediaries in sustaining credit supply.

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

by domestic banks from 9.7 per cent to 0.4 per cent; the growth of credit extended by foreign intermediaries, instead, collapsed from 19.7 per cent in the pre-Lehman window to a staggering −4.0 per cent.[6]

This evidence suggest that in the aftermath of the crisis foreign intermediaries have behaved more procyclically than their domestic counterparts also in Italy; however, aggregate time series such as those displayed by Figure 2 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). As long as firms borrowing from foreign lenders are different from other firms, the larger restriction displayed in Figure 2 could simply reflect different credit demand conditions. Therefore, it is not possible to draw conclusions about the procyclicality of foreign intermediaries' lending policies based on this Figure alone.

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



Notes: monthly data; annualized growth rate, corrected for cartolarizations. Source: Supervisory Statistical Reports and Central Credit Register.

Admitting that part of the restriction was in fact driven by supply dynamics, as we will rigorously demonstrate later on, several reasons could explain why foreign banks' supply of credit has evolved differently from that of domestic lenders. We advance and test three main hypotheses. The first relates to a bank's organizational form and business model. Foreign banks are typically multinational banks that are much larger, in all respects, than domestic institutions; accordingly, they are also likely to adopt a different business model in terms of funding and risk taking.

Secondly, we examine the extent to which the credit restriction operated by foreign intermediaries reflects their higher exposure to the negative shocks brought about the

[6]The sample period has been chosen so as to include the peak of credit growth prior to Lehman's collapse and the trough after that. The results are however virtually unaffected by marginal changes in the sample period considered.

crisis, as suggested by the literature that studies the international bank balance-sheet channel.

Finally, we argue that foreign lenders, because of their distance from the Italian credit market, can less easily manage deteriorations in credit quality. If this is the case, the sizeable reduction in foreign banks' credit exposures towards Italy may have reflected the significant increase in credit risk that accompanied the Lehman collapse.

4 Empirical strategy

We compare lending decisions of foreign and domestic banks before and after the crisis (as in Ongena et al. 2013), including borrower/quarter fixed effects to isolate supply from contemporaneous demand dynamics (as in Schnabl 2012). Precisely, we estimate

$$\Delta \ln(L_{bft}) = a_{0t} + a_1 foreign_b + a_2 lehman_t + a_3 foreign * lehman_{bt} + b_{ft} + u_{bft} \quad (1)$$

where $\Delta \ln(L_{bft})$ is the quarterly change of the natural logarithm of credit extended by bank b to firm f in quarter t; $foreign_b$ is a dummy indicating whether bank b is a branch of a foreign bank; $lehman_t$ is a dummy that takes value 1 if the period t is after the collapse of Lehman Brothers; *foreign*lehman*$_{bt}$ is the interaction term between the two dummies above; b_{ft} represents the firm-quarter fixed-effect and u_{bft} is an idiosyncratic error term.[7]

The fixed effects, which we can introduce thanks to the presence of multiple lending relationships in our dataset, allow us to control for *all* firm's 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.[8] The coefficient on *foreign*lehman*$_{bt}$, if negative, indicates that foreign banks have restricted credit supply more than domestic banks, thus behaving procyclically.

Next we simply add to model (1) a number of covariates Z_{bt} that proxy the hypotheses that we think could have prompted foreign banks' larger credit cuts. In practice, we estimate

$$\Delta L_{bft} = a_{0t} + a_1 foreign_b + a_2 lehman_t + a_3 foreign * lehman_{bt} + b_{ft} + a_4 Z_{bt} + u_{bft} \quad (2)$$

If the hypothesis under study explains the different behavior of foreign lenders, then

[7] We consider as foreign banks only the branches of foreign banks; in section 6.2.3 we explore the role played by affiliates of foreign banking groups.

[8] Although included here for expositional clarity, the coefficient a_2 will no be estimated in the presence of firm/quarter fixed effects.

inclusion of Z_{bt} should render the coefficient a_3 insignificant.

Finally, we will also analyze differences across banks and firms in the intensity of foreign lender's procyclicality by estimating specifications in which we also include the triple interaction of Z_{bt}*$foreign$*$lehman_{bt}$ (together with all relevant double interactions).

$$\begin{aligned}\Delta L_{bft} = {} & a_{0t} + a_1 foreign_b + a_2 lehman_t + a_3 foreign * lehman_{bt} \\ & + a_4 Z_{bt} + a_5 Z_{bt} * foreign_b + a_6 Z_{bt} * lehman_t + a_7 Z_{bt} * foreign * lehman_{bt} \\ & + b_{ft} + u_{bft}\end{aligned} \tag{3}$$

It is worth pointing out that, despite the similarity, our exercise does not correspond to a difference-in-difference (DD) estimation as we are not assuming that the shock necessarily hit only one (treated) group of banks. Although we will check to what extent the observed differences in behavior can be ascribed to different direct exposures to the Lehman shock, our objective is also to assess the extent to which the unexpected deterioration of credit quality in Italy observed after the Lehman's collapse prompted different reactions from part of foreign and domestic banks.

5 Definition of variables and description of data

Our dataset takes advantage of the information contained in the Italian Credit Register, which monitors all existing credit relations above the threshold of 30.000 euros, by requiring all banks operating in Italy to report the identity of the borrowers they are engaged with, along with the amount of credit granted to them and its features. More precisely, we started off by compiling the list of all those borrowers that have been reported by a foreign bank to the Register at least once in the period examined (2007Q4-2010Q4; end-of-quarter exposures are considered). For these borrowers we then derived information on all other credit relations (with both domestic and foreign banks) that they entertained during the same period.

We have information on the amount of credit granted and utilized; whether the credit granted was short- or long-term (i.e. a loan is short-term if its original maturity is less than eighteen months, long-term otherwise); whether it was collateralized or not and finally if it turned out to be a deteriorated or bad loan. For computational reasons, we carry out our regressions with a random sample including fifteen per cent of the original list of borrowers, which left us with a dataset of thirty-eight thousands borrowers and over six hundred intermediaries, of which a bit more than ten per cent are branches of foreign banks, for about a million quarterly observations. We derive information on the balance sheet of borrowers and of domestic and foreign banks from Cerved and from the Bank of Italy Supervisory statistical report and Bankscope respectively.[9]

Our main dependent variable, credit growth, is the delta of the log exposure of a bank toward a borrower between quarter t and $t+1$, that is $\Delta \ln(L) = \ln(credit\ granted_t)$

[9] Cerved is a private company providing a database for a large sample of Italian firms (more than 1,000,000) which contains detailed information about firms' activity and balance sheets, reported on a yearly basis. It also produces a synthetic indicator capturing a firm's overall credit worthiness, the Zscore. More precisely, following Altman et al. (1994), each firm is assigned a value from 1 to 9 where values from 7 upwards indicate sensible riskiness. Our dummy *rating* takes value 1 for firms with Zscore higher than or equal to 7.

$-\ln(credit\ granted_{t-1})$. Given that the growth rate variable cannot by construction be computed in the quarter where a loan is originated, for robustness reasons we also consider the delta in levels of credit granted (see also Albertazzi and Marchetti 2010). Table 1 presents some summary statistics.

Table 1. Summary statistics

	Domestic			Foreign		
Variable	Obs.	Mean	Median	Obs.	Mean	Median
credit granted	1080831	1.258.844	1.751.91	89150	2.419.356	73.334
credit utilized	1080831	851.974	125.959	89150	1.581.307	48.962
short-term	1080831	52.6%	64.1%	89150	29.9%	0%
collateralized	1080831	12.9%	0%	89150	17.4%	0%
deteriorated	1080831	22.0%	0%	89150	30.8%	0%
bad	905067	0.03%	0%	89150	0.01%	0%

Note: summary statistics for all bank-firm-quarter matches included in the dataset. *Foreign* is branches of foreign intermediaries; *Domestic* is domestic banks and subsidiaries of foreign banks; *credit granted* is the total amount granted in euro; *credit utilized* is amount drawn in euro; $short-term$ is the percentage of credit granted that is short-term; ditto for *collateralized*, *deteriorated* (substandard, restructured and past-due loans which are not reported as bad loans) and *bad loans* (exposures to borrowers in a state of insolvency, even if not legally ascertained and regardless of the losses forecasted by the bank).

Over the period under study, foreign banks have granted on average less short-term and more collateralized credit; further foreign banks have reported on average more deteriorated credit than their Italian counterparts.

Moving to banks' balance sheets, in the analysis we consider the following balance sheet indicators: total assets; total capital ratio; liquidity ratio, i.e. the ratio of securities other than shares to the sum of securities other than shares and loans; funding gap, i.e. the ratio of loans to total deposits; bad loan ratio, i.e. the ratio of bad loans to total loans; ROA, i.e. the ratio of net income to total assets.[10] Importantly, we consider consolidated balance sheets at the group level, which is why we have to make use of Bankscope to get the data on foreign banks' balance sheets.

Table 2 presents the summary statistics for these variables over the period considered. Note that for the subsidiaries of foreign banks, which we classify as domestic banks, we consider the consolidated balance sheet for the sole Italian component of the bank group.

Overall, the main difference between the two categories of banks concerns their size, which is significantly larger for foreign intermediaries, as one would expect given the fact that these are by definition international banking groups. Foreign banks are more liquid than domestic banks. The quality of the loan portfolio is somewhat worse for domestic lenders, that are nonetheless more profitable as indicated by the higher ROA.[11] When

[10] In computing the liquidity ratio, we do not consider cash because this information is missing for banks in Bankscope.

[11] This comparison is however likely to be significantly distorted by the leverage ratios of Italian banks,

only large domestic intermediaries are considered differences are significantly more muted (Table A1 in the Appendix).

Table 2. Summary statistics

	Domestic			Foreign		
Variable	Obs.	Mean	Median	Obs.	Mean	Median
total assets	7953	4.5	.44	468	673	581
total capital ratio	7852	17.4	13.8	442	13.0	12.4
liquidity ratio	7636	22%	19%	446	35%	32%
funding gap ratio	7867	427%	139%	445	629%	138%
bad loan ratio	7584	4.2%	2.8%	365	3.3%	1.7%
ROA	7838	.35%	.39%	2220	.10%	-.31%

Note: summary statistics for all bank-quarter matches included in the dataset. *total assets* are in billion euro; *total capital ratio* is the ratio of regulatory capital to risk weighted assets; *liquidity ratio* is the ratio of securities other than shares to the sum of securities other than shares and loans; *funding gap* is the ratio of loans to total deposits ratio; *bad loan ratio* is the ratio of bad loans to total loans; *ROA* is the ratio of net income to total assets. Balance-sheet data are consolidated.

Regarding the borrowers, we focus on two main indicators of their creditworthiness and opaqueness, namely total assets and the rating. The relevant summary statistics are presented in the Appendix (Table A2). As Cerved does not survey the universe of borrowers, we are not always able to match a borrower with its balance sheet data. This has no implications for us as first, Cerved is a large dataset which includes data on small firms as well (though these may be under-represented); second, in the baseline regressions we will not use such information; third, as explained in the empirical methodology section, our results do not suffer from possible selection biases since the time-varying firm fixed effects control for all (observable and unobservable) characteristics of the firm. Finally, the firms included in the sample (which by construction are those borrowing at least once from at least one foreign lender) do not exhibit specific characteristics, compared to the whole Cerved population (see Table A2).

6 Results

6.1 The procyclicality of foreign intermediaries

We start off with presenting in table 3 the estimation of the baseline model (equation 1), which tests for the procyclicality of foreign intermediaries' credit supply in response to the Lehman shock.

When credit risk is controlled for with inclusion of the fixed-effects, the *foreign*lehman* coefficient indicates that foreign banks have, on average, restricted their credit supply by 1.5 percentage points on a quarterly basis more than what domestic banks did.[12]

structurally much lower than that of other banking sectors.

[12]Note how here and elsewhere where the fixed effects are taken at the firm/quarter level, the dummy

Table 3. The procyclicality of foreign lending

	(1)	(2)	(3)
Dep. variable	$\Delta \ln L$	$\Delta \ln L$	$\Delta \ln L$
foreign	0.001	0.001	0.001
	(0.005)	(0.003)	(0.004)
foreign*lehman	-0.015***	-0.015***	-0.015**
	(0.005)	(0.004)	(0.006)
Constant	-0.012***	-0.012***	-0.012***
	(0.000)	(0.000)	(0.002)
obs.	1071645	1071645	1071645
R^2			0.260
prob>F	0.002	0.000	
fixed effects	firm/quarter	firm/quarter	firm/quarter
cluster by	firm/quarter	firm	bank

Note: these regressions examine the procyclicality of foreign lenders. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the delta log exposure of a bank toward a borrower between quarter t and $t-1$; *foreign* is a dummy variable taking value 1 if the observation pertains to a branch of a foreign intermediary; *lehman* is a dummy variable taking value 1 if the observation pertains to the period 2008Q4-2010Q4. Sample period is 2007Q4 - 2010Q4. Estimation technique is: panel regression with firm/quarter fixed effects clustered at the firm/quarter level in (1); panel regression with firm/quarter fixed effects clustered at the firm level in (2); panel regression with firm/quarter fixed effects clustered at the bank level in (3).

In the benchmark, we clusters errors at firm/quarter level, allowing errors to be correlated across *different* observations for the *same* firm/quarter (i.e. observations referring to credit granted to the same firm by different banks). However, errors may be correlated among the observations for the same firm at different dates, in which case it is appropriate to cluster by firm (column 2) or among the observations for the same bank at different dates (independently of the firm receiving the credit), in which case it is appropriate to cluster by bank (column 3). The results confirm that clustering does not affect our main result.[13]

Lehman is omitted because of collinearity. Note also, here and in the following tables, that when the errors are clustered the firm/quarter level, the estimation procedure delivers an R squared computed without the contribution of the fixed effects, which explains the poor fit of the model. For this reason, we show the results of the F-test instead, which are more appropriate to evaluate the empirical model.

[13] A number of exercises confirm the robustness of the coefficient on *foreign*lehman* to alternative definitions of the dependent variable (Appendix, table A3). More precisely, we have considered the change in levels of credit rather than credit growth (column 1), and the corresponding variable that accounts for the variation induced by the extension and the reimbursement of a credit line (column 2).

We have further checked whether the larger cut in credit operated by foreign banks has to do with the fact that these intermediaries tend to grant more short-term than long-term credit. If this was the case, the *foreign*lehman* coefficient could simply reflect the fact that short-term exposition can by definition be cut down more rapidly; then, the documented larger cut would be primarily driven by an abnormally slow tightening from part of the domestic banks (because they are relatively more exposed in long-term credit). To control for this, we have estimated the baseline regression including, as a control variable, the share of long-term credit granted, defined at the bank-firm level (and measured at the end of the preceding quarter). The findings indicate that the coefficient on *foreign*lehman* remains negative and significant (it actually increases in magnitude to 0.23***).

Finally, we have investigated whether the restriction was target to specific categories of borrowers. Overall, we could detect a lower contraction only for the top segments for the population of firms, both in terms of size and of risk. In particular, when we estimate model (3) by also including two further interactions of *foreign*lehman* with the dummy *small firm*, which takes value 1 if the borrowing firm's assets fall below the 95th percentile of the distribution, and with the dummy *top rating*, which takes value 1 if the borrowing firm is rated with one of the top three Cerved ratings, we can see that the restriction in lending supply by foreign lenders did not concern very large firms and those with a very good rating (table A4, column 1).

6.1.1 The procyclicality of the extensive margin of credit supply

In this section we focus on the extensive margin of credit supply, namely the opening of new credit lines; the credit growth variable that we have considered in the baseline model captures only the intensive margin of credit supply, meaning the dynamics of the volumes of (existing) credit lines.

To study the extensive margin, we estimate a linear probability model, with the usual firm/quarter fixed effects, for a variable which is meant to capture the propensity of a category of banks (domestic and foreign) to extend new loans.

To do so, we define the variable *new loan* as the ratio between the number of new loans a firm has received by banks in a given category in that quarter, and the total number of banks in that category.[14] We compute this variable for *any possible* triple $\langle i, c, t \rangle$, that is, for any firm i in the sample, any bank category c, and any quarter t in the sample period

We also have looked at the dynamics of credit utilized instead of credit granted (column 3).

[14] While we could have in principle have done so by defining the dependent variable for each bank in the sample, such approach would have complicated the estimation, by leading to an uncontrolled expansion of the dataset, and delivered a dependent variable with a very small mean. Moreover, by doing so one would also have considered as possible matches which are actually not (for example, we would consider not plausible that a small firm in northern Italy apply for a loan with a small bank operating in the southern part of the country).

covered (2007Q4-2010Q4).

Table 4. The procyclicality of foreign lending: the extensive margin

	(1)	(2)
Dep. variable	*new loan*	*new loan*
foreign	-0.087***	-0.087***
	(0.001)	(0.000)
foreign*lehman	-0.028***	-0.028***
	(0.001)	(0.000)
Constant	0.131***	0.131***
	(0.000)	(0.000)
obs.	956332	956332
R^2		0.53
prob> F	.0000	
fixed effects	firm/quarter	firm/quarter
cluster by	firm/quarter	bank category

Note: these regressions examine the procyclicality of foreign lenders on the extensive margin of credit supply. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. For any quarter/firm, the dependent variable is the number of new loans by bank category (foreign, domestic) over the number of lenders in that category; *foreign* is a dummy variable taking value 1 if the observation pertains to a branch of a foreign intermediary; *lehman* is a dummy variable taking value 1 if the observation pertains to the period 2008Q4-2010Q4. Sample period is 2007Q4 - 2010Q4. Estimation technique is: panel regression with firm/quarter fixed effects clustered at the firm/quarter level in (1); panel regression with firm/quarter fixed effects clustered at the bank-category level in (2).

The results, reported in table 4, 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 *foreign*lehman* is negative and significant, both when we cluster the errors at the firm/quarter level (column 1) as well as at bank category level (column 2).

6.2 The determinants of the foreign lenders' procyclicality

6.2.1 The *organizational form* hypothesis

The first hypothesis we consider to explain the larger restriction operated by foreign intermediaries is related to the notion that these intermediaries have a different organizational form and business model. Indeed, as we have seen, foreign lenders tend to be much larger

than their domestic competitors; we know from the literature that, due to a number of reasons, small and large banks tend to behave differently.

Table 5. The organizational form hypothesis

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. variable	$\Delta \ln L$	$\Delta \ln L$	$\Delta \ln L$	$\Delta \ln L$	$\Delta \ln L$	$\Delta \ln L$
foreign	-.014	-0.027***	0.005	0.005	0.004	0.004
	(492.7)	(0.006)	(0.005)	(0.006)	(0.005)	(0.005)
foreign*lehman	-0.15***	-0.015**	-0.015***	-0.015**	-0.015***	-0.015*
	(0.004)	(0.006)	(0.005)	(0.006)	(0.006)	(0.008)
dummy size			-0.005***	-0.005	-0.004	-0.004
			(0.001)	(0.006)	(0.003)	(0.004)
dummy size*lehman					-0.001	-0.001
					(0.003)	(0.005)
Constant	.0012***	0.001	-0.012***	-0.012***	-0.012***	-0.012***
	(0.001)	(0.001)	(0.000)	(0.002)	(0.000)	(0.002)
obs.	949195	949195	1071645	1071645	1071645	1071645
R^2		0.322		0.272		0.272
prob>F	.0000		.0000		.0000	
bank dummies	yes	yes	no	no	no	no
fixed effects	firm/quar.	firm/quar.	firm/quar.	firm/quar.	firm/quar.	firm/quar.
cluster by	firm/quar.	bank	firm/quar.	bank	firm/quar.	bank

Note: these regressions examine the extent to which the organizational form hypothesis can explain the procyclicality of foreign intermediaries' credit supply. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the delta exposure of a bank towards a borrower between quarter t and$t-1$; *foreign* is a dummy variable taking value 1 if the observation pertains to a branch of a foreign intermediary; *lehman* is a dummy variable taking value 1 if the observation pertains to the period 2008Q4-2010Q4; *dummy size* is a dummy that takes value 1 if the total assets of the intermediary granting the credit fall in the highest 10 per cent of the distribution. Sample period is 2007Q4 - 2010Q4. Estimation technique is: panel regression with firm/quarter fixed effects clustered at the firm/quarter level in (1), (3) and (5); panel regression with firm/quarter fixed effects clustered at the bank level in (2), (4) and (6).

To capture these aspects, we first include in the baseline regression the full battery of bank dummies, which capture all time-invariant aspects that characterize each bank, among which, prominently, its organizational form (Table 5, column 1 and 2). Here we cannot include the interaction of each bank dummy with the dummy *lehman*, as this would be collinear with the *foreign*lehman* coefficient, which would not be estimated. However, later on, we will carry out a similar exercise, which will allow us to circumventing the problem (see section 6.2.2)

Next, we look directly at a bank's size, which, although being a rather crude measure of a bank's organizational form, has been widely used to capture how banks conduct their business (see for instance Gambacorta and Marques-Ibanez 2011). In particular,

we include in the baseline regression a dummy that takes value 1 for those intermediaries whose total assets falls in the top 10 per cent of the distribution (among these, we find two Italian banks). As can be seen (Table 5, columns 3 to 6), neither the sign nor the size of the coefficient *foreign*lehman* are impaired with respect to the baseline case by the inclusion of covariates above, although its significance is slightly weakened when we introduce both the dummy *size* and its interaction with the dummy *lehman*; however, the fact that the coefficient on *foreign*lehman* is not affected by such inclusion is particularly important given that the dummy *size* is highly correlated with the dummy foreign (more than 40 per cent). Note also how the *size* dummy is negative, although not significant when we cluster by bank, consistently with what found elsewhere in the literature (Albertazzi and Marchetti, 2010).

While we agree that our approach may be too crude to measure a bank's organization form and business model, we are confident that we do not miss out on important aspects as in the next section we will look at a bank's balance sheet indicators and whether they can explain the intermediary's lending choices. However, for what concerns foreign banks' organizational form, as captured by bank-specific dummies and by size, it does not seem capable of explaining the procyclicality observed in the baseline estimation.

6.2.2 The *international shock propagation* hypothesis

In this section we study whether the documented procyclicality is connected to difficulties experienced by the foreign banks at the parent bank level, which may be either shocks that hit directly the headquarters' balance sheet or economy-wide shocks that hit the country wherein the intermediary is headquartered. In the first case, the observed restriction would be the result of the so-called "international" balance-sheet channel of transmission, according to which parent banks faced with financial difficulties redirect liquidity away from the affiliates and towards the headquarters (see for instance, Ongena et al. 2013 for a study of such mechanisms during the Lehman crisis).

To test this conjecture, we estimate model (2), adding to the baseline specification six balance sheet indicators, that account for how much each bank was hit by the crisis. These are a bank's total regulatory capital; its liquidity ratio; its funding gap; its bad loan ratio; its ROA and the size dummy used in the previous section. As usual, if foreign banks restricted their credit supply by more than domestic banks because of their more important exposure to the crisis, the inclusion of balance sheet indicators should render the coefficient on *foreign*lehman* not significant.

The results displayed in Table 6, however, show that the coefficient on *foreign*lehman* remains negative and statistically significant, which suggests that the international bank balance sheet channel is not the main driver of foreign lenders' procyclicality. This result holds true when we cluster errors by bank (column 2), as the coefficient on *foreign*lehman* remains significant (although at 10 per cent), even if the particularly severe nature of this

clustering weakens the significance of many coefficients.

Table 6. The international shock transmission hypothesis: balance sheet

	(1)	(2)
Dep. variable	$\Delta \ln L$	$\Delta \ln L$
foreign	0.026***	0.026
	(0.004)	(0.017)
foreign*lehman	-0.017***	-0.017*
	(0.004)	(0.010)
total regulatory capital	0.044**	0.044
	(0.018)	(0.040)
liquidity ratio	0.023**	0.023
	(0.010)	(0.052)
liquidity ratio*total regulatory capital	-0.261***	-0.261
	(0.081)	(0.268)
funding gap	-0.000***	-0.000
	(0.000)	(0.000)
bad loans ratio	-0.005	-0.005
	(0.011)	(0.037)
roa	0.885***	0.885***
	(0.688)	(2.333)
dummy size	-0.014***	-0.014*
	(0.001)	(0.008)
Constant	-0.014***	-0.014**
	(0.002)	(0.006)
obs.	894550	894550
R^2		0.337
prob>F	0.000	
fixed effects	firm/quarter	firm/quarter
clustered by	firm/quarter	bank

Note: these regressions examine the extent to which the international bank balance sheet cannel can explain the procyclicality displayed by foreign intermediaries' credit supply. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the delta log exposure of a bank toward a borrower between quarter t and $t-1$; *foreign* is a dummy variable taking value 1 if the observation pertains to a branch of a foreign intermediary; *lehman* is a dummy variable taking value 1 if the observation pertains to the period 2008Q4-2010Q4; *Total capital ratio* is bank's total capital ratio as a difference from its 2007Q4-2008Q4 average; ditto for *liquidity ratio* (securities to securities plus gross loans); *bad loans ratio* (impaired to gross loans); *ROA* (net income to total liabilities and equities); *dummy size* is a dummy that takes value 1 if the total assets of the intermediary granting the credit falls in the highest 10 per cent of the distribution. Sample period is 2007Q4 - 2010Q4. Estimation technique is: panel regression with firm/quarter fixed effects clustered at the firm/quarter level in (1); panel regression with firm/quarter fixed effects clustered at the bank level in (2).

Note also that the estimated coefficients on the balance-sheet covariates have the signs one would have expected. The capital and the liquidity ratio have a positive impact on lending supply, while their interaction takes up a negative sign, suggesting that liquidity is more of a problem for under-capitalized banks (i.e. banks with more difficulties in accessing wholesale funding markets). The funding gap, the bad loan ratio and size have a negative impact on lending, while the ROA takes up a positive sign.

In principle, one could argue that the fact that the balance sheet items are basically contemporaneous to the dependent variable may make way for endogeneity concerns that could impair the estimation of the coefficients. For example, this would be the case if a bank adjusted its capital or liquidity ratio in order to match variations in credit demand. We argue that in our case simultaneity issues are circumvented because (i) we use firm/quarter fixed effects to effectively control for credit demand and risk; (ii) after Lehman, wholesale financial markets were fully disrupted and shares of banks in the stock market collapsed: this made very difficult, for instance, for undercapitalized banks to raise new capital in order to match credit demand and left deleveraging as the only option for these intermediaries; (iii) we look at consolidated balance sheet data: it is unlikely that a large foreign banking group adjusts its capitalitazation or any other balance-sheet indicator just in order to match credit demand in Italy, as the market share of branches of foreign banks in Italy is rather small and the Italian credit market itself represents a small part of the overall foreign bank activities.

As a final exercise to investigate (and rule out) possible endogeneity issues, we have conducted an estimation including into the regression, besides the usual firm/quarter fixed effects, a large set of bank/time fixed effects. Since these effectively control for all bank specific characteristics, even if time varying and/or unobservable, they will control as well for the effect of a bank's balance sheet on its lending dynamics. The shortcoming of this is that, given that this set of fixed effects makes redundant any other regressor which is bank-specific, even if time varying, it cannot test if the coefficient for *foreign*lehman* is negative. What we can do, is instead to check if the differences of such coefficient across types of borrowers, that we have documented above (Table A4, column 1), are observable even once these controls are inserted. The results are shown in column 2 of the same table. Despite the addition of this very large set of fixed effects, the coefficient for the triple interaction *top rating*foreign*lehman* keeps being positive and statistically significant, although at a lower level. This allows us to conclude again that foreign banks behaved procyclically compared to domestic banks, although predominantly towards riskier borrowers, even when bank balance sheet channel is controlled via bank/year fixed effects.

To further investigate the International shock propagation hypothesis, besides testing for the international bank balance sheet channel, we also consider whether the stronger restriction operated by foreign banks reflected the state of the economy at the headquarters' level. Note that by doing so we circumvent the endogeneity concerns that may apply to testing the international bank balance sheet channel, as arguably the state of the economy at the headquarters' country level is fully exogenous to credit supply in Italy

To test for this conjecture, we proceed as before, by including in the regressions measures of such shocks in order to verify if the coefficient on *foreign*lehman* becomes insignificant. In practice, we add to the baseline regression two indicators of the relative severity with which a foreign country' financial sector and real economy have been hit by the crisis compared to Italy (rsi, or relative severity index).

Table 7. The international shock propagation hypothesis: stock prices and economic outlook

	(1)	(2)	(3)	(4)
Dep, variable	$\Delta \ln L$	$\Delta \ln L$	$\Delta \ln L$	$\Delta \ln L$
foreign	0.001	0.001	-0.006	-0.006
	(0.005)	(0.004)	(0.005)	(0.004)
foreign*lehman	-0.015***	-0.015**	-0.014***	-0.014**
	(0.005)	(0.006)	(0.005)	(0.006)
rsi_{SP}	-0.003	-0.003		
	(0.007)	(0.009)		
rsi_{GDP}			0.007***	0.007***
			(0.001)	(0.002)
Constant	-0.012***	-0.015**	-0.013***	-0.013***
	(0.000)	(0.006)	(0.000)	(0.002)
obs.	1071556	1071556	1068148	1068148
R^2		0.272		0.272
Prob>F	0.000		0.000	
fixed effects	firm/quart.	firm/quart.	firm/quart.	firm/quart.
clustered by	firm/quart.	bank	firm/quart.	bank

Note: these regressions examine the extent to which the international shock propagation hypothesis can explain the procyclicality of foreign intermediaries' credit supply. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the delta log exposure of a bank toward a borrower between quarter t and $t-1$; *foreign* is a dummy variable taking value 1 if the observation pertains to a branch of a foreign intermediary; *lehman* is a dummy variable taking value 1 if the observation pertains to the period 2008Q4-2010Q4; *rsiSP* is a dummy taking value 1 if the foreign bank that grants the loan in the dependent variable is headquartered in a country *less* severely hit than Italy on the basis of bank stock prices' comparison; *rsiGDP* is a similar indicator based on GDP deveolpments. Sample period is 2007Q4 - 2010Q4. Estimation technique is: panel regression with firm/quarter fixed effects clustered at the firm/quarter in (1) and (3); level panel regression with firm/quarter fixed effects clustered at the bank level in (2) and (4).

The first is the dummy rsi_{SP} that takes value 1 if a foreign bank is from a country *less* hit by the crisis (than Italy) on the basis of a comparison between the developments of stock price indexes (i.e. relative to the whole banking sector in Italy and in the country of origin; we are not considering the stock price of the individual bank); the second is the dummy rsi_{GDP} that similarly takes value 1 if a foreign bank comes from a country *less* severely hit by the crisis on the basis of a comparison between the developments of

GDP.[15]

The results of this test (Table 7) show that the *foreign*lehman* coefficient remains significant and negative to the addition of the two covariates, both when we cluster errors at the firm/quarter as well as the bank level.

Further, when also including the interaction of the dummy rsi_{SP} with the dummy *foreign*lehman*, we observe that banks headquartered in countries whose banking sector stock price index experienced the most severe losses have passed on a milder restriction of credit supply in Italy, probably reflecting a more limited re-composition of their lending portfolio towards their domestic (and deteriorated) credit market. This evidence runs against what one would expect if the international bank lending channel of shock transmission were the main driving force of the observed procyclicality.

Together with the results on banks' balance sheet channel presented above, the evidence presented in this section indicates that the international shock propagation hypothesis is not sufficient to explain the procyclicality of foreign banks' lending.

6.2.3 The *functional distance* hypothesis

The last hypothesis we put forward moves from the consideration that the global financial crisis determined a sudden and unexpected increase in the credit risk associated with funding Italian borrowers, which in turn increased banks' risk-management costs, in a way directly proportional to their distance from the local borrowers. Accordingly, it may have become more convenient for more distant banks to directly cut on lending, determining the observed procyclicality; we call this hypothesis "functional distance".

The notion of functional distance, as those of shock transmission and organizational form, is often elusive, but the fact that such a channel is at work is supported by the finding that the procyclicality has been induced more by those foreign banks headquartered outside the Euro Area, and less so by those within it.

Indeed, substituting the *foreign* dummy in the baseline regression with three dummies that single out foreign banks according to their being part of a increasingly farther economic areas (Euro area, other European Union countries and Rest of the World; Table A5), the interactions of these new dummies with the dummy *lehman* show that foreign banks resident in a country in the Euro Area, which is likely the "functionally closest", or in the European Union, did not behave in a statistically different way from domestic banks; banks headquartered in the Rest of the World, instead, restricted credit significantly more.

Similarly, taking advantage of the Doing Business database we estimate model (2) by adding to the baseline regression a measure of the difference in the investors' protection index and years taken to resolve insolvency cases between the country of residence of the foreign intermediary and Italy (see also Mian 2006 for a study of the effects of cultural -and geographic- distance on lending policies). Both indicators show that the larger such difference the more negative the impact on local credit supply; further the higher

[15] More precisely, to calculate rsi_{SP} we used Datastream information to compute the delta in banks' stock prices index between 2008Q4 and 2010Q4. Next, we assigned value 1 to those countries that experienced a smaller decrease than Italy (and zero to those that experience a larger one, that is, Spain, the Netherlands, Iceland, the US, the UK and Japan). The dummy rsi_{GDP}, instead, assigns value 1 to those countries less hit by the crisis in terms of their GDP performance (and zero to those more severely hit, which are Spain, Finland, Slovenia, the UK and the US).

such differences the stronger the credit restriction operated after the collapse of Lehman brothers (see Table A6).

An alternative way to examine the role of functional distance is to look at whether a foreign bank operates in the destination market as branch or as a subsidiary. Up to now, to reflect the different supervisory regime, we have classified subsidiaries as domestic banks, also in virtue of a few studies have documented that subsidiaries of foreign banks are more akin to domestic banks in terms of retail funding and presence on the territory (see Barba Navaretti et al. 2010).[16]

However, the decision to enter a foreign market with a subsidiary usually is the result of an acquisition procedure that preserves the acquired bank's local brand, which suggests the foreign intermediary's intention to establish a "closer" presence in the local market, especially given that branches could in principle focus also on retail activities (and sometimes successfully did so). Indeed, we show that if we had classified subsidiaries of foreign banks as foreign banks, the estimated magnitude of foreign procyclicality would have been lower than what we found (Table A7, column 1). Further, the inclusion of the dummy *branch* in such regression shows that indeed the difference between foreign and domestic banks observed in the post-Lehman is ascribable to branches only (column 2).

Our main test of functional distance looks at the notion of local funding gap, i.e. the ratio of loans to deposits computed at the unconsolidated level. Such indicator captures by how much the bank is actually "present on" the territory by scaling down its lending activities by the amount of retail deposits it collects locally. We proceed as before, by adding the covariate *local funding gap* to the baseline regression.

The results in Table 8 confirm our hypothesis: the direct effect of the local funding gap on lending policies is always statistically significant at 1%, while the significance of the interaction of *foreign*lehman* goes down when we add the additional covariate (column 1 and 2) and it disappears when we add the other interaction terms (column 3 and 4). Accordingly, we conclude that this indicator largely captures what has driven foreign banks' procyclicality.[17]

Functional "closedness" is a concept that captures those banks which rely on a stable permanence on the local territory: one alternative way to test this hypothesis is to consider a direct measure of the extent of credit relationship. We define the variable *relationship lending* as the share of total credit granted in quarter t to firm i from bank b as a percentage of the total credit granted to that firm in that quarter.

[16] Concerning the supervisory regimes, branches are subject to a supervisory model significantly different from that applied to subsidiaries of Italian law: the controls on the first are entrusted almost entirely to the authorities of the Member States of origin, with the notable exception of liquidity risk, which is monitored by the authorities of the host countries. Controls on subsidiaries are instead more intense and similar to those on Italian banks.

[17] Note also that while it may be argued that the local funding gap could reflect the international propagation of shock (to the extent that is eventually influenced by the consolidated funding gap at the headquarters' level), we can exclude this concern, since the results just presented also holds in a specification when both measures are simultaneously considered).

Table 8. The functional distance hypothesis: local funding gap

	(1)	(2)	(3)	(4)
Dep. variable	Δ lnL	Δ lnL	Δ lnL	Δ lnL
foreign	0.005	0.005	-0.005	-0.005
	(0.005)	(0.005)	(0.004)	(0.006)
foreign*lehman	-0.013**	-0.013*	-0.005	-0.005
	(0.006)	(0.007)	(0.005)	(0.004)
local funding gap	-0.009***	-0.009***	-0.009***	-0.009***
	(0.000)	(0.002)	(0.001)	(0.002)
local fund. gap*foreign			0.007*	0.007
			(0.004)	(0.005)
local fund. gap*lehman			0.000	0.000
			(0.001)	(0.002)
local fund. gap*for.*lehman			-0.005	-0.005
			(0.004)	(0.005)
Constant	-0.002***	-0.002	-0.002***	-0.002
	(0.000)	(0.002)	(0.000)	(0.002)
obs.	935275	935275	935275	935275
R^2		0.324		0.324
Prob>F	0.000		0.000	
fixed effects	firm/quarter	firm/quarter	firm/quarter	firm/quarter
clustered by	firm/quarter	bank	firm/quarter	bank

Note: these regressions examine the extent to which the functional distance hypothesis can explain the procyclicality of foreign intermediaries' credit supply. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the delta log exposure of a bank toward a borrower between quarter t and $t-1$; *foreign* is a dummy variable taking value 1 if the observation pertains to a branch of a foreign intermediary. *local funding gap* is the ratio of loans to deposit (in percentage points) computed at the unconsolidated level for branches of foreign banks. Sample period is 2007Q4 - 2010Q4. Estimation technique is: panel regression with firm/quarter fixed effects clustered at the firm/quarter level in (1) and (3), and at the bank level in (2) and (4) .

We find that our relationship lending variable has a direct, significant and positive effect on lending dynamics (Table 9). The dummy *foreign*lehman* is somewhat weakened but remains significant. Further, its interaction with the dummy *foreign* is negative and significant, suggesting that banks in this category tend to provide less intense credit relationship than domestic banks. These results remain robust when we cluster errors at the bank level.

Table 9. The functional distance hypothesis: relationship lending

	(1)	(2)
Dep. variable	Δ lnL	Δ lnL
foreign	0.009*	0.026***
	(0.005)	(0.008)
foreign*lehman	-0.010**	-0.016*
	(0.005)	(0.009)
relationship lending	0.002***	0.002***
	(0.000)	(0.000)
relationship lending*foreign		-0.001***
		(0.000)
relationship lending*lehman		0.000
		(0.000)
relationship lending*for.*lehman		0.000
		(0.000)
Constant	-0.073***	-0.073***
	(0.001)	(0.001)
obs.	1071645	1071645
prob>F	0.0000	0.0000
fixed effects	firm/quart.	firm/quart.
clustered by	firm/quart.	firm/quart.

Note: these regressions examine the extent to which the functional distance hypothesis can explain the procyclicality of foreign intermediaries' credit supply. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the delta log exposure of a bank toward a borrower between quarter t and $t-1$; *foreign* is a dummy variable taking value 1 if the observation pertains to a branch of a foreign intermediary; *lehman* is a dummy variable taking value 1 if the observation pertains to the period 2008Q4-2010Q4; *relationship lending* is the share of credit obtained by firm i from bank b in quarter t as the percentage of the total credit received by firm i in that quarter. Sample period is 2007Q4 - 2010Q4. Estimation technique is: panel regression with firm/quarter fixed effects clustered at the firm/quarter level.

Importantly, the ability of the local funding gap variable to explain the procyclicality captured by the coefficient on *foreign*lehman* is robust to the inclusion of all the variables that we examined so far (size, balance sheet indicators and macroeconomic and financial conditions of the countries where foreign banks are headquartered).

6.3 The efficiency of foreign lending

It is natural to ask how distance and the international shock propagation hypothesis interact. In our view this is interesting, as it bears implications regarding the efficiency of credit flows with foreign intermediaries. Obviously this type of question is particularly complex: while we do not aim at providing a fully-fledged answer to such crucial question, the simple econometric exercise we present in this section can shed some light on the issue.

Table 10. The efficiency of foreign lending

	(1)	(2)	(3)	(4)
Dep. variable	Δ lnL	Δ lnL	Δ lnL	Δ lnL
foreign	0.000	0.000	0.000	0.000
	(0.004)	(0.005)	(0.004)	(0.005)
foreign*lehman	-0.014**	-0.014***	-0.014**	-0.014***
	(0.006)	(0.005)	(0.006)	(0.005)
rsi_{SP}	0.017	0.017	0.032***	0.032*
	(0.010)	(0.012)	(0.011)	(0.017)
rsi_{SP}*foreign*lehman	0.052*	0.052	-0.043***	-0.043**
	(0.028)	(0.246)	(0.015)	(0.019)
Func. distance	Euro Area	Euro Area	other	other
Constant	-0.012***	-0.012***	-0.012***	-0.012***
	(0.002)	(0.000)	(0.002)	(0.000)
obs.	1067610	1067610	1071556	1071556
Prob>F		0.000		0.000
R^2	0.271		0.272	
fixed effects	firm/quarter	firm/quarter	firm/quarter	firm/quarter
clustered by	bank	firm/quarter	bank	firm/quarter

Note: these regressions explore the connection between the international shock propagation hypothesis and functional distance. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the delta log exposure of a bank toward a borrower between quarter t and $t-1$; *foreign* is a dummy variable taking value 1 if the observation pertains to a branch of a foreign intermediary; *lehman* is a dummy variable taking value 1 if the observation pertains to the period 2008Q4-2010Q4; $rsiSP$ is dummy taking value 1 if the foreign bank that grants the loan in the dependent variable is headquartered in a country less severely hit than Italy on the basis of stock prices' comparison. Sample period is 2007Q4 - 2010Q4. Estimation technique is: panel regression with firm/quarter fixed effects clustered at the firm/quarter level.

In particular, one could classify cross-border lending flows by distinguishing those that are coherent with some risk sharing scheme (i.e. a country hit by a negative shock "absorbs" resources from aboard) and those which are not. In the latter case, 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).

To conduct this test, we run the baseline specification augmented with our measure of the intensity with which the financial sector of the country where foreign banks are headquartered has been hit by the crisis (rsi_{SP}) interacted with the dummy *foreign*lehman*. The results in Table 10 show that when the credit flows involve banks from "closer" countries, credit flows are compatible with ex-ante efficient flows (i.e. those coherent with risk sharing), while this appears not to be the case when international lending is conducted with farther away banks.

In particular, the results confirm our conjecture that foreign banks headquartered in closer countries which have been relatively less hit by the crisis than Italy, in terms of financial markets developments, transmitted *less* of a restriction than foreign banks similarly hit by the crisis but located farther away from Italy. In other words, for closer banks, the restriction was related to the intensity of the financial shock experienced at home, while this is less true for banks located farther away.[18]

6.4 The substitutability of foreign credit

From the point of view of the borrowers, the high procyclicality of foreign lenders may not be troublesome, to the extent that they are able to substitute out shrinking funding sources with other, more available, ones. To assess the extent to which Italian firms have been able to do so, 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 (which we call $foreign_exposure_{ft-1}$),

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

If firms have not been able to fully substitute the reduction in foreign funding sources that we have documented for the post Lehman period, then the estimated a_2 coefficient should be negative. Conducting this exercise, however, encounters the same identification issues discussed above. Precisely, if some firms select into borrowing from foreign instead of from domestic banks, $foreign_exposure_{ft-1}$ could be correlated with unobservable demand shocks, rendering biased an estimation of a_2 which does not take into account demand conditions. 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.

[18] A 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 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.

Table 11. Substitutability of foreign credit

	(1)	(2)	(3)
	$\Delta \ln L_{TOT}$	$\Delta \ln L_{TOT}$	$\Delta \ln L_{TOT}$
exposure toward a foreign bank	-0.000	0.000*	-0.000
	(0.000)	(0.000)	(0.000)
exposure*lehman	-0.000	0.00002	-0.00009***
	(0.000)	(0.000)	(0.000)
lehman	-0.008***	-0.020***	-0.001
	(0.001)	(0.001)	(0.001)
estimated demand FE			0.791***
			(0.014)
Constant	0.010***	0.015***	-0.010***
	(0.001)	(0.002)	(0.001)
obs.	347611	347611	323853
R^2	0.000		0.390
prob>F		.0001	
fixed effects	no	firm	estimated firm/quarter
clustered by		firm	

Note: these regressions examine the extent to which Italian borrowers have been able to substitute foreign with domestic funding. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the delta log in total credit granted to a borrower i from quarter t-1 to t; *lehman* is a dummy variable taking value 1 if the observation pertains to the period 2008Q4-2010Q4; *exposure towards a foreign bank* is borrower i's credit granted in quarter t-1 by foreign lenders; *estimated demand fixed effects* is the firm/quarter fixed effects estimated in the baseline equation. Sample period is 2007Q4 - 2010Q4. Estimation technique is: OLS in (1); panel regression with firm fixed effects clustered at the firm level in (2); OLS in (3).

Table 11 presents the relevant estimates. If the unobservable demand dynamics are not or only partially -with firm fixed effects- controlled for (column 1 and 2), it results that being exposed to a foreign lender did not cause distress for borrower, as the coefficient on the *exposure* variable interacted with the *lehman* dummy is not significant. However, if we include the estimated fixed effects $\hat{d}_{ft}$, it turns out that borrowers encountered difficulties in substituting foreign funding with other sources, and this finding is significant at the 1% level.

Back of the envelope calculation show that on average, a borrower with a reliance on foreign credit in the 25th percentile (0 per cent of total credit) displayed 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).[19]

[19]This 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 form the estimation of another regression,

7 Conclusions

In this work, we have investigated whether after the outburst of the global financial crisis foreign banks operating in Italy behaved more procyclically than domestic banks and what could explain this different behavior.

Our findings document that the post-Lehman contraction of the credit extended by foreign banks, sharper than that of their domestic competitors, reflects less favorable supply dynamics and does not (just) result from a stronger weakening of the demand side. This is true both when we look at the total amount of credit granted and at the openings of new credit lines (i.e. the intensive and extensive margins). The harsher contraction of lending supply operated by foreign banks is rather widespread across borrowers, although it did not concern very large borrowers or very high quality firms.

Concerning the determinants of such procyclicality, we observe that it can be explained only in minor part by the fact that foreign banks tend to be very large institutions, suggesting that the organizational form of foreign intermediaries did not constitute the main driving force of their lending behavior. This view is further corroborated by estimations in which the organization form of a bank is controlled by a set of bank dummies.

Turning to the international propagation of shocks, developments in the balance sheet conditions of individual banks explain at most part of foreign lenders procyclicality, although they affected its intensity. This is confirmed when, instead of banks balance sheet conditions, we look at the economic conditions of the country in which foreign banks are headquartered.

Our findings document instead that the behavior of foreign lenders has been strongly influenced by the functional distance between their headquarters and Italy. We show that the credit restriction has been predominantly operated by lenders with a higher ratio of loans extended in Italy to deposits also raised locally (the local funding gap), banks which can be thought of as less deeply involved with the local economy. In a similar vein, we also demonstrate that the procyclicality is almost entirely induced by branches of foreign banks rather than by foreign subsidiaries. To corroborate the interpretation of these findings in terms of distance, we also show that the foreign lenders' procyclicality was stronger for credit relationships in which the (foreign) bank is not the main lender of the borrowing firm.

We show that distance also influences the relationship between the financial condition of the country of origin and lending supply in Italy. More precisely, we document that among banks headquartered in distant countries the lending restriction operated in Italy was more intense for those intermediaries based in economies which financial sector has been less hit by the crisis, while the opposite is true for closer economies. We argue that this evidence provides interesting normative indications, as it implies that the cross-border flows of credit among functionally close countries is coherent with some notion of risk sharing.

Finally, we find that Italian firms have been able to compensate only partially the

they are measured with some noise (generated regressor problem). The sign of the estimated coefficients for both D proxy and *exposure*lehman* and the negative correlation between these two regressors (-0.0061***) suggest that we might be over-estimating the coefficient for *exposure*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.

contraction of lending supply by foreign banks, through a greater recourse to credit from domestic intermediaries.

To draw some concluding considerations, our results suggest that foreign intermediaries that establish a steady presence in the host-country, with such commitment measurable by the extent to which the bank interfaces itself with retail customers, contribute less to the procyclicality that generally accompanies financial integration. Also, according to our analysis, foreign intermediation seems to be more desirable when it involves banks headquartered in areas that are geographically 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.

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9 Appendix

Table A1. Summary statistics:large domestic and foreign banks

	Largest 5 domestic			Foreign		
Variable	Obs.	Mean	Median	Obs.	Mean	Median
total assets	58	206	184	468	673	581
total capital ratio	56	10.5	10.4	442	13.0	12.4
liquidity ratio	58	61%	54%	446	35%	32%
funding gap ratio	58	842%	155%	445	1252%	138%
bad loan ratio	48	2.9%	1.7%	365	3.3%	1.7%
ROA	56	.53%	.52%	2220	.10%	-.31%

Note: summary statistics for all bank-quarter matches included in the dataset. *total assets* are in billion euro; *total capital ratio* is the ratio of regulatory capital to risk weighted assets; *liquidity ratio* is the ratio of securities other than shares to the sum of securities other than shares and loans; *funding gap* is the ratio of loans to total deposits ratio; *bad loan ratio* is the ratio of bad loans to total loans; *ROA* is the ratio of net income to total assets. Balance-sheet data are consolidated.

Table A2. Summary statistics: firms

	sample			Cerved		
Variable	Obs.	Mean	Median	Obs.	Mean	Median
assets	756345	35.1	3.51	614264	41.1	6.6
self-financing	573269	0.3	0.1	518757	1.1	0.2
roe	542035	2.1%	5.4%	553460	2.2%	5.0%
rating	804787	.28	0	593184	.33	0

Note: summary statistics for the sample are based on all firm/quarter matches included in the dataset pertaining to firms which are also reported in Cerved; summary statistics for Cerved are based on yearly balance sheets for all firms included in that database (for computational reasons only year 2010 is considered). Assets are in million euros; rating is a dummy variable taking value 1 for firms with Z-score higher than or equal to 7.

Table A3. Main robustness tests
on the benchmark specification

	(1)	(2)	(3)
Dep. variable	ΔL	ΔL_{fillin}	$\Delta \ln L_{uti}$
foreign	0.009***	0.001	0.071***
	(0.002)	(0.001)	(0.014)
FOLE	-0.011***	-0.002**	-0.075***
	(0.002)	(0.001)	(0.016)
Constant	0.008***	0.000	-0.000
	(0.000)	(0.000)	(0.001)
obs.	1156173	1150043	1088281
prob>F	0.000	0.000	0.002
fixed effects	firm/quarter	firm/quarter	firm/quarter
cluster by	firm/quarter	firm/quarter	firm/quarter

Note: these regressions examine the robustness of the procyclicality of foreign lenders to alternative definitions of the dependent variable. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is: in (1) the delta exposure of a bank towards a borrower between quarter t and $t-1$; in (2) the delta exposure of a bank toward a borrower between quarter t and $t-1$ including the delta induced by the reimbursement of the loan; in (3) the delta credit utilized -rather than granted- of a bank toward a borrower between quarter t and $t-1$; $foreign$ is a dummy variable taking value 1 if the observation pertains to a branch of a foreign intermediary; *lehman* is a dummy variable taking value 1 if the observation pertains to the period 2008Q4-2010Q4. Sample period is 2007Q4 - 2010Q4. Estimation technique is: panel regression with firm/quarter fixed effects clustered at the firm/quarter level.

Table A4. Foreign lending by borrower's type

	(1)	(2)
Dep. variable	Δ lnL	Δ lnL
foreign	-0.000	-.056***
	(0.009)	(.012)
foreign*lehman	-0.000	-.006
	(0.011)	(.011)
dummy small firm*foreign	0.007	.001
	(0.010)	(.010)
dummy small firm*foreign*lehman	-0.020*	-.012
	(0.011)	(.011)
top rating*foreign	-0.005	-.005
	(0.005)	(.005)
top rating*foreign*lehman	0.013**	.012*
	(0.006)	(.006)
Constant	-0.013***	.010***
	(0.000)	(.002)
obs.	522277	465801
prob>F.	0.000	
fixed effects	firm/quarter	firm/quarter & bank/year
clustered by	firm/quarter	firm/quarter

Note: these regressions examine whether the procyclicality of foreign lenders was targeted to particular segment of borrowers, even when time varying and invariant bank characteristics are controlled for via bank/year fixed effects. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the delta log exposure of a bank towards a borrower between quarter t and $t-1$ (we exclude outliers below the 1st percentile and above the 99th); $foreign$ is a dummy variable taking value 1 if the observation pertains to a branch of a foreign intermediary; *lehman* is a dummy variable taking value 1 if the observation pertains to the period 2008Q4-2010Q4; *dummy small firm* is a dummy that takes value 1 if the borrower's size in total assets is below the 95th percentile; *top rating* is a dummy taking value 1 if the borrower's Cerved rating is one of the three best available (out of nine; firms with no rating are classified as missing). Sample period is 2007Q4 - 2010Q4. Estimation technique is panel regression with firm/quarter fixed effects clustered at the firm/quarter level.

Table A5. The functional distance hypothesis: economic area

	(1)	(2)
Dep. variable	$\Delta \ln L$	$\Delta \ln L$
foreign$_{EUROarea}$	-0.007***	-0.007***
	(0.002)	(0.003)
foreign$_{EuropeanUnion}$	-0.008	-0.008
	(0.023)	(0.031)
foreign$_{RestoftheWorld}$	0.001	0.001
	(0.005)	(0.004)
foreign$_{EUROarea}$*lehman	0.005*	0.005
	(0.003)	(0.004)
foreign$_{EuropeanUnion}$*lehman	-0.045*	-0.045
	(0.025)	(0.032)
foreign$_{RestoftheWorld}$*lehman	-0.013**	-0.013**
	(0.005)	(0.005)
Constant	-0.009***	-0.009***
	(0.001)	(0.003)
obs.	1071645	1071645
R^2		0.272
prob>F	0.000	
fixed effects	firm/quarter	firm/quarter
clustered by	firm/quarter	bank

Note: these regressions examine the extent to which the functional distance hypothesis can explain the procyclicality of foreing intermediaries' credit supply. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. $foreignEUROarea$ is a dummy that takes value 1 if the observation refers to a branch of a foreign bank which is headquartered in the Euro Area; ditto for $foreignEuropeanUnion$ and $foreignRestOfTheWorld$; $lehman$ is a dummy variable taking value 1 if the observation pertains to the period 2008Q4-2010Q4. Sample period is 2007Q4 - 2010Q4. Estimation technique is: panel regression with firm/quarter fixed effects clustered at the firm/quarter level in (1) and panel regression with firm/quarter fixed effects clustered at the bank level in (2).

Table A6 The functional distance hypothesis: cultural distance

	(1)	(2)	(3)	(4)
foreign	-0.014	-0.014	0.010	0.010
	(0.011)	(0.009)	(0.025)	(0.012)
foreign*lehman	-0.015***	-0.015**	-0.045*	-0.045***
	(0.005)	(0.006)	(0.026)	(0.017)
years taken to resolve insolvencies	-0.000	-0.000	0.007	0.007**
	(0.002)	(0.002)	(0.005)	(0.003)
degree of investor protection	-0.007***	-0.007***	-0.005	-0.005
	(0.002)	(0.002)	(0.006)	(0.004)
inv. prot.*foreign*lehman			-0.003	-0.003
			(0.006)	(0.005)
years to res. ins.*foreign*lehman			-0.009*	-0.009*
			(0.005)	(0.005)
Constant	-0.012***	-0.012***	-0.012***	-0.012***
	(0.000)	(0.002)	(0.000)	(0.002)
obs.	1071502	1071502	1071502	1071502
R^2		0.272		0.272
prob>F	0.000		0.000	
fixed effects	firm/quarter	firm/quarter	firm/quarter	firm/quarter
clustered by	firm/quarter	bank	firm/quarter	banks

Note: these regressions examine the extent to which the functional distance hypothesis can explain the procyclicality of foreign intermediaries' credit supply. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the delta log exposure of a bank toward a borrower between quarter t and $t-1$; *foreign* is a dummy variable taking value 1 if the observation pertains to a branch of a foreign intermediary; *lehman* is a dummy variable taking value 1 if the observation pertains to the period 2008Q4-2010Q4; *years taken to resolve insolvencies* is the difference in years between the years taken to resolve an insolvency in Italy and in the country where the bank is headquartered (i.e. it is zero for domestic banks); ditto for the *degree of investors protection*. Sample period is 2007Q4 - 2010Q4. Estimation technique is: panel regression with firm/quarter fixed effects clustered at the firm/quarter level in (1) and (3) and panel regression with firm/quarter fixed effects clustered at the bank level in (2) and (4).

Table A7. The procyclicality of foreign lending by affiliate's type

	(1)	(2)
Dep variable	$\Delta \ln L$	$\Delta \ln L$
all foreign banks	0.005**	0.007***
	(0.002)	(0.002)
all foreign banks*lehman	-0.008***	-0.004
	(0.002)	(0.003)
branch		-0.005
		(0.005)
branch*foreign		0.000
		(0.000)
branch*lehman		0.000
		(0.000)
branch*all foreign banks *lehman		-0.011**
		(0.006)
Constant	-0.003***	-0.013***
	(0.001)	(0.000)
obs.	1071645	1071645
prob>F	0.002	.000
fixed Effects	firm/quarter	firm/quarter
cluster by	firm/quarter	firm/quarter

Note: these regressions examine whether the procyclicality of foreign intermediaries' credit supply was passed on by branches or subsidiaries. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the delta log exposure of a bank toward a borrower between quarter t and $t-1$; *lehman* is a dummy variable taking value 1 if the observation pertains to the period 2008Q4-2010Q4; *all foreign banks* is a dummy variable taking value 1 if the observation pertains to a foreign intermediary, either branch or subsidiary; *branch* is a dummy variable taking value 1 if the observation pertains to a foreign intermediary which operates as a branch. Sample period is 2007Q4 - 2010:Q4. Estimation technique is: FE with firm/quarter fixed effects clustered at the firm/quarter level in (1) and (2); FE with firm/quarter fixed effects clustered at the bank level in (2).