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Evidence from matched bank-firm data

by Silvia Del Prete and Stefano Federico

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TRADE AND FINANCE: IS THERE MORE THAN JUST “TRADE FINANCE”? EVIDENCE FROM MATCHED BANK-FIRM DATA

by Silvia Del Prete* and Stefano Federico**

Abstract

Using unique matched bank-firm data on export, import and ordinary loans for a large sample of Italian manufacturing exporters for the years 2007-2010, this paper investigates the role of trade finance in a credit shock. We find that the credit shock faced by exporters in the aftermath of the Lehman Brothers’ collapse was due more to a diminished availability of ordinary loans than to specific constraints in trade finance. We also show that the credit shock had a negative impact on exports: firms, especially financially distressed ones, that borrowed from banks which were more exposed to a negative funding shock exported less compared with firms that borrowed from less exposed intermediaries.

JEL Classification: G21, F14, F30, G30, L20.

Keywords: trade finance, trade collapse, credit shocks, export loans.

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1 Introduction¹

The role of banks in international trade has been subject to greater scrutiny since the trade collapse in the recent economic crisis, resulting in a rich literature being produced (for a recent survey, see Bems et al. 2013). Some studies argue that credit shocks were responsible for a significant fraction of the decrease in trade flows in 2008-2009 (Amiti and Weinstein 2011, Bricongne et al. 2012, Chor and Manova 2012, Paravisini et al. 2011), while other studies find that the trade collapse was largely due to demand factors (Eaton et al. 2011, Levchenko et al. 2011).

A major limitation of this literature is related to how “trade finance” is measured.² Due to data availability issues, almost all of the empirical studies use sector-level indicators of external finance dependence and trade credit intensity, which are only weakly correlated with trade finance. Amiti and Weinstein (2011) and Paravisini et al. (2011) use matched bank-firm data, but do not observe the actual amount of credit specifically devoted to export or import activities.

Another important limitation of this literature is the lack of knowledge of the channels through which credit supply shocks impact on trade. From a theoretical point of view, banks contribute to international trade in several ways (see Figure 1 for a simplified diagram). First, they facilitate cross-border payments acting as guarantors of commercial transactions through instruments such as letters of credit. Second, they provide short-term loans to finance export working capital and imports of intermediate inputs. Third, they provide other short-term loans, mainly for liquidity management purposes, and long-term loans for investments that expand firms’ production capacity for

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²Following Amiti and Weinstein (2011) and Chor and Manova (2012), we use the term “trade finance” to refer to lending by banks and other financial institutions to firms for international trade activities. “Trade credit” refers instead to credit between a firm and its buyers which follows commercial transactions without immediate payments.

exports. There is very little evidence in the literature on the relative importance of these channels.

Ideally, for each bank-firm relationship it would be preferable to observe not only the total amount of loans but also the amount of loans explicitly provided to finance exports or imports. To this end, we use a unique matched bank-firm dataset of a large sample of Italian firms, which account for almost half of Italy's exports of goods. Loans and guarantees provided by banks to firms are disaggregated, crucially, according to loan destination (export, import or other activity). To the best of our knowledge, this is the first study in which loans for export or import transactions are observed in a matched bank-firm dataset.³

We contribute to the empirical literature in several ways. First, we report a set of stylized facts on trade finance. This represents a contribution to the existing body of knowledge, which is traditionally based on aggregate surveys or evidence from a single exporter. We then exploit ex-ante variation in banks' exposure to foreign funding as an instrument for the decrease in credit supply in the aftermath of Lehman Brothers. Using our detailed data on loan types, we are able to investigate how the Lehman shock affected the supply of trade finance versus ordinary lending. This is our second and pivotal contribution, since previous studies using matched bank-firm data only looked at the total amount of credit. We then estimate the effect of the overall credit supply shock on firm exports, thus extending the available evidence to an advanced economy.

On top of the unique richness of our data, Italy is an interesting case to study for two additional reasons. First, its financial system is largely bank-driven. Distortions in credit supply may therefore have a more sizable impact on trade in comparison to other countries. Second, Italy is an export-oriented economy, with a strong manufacturing base and close trade integration with several countries.

Our main finding is that the credit shock faced by exporters in the aftermath of the Lehman Brothers' collapse was due more to a diminished availability of ordinary loans

³The only exception we are aware of is Zia (2008), who uses matched bank-firm data on Pakistan to examine the effects of a shock to the supply of subsidized export loans on firms in the textile sector.

than to specific constraints in trade finance. This might be related to the short-term and low-risk nature of export and import loans.

The rest of the paper is organized as follows. In Section 2 we discuss related literature. Section 3 describes the data, while Section 4 reports descriptive statistics on trade finance. Section 5 presents our results on the effect of bank liquidity shocks on the supply of trade finance versus ordinary lending. Section 6 focuses on the effects of the credit supply shock on exports. Section 7 concludes.

2 Related literature

Our study is related to three main lines of research: the literature on financial shocks and trade, the literature on international trade finance practices and the literature on the “real effects of finance” and the “credit channel”.

The first line of research suggests that exporters are particularly vulnerable to financial market frictions. There are various reasons why financial shocks may matter more for exports than for domestic sales (see the discussion in Amiti and Weinstein 2011, Feenstra et al. 2013). First, cross-border shipments often take considerably longer than domestic shipments: the longer time-lag between production and delivery of goods to the importer increases the risks of contractual non-compliance, as well as the need for short-term working capital financing. Second, enforcing payments across country boundaries might be difficult, especially in distant countries with a different legal system. Third, exporting may require additional fixed costs that need to be financed. Thus, shocks originating from the bank lending channel are potentially relevant for firms’ trade activity.

The vast majority of studies use indirect proxies of trade finance. Specifically, Chor and Manova (2012) approximate trade finance with cross-industry measures of external finance dependence, trade credit intensity and asset tangibility. Using U.S. monthly trade data by partner country and sector, they find that, in countries with higher interbank rates, exports in financially vulnerable sectors declined more during the financial crisis.

Using a similar set of trade finance indicators, other studies find much weaker evidence on the impact of financial factors on trade (Levchenko et al. 2011). Among firm-level studies, Bricongne et al. (2012) and Coulibaly et al. (2011) find that more financially vulnerable exporters experienced larger declines in sales during the crisis, while Behrens et al. (2013) do not find support for the hypothesis that financial shocks matter more for exports than for domestic sales during the trade collapse.⁴ As argued by Ahn et al. (2011), however, financial vulnerability proxies are not necessarily correlated with trade finance intensity.⁵

Two studies analyze the effect of credit supply shocks on exports using matched bank-firm data. Amiti and Weinstein (2011) show that a deterioration in Japanese banks' market-to-book value was associated with a decrease in their borrowers' exports during the 1990s. Paravisini et al. (2011) match bank-firm data with detailed customs data on Peruvian exports in 2007-2009. They use banks' ex ante exposure in foreign liabilities as an instrument for changes in the supply of credit in the post-Lehman period and include country and product fixed effects, in order to control for credit demand shocks. In other words, they compare the effect of bank shocks across firms exporting the same product to the same destination. They find that exports in the post-Lehman year decreased more for firms whose main bank was exposed to the foreign liquidity shocks than for firms whose main bank was not exposed. Relative to this line of research, the contribution of our paper lies not only in extending the available evidence based on matched bank-firm data but also in analysing for the first time the specific role of trade finance in a credit shock faced by exporters.

In a related line of research, a set of recent studies provides an analysis of the role of banks in international trade finance practices. This literature explores how the choice of

⁴The literature on financial shocks and trade was largely inspired by the post-Lehman trade collapse. Earlier studies focused on the impact of financial factors on trade activities, especially in the context of models with heterogeneous firms with credit constraints (Chaney 2005, Greenaway et al. 2007, Muuls 2008, Bellone et al. 2010, Manova 2013, Minetti and Zhu 2011).

⁵External finance dependence is usually defined as the share of capital expenditures not financed by cash flow, but this has little to do with needs for trade finance. Trade credit intensity (usually measured as the ratio of trade credit to assets) might even be a substitute of trade finance, to the extent that firms unable to borrow from banks increase their reliance on trade credit.

financing terms for cross-border commercial transactions is influenced by firm, sector or country characteristics (Ahn 2011, Antràs and Foley 2011, Feenstra et al. 2013, Olsen 2010, Schmidt-Eisenlohr 2013).⁶ Antràs and Foley (2011) report evidence based on a single U.S.-based exporter in the food industry and show that the choice of exporter finance (where the importer pays the exporter after receiving the goods) is less likely when there is a long-lasting relationship between the exporter and the importer, and in countries with a weaker enforcement of contracts. While our paper does not directly contribute to this literature, our detailed matched bank-firm data enable us to present for the first time a rich characterization of the market for trade finance.

Finally, our paper is also related to a separate and very broad literature on the real effects of finance (Bernanke 1983, Peek and Rosengren 2000, Kashyap and Stein 2000, Khwaja and Mian 2008).⁷ Relative to this literature, our paper highlights the different features of the various forms of bank finance and, in particular, the role of trade finance versus ordinary loans in a credit supply shock.

3 Data

3.1 Sources

We use data on outstanding loans extended by Italian banks to a large sample of Italian manufacturing firms between 2006 and 2010. Drawing on the Italian Central Credit Register (*Centrale dei Rischi*), we build a panel of bank-firm credit relationships, with detailed information on the destination of each loan, including whether it is export or import-related. We link our bank-firm data with two firm-level datasets: the Company

⁶The four different payment forms for an export/import transaction are traditionally summarized as follows: *cash in advance* (importer finance), when the importer pays the amount to the exporter before the delivery of the goods; *open account* (exporter finance), when the importer pays the amount to the exporter after the delivery of the goods; *letter of credit* (bank finance), when the bank in the importer's country guarantees the payment to the exporter's bank; *documentary collection*, when the bank provides assistance in obtaining the payment through an exchange of documents with the bank in the exporter's country but does not guarantee the payment.

⁷The literature on the real outcomes of bank shocks includes, among other studies, Carvalho et al. (2012), Iyer et al. (2010), Jimenez et al. (2010), Kalemli-Ozcan et al. (2010), Ashcraft (2005).

Accounts Data Service (*Centrale dei Bilanci*) and the Bank of Italy's Survey of Industrial and Service Firms (further information is provided in Appendix 1).

The Central Credit Register is a database run by the Bank of Italy. It contains detailed information on virtually all firms' and individuals' loans extended by Italian banks and other financial institutions under the Bank of Italy's supervision. All lines of credit (henceforth, loans) and guarantees above a very low threshold level are recorded.⁸ Since banks use the Register to assess the creditworthiness of their current or prospective borrowers, the quality of data is very high. The database is confidential.

We derive information on firm-level exports and other variables from two separate sources. The first is the Company Accounts Data Service (CADS), which is a commercial database which represents the most important source of balance-sheet data on Italian firms. It covers about 25,000 firms and is compiled by a consortium that includes the Bank of Italy and Italian commercial banks. We observe firms' annual sales, exports, employment and balance-sheet variables.

The second is the Survey of Industrial and Service Firms (SISF), which is carried out yearly by the Bank of Italy and covers a sample of about 4,000 Italian firms with at least 20 employees in manufacturing and service sectors (Bank of Italy 2011). The data are of a very high quality, being collected by economists at the local branches of the Bank of Italy who often have a long-lasting relationship with the firms' management. We observe firms' sales, exports, employment and several firm-level variables. Survey data are available for research under restrictions.⁹

Finally, we draw additional bank-level information from other sources. We derive data on the share of deposits held by non-residents (as a measure of exposure to the foreign interbank market) from the Bank of Italy's confidential Supervisory Reports. We also use Bank of Italy data on banks' structural characteristics (i.e. size, group structure,

⁸The threshold level was equal to EUR 75,000 until the end of 2008 and was thereafter reduced to EUR 30,000. To correct for the change in the threshold, we drop bank-firm pairs with total loans and guarantees lower than EUR 75,000 over the whole sample period.

⁹Using data from both sources (CADS and SISF) enables us to increase the sample size and, for firms that appear in both datasets, to run several consistency checks (for further details, see Appendix 1).

ownership of foreign branches and subsidiaries) and on mergers and acquisitions. Finally, we get additional bank-level indicators, such as capital requirements ratios and position on the interbank market from Bureau van Dijk's ORBIS.

3.2 Export and import loans and guarantees

The Central Credit Register reports information on loans (credit transactions) and guarantees (transactions by means of which a bank takes over or guarantees the liability of a third party) for each bank-firm relationship. We observe the destination of each loan (export, import or other activities) and the type of risk (self-liquidating, revocable and term loans).

Combining loan destination and risk type, we end up with four types of loans: export loans, import loans, ordinary long-term loans and ordinary short-term loans. Similarly, we aggregate commercial guarantees in three types: export guarantees; import guarantees; ordinary guarantees. A detailed explanation of the different types of loans and guarantees is given in Appendix 2.

Export loans may include advance of receivables generated from export sales, advance on letters of credit, export working capital funds and export factoring. Import loans are used to finance the purchase of foreign goods and services. Export guarantees correspond to standby letters of credit that are used as performance bond or payment guarantees to foreign buyers. Import guarantees usually take the form of letters of credit issued as a guarantee of payment to the exporter's bank in the foreign country (see U.S. Department of Commerce 2008 for an explanation of the various forms of trade finance).

3.3 Sample

We extract bank-firm data from the Central Credit Register for exporting firms in the manufacturing sector (see Appendix 1 for further details on the sample construction). We end up with about 5,000 firms on average each year between 2007 and 2010 and more than 26,000 bank-firm observations every year (Table A1). The sample includes manufacturing

firms that appear in the Company Accounts Data Service or in the Survey of Industrial and Service Firms.¹⁰ Small and very small firms are under-represented, since they usually report a simplified balance sheet and are not covered by surveys. The median number of employees is 82 (Table 1).

The sample accounts for about 40 percent of total sales by Italy’s manufacturing firms. Exports from our firm-level data account on average for almost 50 percent of Italy’s aggregate exports of goods in official statistics and show a similar pattern during the crisis: trade values collapsed in 2009 (-21 percent) and partially recovered in 2010 (15 percent; Table A2).

4 Descriptive statistics on trade finance

This section presents several new statistics on trade finance. Beyond contributing to the evidence on trade finance during the recent economic crisis, this will guide us in the choice of the appropriate empirical methodology.

4.1 Aggregate data

We start by looking at some aggregate statistics, based on the universe of Italian banks and other financial intermediaries reporting data to the Central Credit Register. Export and import loans account for a small share of total loans reported by Italian banks and other financial intermediaries to the Central Credit Register (1.2 and 0.9 percent on average in 2006-2011, respectively; Figure 2).¹¹ The share of export and import guarantees on total guarantees is instead slightly less than 10 percent. The very small share of trade finance loans on total loans is in line with the finding by Amiti and Weinstein (2011), according to whom “foreign bills bought” (advance of receivables from export sales) account for

¹⁰We consider only manufacturing firms since one of the reasons why credit supply shocks are supposed to have a larger effect on exports is related to the longer transit time in shipments of exported goods (which does not necessarily apply to exports of services).

¹¹Notice that if we consider instead our sample of manufacturing exporters, the share of export loans rises to 12 percent and that of import loans rises to 5 percent, in line with these firms’ higher involvement in international activities.

about 1 percent of total loans by Japanese banks.

To get a sense of the magnitude of trade finance vis-à-vis total trade values, if we assume that the average maturity is equal to four months (as reported for a sample of global banks by the International Chamber of Commerce 2010), export loans and guarantees finance 25 percent of Italy's exports of goods, while import loans and guarantees finance about 20 percent of Italy's imports in 2012.

To further investigate what happened to trade finance during the trade collapse, Figure 3 shows the evolution of export and import loans and guarantees, compared with the corresponding trade flows, since the third quarter of 2008. The trade collapse in Italy was broadly similar in magnitude and timing to the experience of the other advanced countries: between 2008Q3 and 2009Q1 exports fell by 25 percent, while imports fell by 20 percent. The fall in export loans and, especially, in export guarantees was less intense. Import loans and guarantees largely followed the decline in imports. The recovery was faster for imports than for exports and, as far as trade finance is concerned, it was faster for guarantees than for loans. This evidence cannot be taken, however, as a clear indication about the role of trade finance during the trade collapse, given that the causality may go both ways and that we only observe trade finance stocks instead of flows: changes in the stocks are significantly influenced by their average maturity and the slower reaction of export loans might indeed reflect their longer maturity compared to import loans (see Appendix A2).¹²

4.2 Bank-firm-level data

Further evidence on trade finance can be drawn using our matched bank-firm data. Table 2 reports selected statistics for loans (upper panel) and guarantees (lower panel). We find that only a subset of banks provides export or import loans: 231 banks are indeed

¹²The same caveat applies to several studies that report aggregate evidence on trade finance developments during the trade collapse (International Monetary Fund and Bankers' Association for Finance and Trade 2009, Finance, Credit and International Business Association 2009, International Chamber of Commerce 2010, 2011, Asmundson et al. 2011, Auboin and Engemann 2012).

active in the market for export loans (180 banks for import loans), compared with about 350 banks reporting ordinary loans to the Central Credit Register in our sample. Banks that do not lend for exports or imports are generally very small local banks (e.g. mutual banks *“banche di credito cooperativo”*), which are subject to special regulations, including stronger limitations in terms of size and scope of their lending activity and geographical reach. An even smaller subset of banks provides export and import guarantees.

The market for export and import finance tends to be more concentrated than the market for other forms of finance, especially for guarantees. The top ten banks account for 78 percent of export loans and 74 percent of import loans, compared with 66 percent for total loans. All export and import guarantees are issued by the ten most important banks. The evidence of high concentration is in line with Olsen (2010), who reports that the top ten banks in the U.S. accounted for 75 percent of the value of issued letters of credit in 2005.

A median firm borrows from 5 different banks, in line with previous studies suggesting that multiple-relationship banking is very common among Italian firms (Detragiache et al. 2000). Interestingly, there is evidence of multiple banking for export and import loans as well. A median firm borrows export or import loans from 3 different banks. The use of multiple lenders, not only for ordinary lending but also for trade finance, might attenuate the effect of bank lending shocks, to the extent that it makes easier for the borrower to substitute one lender with the other lenders. However, firms tend to borrow a large share of their export or import loans from their main bank. For the median firm, almost two thirds of export loans are borrowed from the main bank; a similar percentage is found for ordinary long-term loans, while for ordinary short-term loans it falls to about a half.

The higher share of the main bank might reflect the lower number of banks active in the market for trade finance. It might also be interpreted as evidence of higher informational costs for international trade transactions, similarly to what happens for longer-term loans to finance investments (Berger and Udell 2006): in this context, concentrating borrowing in few lenders, with long-lasting relationships, is a way to reduce these costs and to allow

banks to invest in soft information.¹³

Guarantees tend to be extremely concentrated in a single intermediary. This holds for both ordinary and export or import guarantees. The median firm receives indeed 100 percent of its guarantees from its main bank.

4.3 Firm-level data

Table 3 reports further statistics on trade finance at the firm level. Firms are more likely to receive export loans than import loans; import guarantees are instead more likely than export guarantees. When we make a distinction between small and large firms based on the median sales (slightly less than 20 EUR million in sales), we find that small firms are more likely to receive export loans but less likely to receive export or import guarantees; the share of firms with import loans is very similar between small and large firms. Export loans account for a larger share of exports in the case of small firms. This evidence is in line with the fact that small firms are usually more dependent on bank finance than large firms, due to the fact that it is harder for them to get access to other external financial sources. Finally, export and import guarantees account for a tiny share of exports and sales.

5 Credit supply shocks and trade finance

5.1 A simple model of trade finance

This section presents an extremely simplified model of finance for exports, following the financial constraints model by Banerjee and Duflo (2008). We assume that firm i produces entirely for export and that output is a Cobb-Douglas function of n inputs $(x_1, x_2 \dots x_n)$.

We also assume that all inputs have to be purchased in competitive markets using working

¹³The literature on relationship banking argues that banks differ in their organization and lending techniques and that they specialize towards different groups of firms in accordance to the techniques in processing and evaluating information on borrowers (soft versus hard information; see, for Italy, Albareto et al. 2011; Cannari et al. 2010).

capital. Firms' export sales (Y_{it}) are then an increasing and concave function of the amount of working capital invested (L_{it}) and productivity (A_{it}).

$$Y_{it} = A_{it}L_{it}^\theta \quad (1)$$

By taking logs and differentiating we can obtain the following:

$$\Delta \ln Y_{it} = \Delta \ln A_{it} + \theta \Delta \ln L_{it} \quad (2)$$

We assume that each firm borrows the entire working capital from one bank only, so that the change in total working capital for firm i is equal to the change in loans from bank b to firm i ($\Delta \ln L_{it} = \Delta \ln L_{ibt}$). Following Khwaja and Mian (2008)¹⁴, the change in loans from bank b to firm i can be written as a function of an economy-wide trend α_t , credit supply shocks δ_{bt} and credit demand shocks η_{it} .

$$\Delta \ln L_{ibt} = \alpha_t + \beta \delta_{bt} + \eta_{it} + \epsilon_{ibt} \quad (3)$$

Credit supply shocks may derive from liquidity or funding constraints that limit banks' ability to provide finance to firms. Credit demand shocks may depend on firm-specific shocks such as changes in customer demand or productivity.

Putting together (2) and (3) we obtain the following relationship between the change in the log of exports and credit supply shocks:

$$\Delta \ln Y_{it} = \alpha'_t + \beta' \delta_{bt} + \eta'_{it} + \epsilon'_{it} \quad (4)$$

where η'_{it} captures firm-level time-varying shocks (such as productivity growth and credit demand shocks). A priori, we expect that firms that borrow from a bank that was exposed to a negative credit supply shock export less (with respect to the previous period) than firms that borrow from another bank that was not exposed to a negative shock. This

¹⁴We refer to their work for a simple model of bank intermediation based on costly external financing.

equation will be the basis for our empirical analysis.

5.2 Measuring the credit supply shock

We exploit Italian banks' access to foreign funding during the crisis as an exogenous source of identification for the credit supply shock. Since the creation of the European Monetary Union, Italian banks started to receive increasing capital inflows from non-residents, especially foreign banks, as the integration in the euro-area interbank market deepened.¹⁵ This process accelerated between 2005 and 2007, as access to foreign funding became increasingly easier for Italian banks. The Lehman crisis marked a turning point. Deposits held by non-residents fell by 12 percent in three months, from a peak of 537 EUR billion in 2008Q3 to 471 EUR billion in 2008Q4; two further steep decreases took place between 2009 and 2011 (Figure 4). At the end of 2011Q4 deposits held by non-residents were 26 percent less than at the peak in 2008Q3.

The shock on foreign funding can be considered as exogenous to firms' export behavior. Tensions in the interbank market reflected concerns about banks' funding ability or investments in asset-backed securities rather than about their portfolio of loans to manufacturing exporters. Credit to manufacturing firms, including non-exporters, accounts for a minor share of Italian banks' total assets (6 percent in 2010).

For each bank in our sample, we therefore compute a measure of exposure to foreign funding ($exposure_{bt}$) as the share of deposits held by non-residents on total deposits.¹⁶ There is evidence that funding constraints significantly contributed to the change in credit supply. We show that a higher exposure to foreign funding at the end of a given year is associated with a lower supply of credit in the following year, controlling for credit demand shocks (Khawaja and Mian 2008). At the aggregate level, funding constraints, especially

¹⁵Deposits held by foreign banks account for more than 80 percent of total deposits held by non-residents at Italian banks.

¹⁶We consider total deposits instead of total liabilities in the denominator of the exposure variable because the latter include other funding sources (bonds, commercial paper, etc.) which cannot easily be accessed, especially during crisis periods. In robustness exercises we also consider alternative measures of bank health, based on capital requirements ratios or interbank position.

for those banks that financed themselves in the interbank markets, were mentioned as the main factor at the basis of lending practices of Italian banks after September 2008, together with the need to reduce risk-weighted assets (Bank of Italy 2009).

Crucially, exposure to foreign funding was heterogeneous across banks. The vast majority of small and local banks had a very negligible exposure, in contrast to larger intermediaries. There is also a significant variation among the latter: among the top 20 banks, the share of deposits held by non-residents goes from 10 percent in the first quartile to 38 percent in the third quartile.

5.3 Methodology

Using matched bank-firm data, this section looks at the effect of credit supply shock on the various types of loan, with a view to highlighting the specific role of trade finance.

We start from equation (3), which shows that the change in loans for firm i is a function of credit supply shocks and credit demand shocks. OLS estimates are biased if credit demand shocks (η_{it}) are correlated with credit supply shocks (δ_{bt}). A consistent estimator can be obtained by including firm-time fixed effects (Khwaja and Mian 2008). This regression can be estimated on the subsample of firms that borrow from two or more banks. As we noticed in Section 4, multiple banking is rather common in Italian firms, not just for ordinary lending but also for trade finance, thus attenuating sample selection issues.

We therefore estimate a within-firm version of equation (3):

$$\Delta \ln L_{ibt} = \beta \text{exposure}_{bt-1} + \sum_{it} \alpha_{it} \text{firm}_{it} + \gamma \mathbf{X}_{bt} + \delta \text{mainbank}_{ibt} + \epsilon_{ibt} \quad (5)$$

where the dependent variable is the change in the log of the total amount of loans that firm i borrows from bank b . In additional specifications, the dependent variable is the change in the log of each of the four loan types (export loans, import loans, ordinary long-term loans and ordinary short-term loans).¹⁷ Our main explanatory variable is the share of

¹⁷All dependent variables are trimmed at the 5th and 95th percentile of their distribution. Replicating

deposits held by non-residents on total deposits for bank b at the end of the previous year ($exposure_{bt-1}$). It should capture banks' funding constraints related to their exposure to the shock on foreign funding. We include a set of firm-year fixed effects $\sum_{it} \alpha_{it} firm_{it}$, which control for credit demand shocks.

We also control for a set of structural bank characteristics (\mathbf{X}_{bt}) that are potentially correlated with the credit supply shock transmission mechanism.¹⁸ We include the following variables: the log of total assets, which controls for bank size ($assets_{bt-1}$); a dummy which equals one if the bank is a branch or subsidiary of a foreign banking group ($foreign_{bt}$), which controls for foreign banks's lower exposure to the shocks on the interbank market; a dummy which equals one if a given bank has branches or subsidiaries abroad ($abroad_{bt}$), which captures banks' presence in foreign markets; a dummy that is equal to one if the bank is the main bank for a given firm (i.e. the one with the highest share of outstanding loans borrowed by a given firm) ($mainbank_{ibt}$), which controls for close relationships between firms and their main banks.

We also check the robustness of our estimates to the inclusion of other bank-level variables (leverage, capital adequacy ratios, net position on the interbank market, etc.), which might capture other factors that could explain the different lending behaviors in the aftermath of Lehman Brothers (see section 5.5) Standard errors are clustered at the bank level, to take into account correlations in error terms across observations related to the same bank. We estimate equation (5) over the two years (2009-2010) in which the funding shock, which started in late 2008, had a significant impact on credit supply.¹⁹

our estimates using the 1st and the 99th percentile, our main findings are confirmed.

¹⁸Following Albertazzi and Marchetti (2010), we use unconsolidated data instead of consolidated data, since the former have a larger variability and granularity. There is in any case a high level of correlation between indicators based on unconsolidated data and those based on consolidated data. We control for mergers and other corporate restructuring activities by computing pro-forma loans data for all banks in our sample.

¹⁹Loans are averaged across all quarters of a given year.

5.4 Results

Table 4 reports the results estimating equation (5) on different loan types. Focusing on the change in log of total loans (column 1), we find that the coefficient on the exposure variable is negative and significant at 1 percent. The higher is the share of deposits that a bank collected on foreign markets, the lower is the bank's capability to extend credit to its borrowers. In other terms, exposed banks reduce their lending growth relative to non-exposed banks. If a bank goes from the first to the third quartile in terms of exposure (corresponding to a 20-percentage-point increase in the share of foreign deposits on total deposits), the growth rate of total loans decreases by 5 percentage points.

When we disentangle the various types of loans (Columns 2-5), we find that the coefficient is always negative, although it is not significant for export and import loans. This reflects not only slightly higher standard errors (which might be related to the lower number of observations due to the fact that not all firms receive these types of loans) but also a substantially smaller (in absolute terms) coefficient. This evidence might be explained by the short-term, low-risk and collateralized nature of trade finance. Export loans, which are typically advances on receivables (bridge payments), are guaranteed by the underlying goods being exported, while import loans are very short-term loans for the purchase of foreign inputs. Transaction banking activities such as trade finance loans are less exposed to the risk of moral hazard, since banks know exactly the transaction that is being financed and there is less scope for a different use of funds by the borrower.

Looking at the bank-level controls, bank size (measured by the log of total assets) is negatively correlated with credit growth (in particular for ordinary long-term loans). This is in line with the view that during the crisis large banks suffered more from capital and funding constraints in the aftermath of Lehman, which are not entirely captured by our measure of exposure to foreign funding. The coefficient on bank size is negative for export and import loans, but again not significant. This confirms our previous finding that trade finance has been less sensitive to bank shocks during the crisis.²⁰ Foreign

²⁰This result might also be related to a 'flight to quality effect' found in the banking literature, where

banks recorded significantly higher credit growth relative to domestic banks, confirming our hypothesis that these banks (mainly belonging to large European groups) were less exposed to the shocks on the interbank market compared to banks that are based in Italy. The dummy signalling whether a bank has branches or subsidiaries abroad is positively and significantly correlated with growth in total loans but not in export or import loans.

We also find that the main bank plays a significant and positive effect on all types of loans, as it might be expected since the main bank usually has an advantage with respect to other lenders due to its private information on the borrower's quality. The role of the main bank seems to be much more important for long-term loans (such as those used to finance fixed investments) than for the other, largely short-term, loan types. This might be related to the fact that the main bank's private information might be especially useful to finance riskier and longer-term loans. This effect might be even stronger during a crisis period (De Mitri et al., 2010).

In order to better appreciate the timing of the funding shock on trade finance during the crisis period, we run our baseline regression separately for each year (Table 5). As in the previous section, we look at 2009 and 2010 as crisis years. We also report results for 2007 and 2008 (pre-crisis years). Exposure to foreign funding has a strongly negative and significant effect on lending in both crisis years. The coefficients remain largely stable. For the pre-crisis years, we do not find instead a significant relationship between foreign funding and the growth rate of total loans: the coefficient on the exposure variable is still negative but very close to zero. The coefficient is not significant for ordinary short-term and long-term loans, while it is positive and significant for export loans and (in 2007) for import loans. Overall, these results suggest that the negative relation between exposure and growth in lending during the crisis is indeed due to the shock in the interbank market which took place after Lehman Brothers' collapse. Among the control variables, we find a larger coefficient on the main bank dummy in the crisis years with respect to the non-crisis

banks that are forced to reduce their overall lending may select their borrowers on the basis of firms' specific characteristics (Albertazzi and Marchetti, 2010). Since exporting firms tend to be more productive, banks may choose to preserve their lending relationships with exporters, dropping relationships with other, less efficient, firms instead.

year. This is in line with recent studies suggesting that the main bank exerted a sort of ‘protection’ from credit supply shocks, especially in 2009-10 when funding on the foreign interbank market was becoming increasingly stringent for Italian banks.

5.5 Robustness

We carry several robustness checks. First, we add alternative indicators of bank health to our baseline regressions, in order to capture other bank-level constraints that might also affect banks’ capability to extend finance to borrowing firms (Table 6). We include various capital ratios (capital and reserves on total assets, Tier 1 and the sum of Tier 1 and Tier 2 ratios) and a measure of the net position on the interbank market (columns 1-4). As a matter of fact, the negative effect of exposure to foreign funding on total loan growth is confirmed also when we control for these alternative bank-health indicators. The coefficient is still negative and significant and its magnitude increases in absolute terms. As in our baseline estimates, exposure to foreign funding is negatively and significantly related to the growth in ordinary long-term and short-term loans, while it is not significantly correlated with export and import loans. The additional bank-level controls are often not significant, suggesting that capital adequacy and leverage ratios were not good predictors of lending behaviours in the aftermath of Lehman Brothers.

We also replicate estimates using the sum of loans and guarantees instead of just loans, in order to see whether there were constraints on the availability of guarantees during the crisis (Table 7). The findings are very similar to our baseline estimates on loans, in terms of significance and magnitude of the coefficients on the exposure variable. One difference is that the coefficient on import loans becomes significantly different from zero. It should be noted that import guarantees include letters of credit issued, which might have been affected more by the crisis than ordinary guarantees.

We also estimate our baseline specification without including firm-year fixed effects but only year fixed effects. This enables us to include not only firms with multiple banks (as in our within-firm model) but also firms borrowing from only one bank. The sample

size increases only marginally (from 41,961 to 42,697 bank-firm observations and from 4,800 to 5,245 firms), in line with the widespread use of multiple banks among Italian borrowers. The results are very similar to our baseline estimates (Table 8). The coefficient on foreign exposure is still negative and significant and its coefficient on the estimate using total loans is very close to the coefficient of the within-firm estimate (-0.264 versus -0.252). The only major difference is that the coefficient of the exposure variable on export loans increases (in absolute terms) and becomes significant at the 5 percent level, although its magnitude is still below that of the same coefficient on ordinary loans. Very similar results are obtained if one replicates the OLS estimate with year fixed effects on the sample of firms with multiple banks (unreported results). Given that the difference between within-firm and OLS estimates reflects the covariance between credit demand and credit supply shocks (Jimenez et al. 2010), the fact that the two coefficients are very similar suggests that the covariance between credit demand and credit supply shocks is quite small.

We have thus far demonstrated that negative shocks to banks' liquidity may translate into a decrease in lending to firms. However, this bank lending channel may not have any aggregate effect if firms can compensate for bank-specific loan losses by borrowing more from less exposed banks. We therefore consider whether firms that suffered from a lower credit supply were able to at least partially offset the fall in credit with additional credit from other banks (either banks with a credit relationship or banks without a credit relationship in the previous year). To estimate whether credit supply shocks had an impact on firm aggregate borrowing, we follow the econometric strategy suggested by Jimenez et al. (2010) and run an OLS estimation of equation (6), which relates the change in the log of firm's total borrowing on firm's weighted average of the exposure variable:

$$\Delta \ln L_{it} = \beta \sum_b \omega_{ibt-1} exposure_{bt-1} + \gamma \mathbf{Z}_{it} + \sum_b \delta_b mainbank_{ibt} + \epsilon_{it} \quad (6)$$

This is a firm-level version of equation (5). Note that the dependent variable captures

not only the intensive margin of firms' borrowing (the change in loans from banks firms have a relationship with at both time t and $t - 1$), but also the extensive margin (loans from new relationships or from dropped relationships). We control for a set of firm-level characteristics (\mathbf{Z}_{it}) (log of assets, return on assets and leverage). We also include a set of bank fixed effects for each firm's main bank in order to control for the non-random matching between firms and banks (similarly to Amiti and Weinstein 2011).

On the basis of the results reported in Table 9, the evidence supports the hypothesis that firms are not able to completely offset the decrease in loans from exposed banks. The coefficient is still negative and significant (-0.172, compared to -0.252 in our baseline estimates at the bank-firm level). If we estimate the aggregate borrowing effect for the various loan types, we find that the negative effect holds for ordinary long-term loans, but it becomes not significant for ordinary short-term loans and it remains not significant for both export and import loans. Firms seem able to offset the decrease in the supply of ordinary short-term loans with increased borrowing from other banks, but not for ordinary long-term loans. This can be presumably explained by the lower risk of short-term loans, which makes easier for firms to find new lenders.

We also restrict the sample to the top 20 banks, since the market for export and import loans is highly concentrated and we want to avoid that our findings might be influenced by the remaining banks that only have a negligible activity in trade finance. This reduces the sample by one third for total loans and by about one fifth for export and import loans. Nevertheless, all the main findings are unchanged.

We also consider government support during the crisis. Four banking groups, which account for about 20 percent of loans in our sample, issued hybrid capitalization instruments (for a total amount of 4 EUR billion), which were entirely subscribed by the Treasury by the end of 2009. The inclusion of this variable in unreported estimates does not change the magnitude and significance of the exposure variable. We include a dummy variable for the banks that received government funds during the crisis. The coefficient on the public aid variable is positive. This can be interpreted either as a positive effect

of recapitalization on lending or as weaker lending standards before the recapitalization which probably contributed to the banks' difficulties.²¹

An important concern is that export loans may receive a partial or total guarantee from Italy's public export credit agency (SACE). While this might explain why export loans are not affected by the banks' negative shock on foreign funding, we have reasons to believe that this might not be the only or even the main explanation behind our finding. First, the overall amount of public export credit guarantees is relatively small. According to SACE (2012), public guarantees covered 6.4 EUR billion of exports in 2011 (equal to 1.7 percent of Italy's exports).²² Second, the vast majority (more than 90 percent) of public export credit guarantees cover extra-EU countries, which account for just 40 percent of Italy's exports. Third, almost two thirds of public export credit guarantees were concentrated in just three sectors (energy, other transport equipment and transport services), which account for only 7 percent of exports in our firm-level data.

Another important issue is that the Central Credit Register does not report loans from foreign banks (although it includes loans from foreign-owned banks that are resident in Italy). The large majority of lending to Italian non-financial companies comes in any case from resident banks.²³ Although small in the aggregate, this phenomenon might be significant for large and very large firms. If we drop the top quartile of firms in terms of sales, our results become even stronger.

Finally, one important limitation of our work is that interest rates are not observed. This might be an issue if the bank shock translates into a loan rate increase rather than

²¹Further public support to trade finance was established by Law 102/2009 (article 8 on the "export bank system"). Cassa Depositi e Prestiti, a joint-stock company under public control which manages a share of Italians' postal savings, was allowed to finance firms' export transactions (only if guaranteed by the public export credit agency) and more generally to support firms' internationalization activity. This instrument became operative only during 2011, therefore it does not affect our results. The amount of funds committed by Cassa Depositi e Prestiti was equal to just 0.8 EUR billion at the beginning of 2012 (Bartiloro et al. 2012).

²²Felbermayr et al. (2012) report that 3.4 percent of Germany's exports were covered by public export credit guarantees in 2010. Interestingly, they note first a decreasing trend from 2000 (3.3 percent) to 2007 (1.8 percent), followed by a rapid increase during the financial crisis. According to the authors, this might reflect a substitution of public for private insurance during the crisis.

²³According to Italy's Financial Accounts, non-financial firms' borrowing from foreign banks and non-banking companies (including intra-company borrowings) was less than 10 percent compared to borrowing from Italian banks (Bank of Italy 2012).

in a decrease in the quantity of credit. While this is a possibility, several studies in the banking literature suggest that quantity adjustments are much more important than price adjustments in bank-firm relationships (Petersen and Rajan 1994, Khwaja and Mian 2008). Further issues are discussed in Appendix 1.

6 Credit supply shocks and exports

6.1 Estimation strategy

The previous section has shown that Italian exporters faced a credit supply shock in the aftermath of Lehman Brothers, which however reflected more a lower availability of ordinary lending than specific constraints on trade finance. This section looks at the effect of the credit supply shock on firms' exports and domestic sales. To this end, we use banks' foreign funding difficulties as a source of an exogenous shock for credit availability.

Using a reduced form approach, we model the relationship between export growth (or domestic sales growth) and bank shocks as in equation (4). Specifically, we estimate the following equation:

$$\Delta \ln Y_{it} = \beta \sum_b \omega_{ibt-1} \text{exposure}_{ibt-1} + \sum_{jt} \alpha_{jt} \text{ind}_{jt} + \boldsymbol{\theta} \mathbf{Z}_{it} + \sum_b \gamma_b \text{mainbank}_{ibt} + \epsilon_{it} \quad (7)$$

where the dependent variable is the change in the log of exports (or domestic sales) for firm i in industry j in year t . Our main explanatory variable is a weighted-average of the share of foreign deposits on total deposits among all banks that were lending to the borrowing firm i in the previous year $t - 1$; we use as weight the share of total loans of each bank towards a given firm i at time $t - 1$ (ω_{ibt-1}). In other terms, we assume that the credit supply shock experienced by a firm at a given time is the weighted liquidity shock experienced by the banks the firm was borrowing from in the previous year. We choose to compute a weighted average of the exposure variable as in Khwaja and Mian

(2008) instead of considering only the exposure variable for the main bank because we have shown that multiple banking is very common among Italian firms and the main bank provides just a portion of a given firm's loans.

The usual issue in estimating equation (4) is the correlation between credit supply shocks (δ_{bt}) and the unobserved component of credit demand shocks (η'_{it}). This is the classic "supply versus demand" identification problem. Banks may reduce their supply of credit because they are not able to finance new loans or re-finance existing loans. Alternatively, firms may reduce their demand for credit as they perceive a lower demand for their products. We control for credit demand shocks in the following ways. First, we include the interaction between two (or three) digit industry and year fixed effects, which capture time-varying shocks at the industry level. Second, we include a set of firm-level variables (\mathbf{Z}_{it}), which may be correlated with export behaviour: firm size (log of assets) and leverage (financial debt on assets). Third, we include bank fixed effects for each firm's main bank in order to control for the non-random matching between firms and banks (as in Amiti and Weinstein 2011).²⁴

Our analysis faces some limitations due to data availability issues. One limitation is that we do not have detailed data on exports by destination country or by product. This prevents us from following the approach suggested by Paravisini et al. (2011), who include country-product fixed effects. Another issue is that we observe firm-level exports and domestic sales only at an annual frequency.²⁵ We therefore relate exports (or domestic sales) in year t to bank exposure to the negative shock at the end of year $t - 1$, in order to take into account a lag between the credit supply shock and the real outcomes. As before, we estimate equations (7) over the two years (2009-2010) in which the funding shock had a significant impact on credit supply. Standard errors are clustered at the firm level.

²⁴Recall that our data on exports are at the annual level and that we take annual averages of end-of-quarter stocks of loans.

²⁵Data on exports are also collected with a monthly frequency by the national statistical institute and have been used by Secchi et al. (2011). Unfortunately, we are currently not able to link them to our data because of confidentiality requirements.

6.2 Results

Results of the OLS estimation of the reduced form equation (7) are reported in Table 10. Column 1 controls for the interaction between two-digit industry and year fixed effects and main bank fixed effects. The coefficient on the exposure variable is negative and significant. Firms borrowing from banks that are more exposed to a negative funding shock are more likely to experience a lower growth of exports relative to firms borrowing from less exposed banks.

Column 2 includes firm size, measured by the log of assets. Larger firms recorded a less favorable export performance in 2009-2010, which perhaps might reflect the lower exposure of small firms to the global shock during that period. The magnitude of the coefficient on the exposure variable slightly falls, but remains significant. Column 3 includes the ratio of financial debt on assets, to control for firms' access to sources of financing before the crisis. Firms with higher leverage experienced a more favorable export performance, which might be related to their larger availability of funds from banks or other financial intermediaries. The inclusion of leverage does not change the significance of the exposure variable. Column 4 then includes interaction dummies between three-digit sector and year fixed effects, in order to better capture demand shocks on firms' foreign sales. The coefficient on the exposure variable becomes slightly smaller but is still significant.

The magnitude of the coefficient is economically relevant, although admittedly not very large. If the exposure variable increases by one standard deviation (corresponding to a 10-percentage-point increase in the share of foreign deposits on total deposits), the growth rate of exports decreases by 1.3 percentage points. The widespread use of multiple lenders might contribute to at least partly attenuate the effect of the credit shock, by making it easier for firms to increase their borrowing from banks that were less exposed to the funding shock.

An interesting issue to examine is whether the impact of the credit supply shock is more severe for financially distressed firms, as it may be expected since these firms are less likely to have access to alternative sources of external finance. To this aim we

compute a dummy variable which identifies distressed firms as those firms that are small (sales below the median), less profitable (return on assets below the median) and highly indebted (leverage above the median). This dummy variable is then interacted with the exposure variable. Column (5) shows that the interaction between distressed firms and the exposure variable is negative and marginally significant. For distressed firms, the effect of the credit shock on exports is four times larger than the effect on firms that are not financially distressed, although the relatively high standard error on the interacted variable suggests that the estimate is not very precise. Overall, the evidence seems to suggest that credit shocks matter more for firms that are financially fragile.

Table 11 considers the change in the log of domestic sales as the dependent variable instead of exports. The coefficient on the exposure variable is positive but not significantly different from zero in every specification. This suggests that domestic sales are less responsive to credit supply shocks than exports, in line with evidence on Japanese companies reported by Amiti and Weinstein (2011). Exports are more sensitive to credit shocks than domestic sales for several reasons, which include the longer cycle between delivery and settlement, higher fixed costs and information asymmetries in dealing with foreign counterparts. The result is not in contrast with our previous finding that trade finance was less affected by the credit shock, to the extent that exporters might use ordinary lending to finance export working capital or investments.

6.3 Robustness

We conduct additional unreported tests to check the robustness of our findings. First, we cluster standard errors at the 3-digit industry level or, alternatively, at the main bank level. This does not have any significant impact on standard errors. Second, we modify the exposure variable, using the sum of loans and guarantees rather than just loans to compute each bank's weight in firms' exposure variable. The coefficient becomes smaller and is only marginally significant. This might be explained by the different nature of guarantees: as they do not require an immediate disbursement of funds but only imply

a potential exposure in the future, they might be less sensitive to the negative funding shock.

One potential concern is that we do not control for destination-specific shocks to exports. This might affect our findings if firms that export to countries that were more affected by the financial crisis tend to borrow from banks that were more exposed to the negative funding shock. It also prevents us from investigating whether bank finance is more important for firms that export to riskier or more distant countries, where exports are less frequent and there is less trust between the parties.²⁶

7 Concluding remarks

The effect of financial shocks on exports has been the subject of a burgeoning literature, especially since the 2008-09 trade collapse. Progress in this area has been hampered by the lack of detailed data on trade finance. To the best of our knowledge, this paper is the first one which provides evidence based on matched bank-firm data where export and import loans and guarantees are explicitly observed.

We exploit the heterogeneous exposure across banks to the shock that hit the international interbank market after the collapse of Lehman Brothers. We show that banks that were more exposed to the foreign funding shock reduced their lending to our sample of manufacturing exporters relatively to less exposed banks. Using our detailed data by loan type, we are able to see how the funding shock affected the availability of the various forms of bank credit. We find that trade finance was only weakly hit by the funding shock, which mainly affected ordinary lending. The lower sensitivity of trade finance to bank funding shocks can presumably be explained with their very short-term, standardized and low-risk nature, in line with the evidence based on trade finance portfolios (International Chamber of Commerce 2010, 2011).

²⁶While we are not able to provide evidence on this hypothesis, it is worth noting that it has received little support in recent studies. Antràs and Foley (2011) find that institutions matter for the choice between exporter and importer finance, but not for the use of letters of credit and documentary collection. Paravisini et al. (2011) find that the elasticity of exports to credit does not vary with distance.

We also show that the credit shock had a negative impact on exports: firms, especially financially distressed ones, that borrowed from banks which were more exposed to a negative funding shock exported less compared with firms that borrowed from less exposed intermediaries.

Overall, our findings suggest that credit supply shocks matter for exporters, although not just via specific constraints on trade finance but more via a reduction in the availability of ordinary lending.

It is worth noting that our methodology, in line with recent studies using matched bank-firm data, identifies the credit supply shock by using bank-level measures of exposure to liquidity or funding constraints. While this approach is able to capture episodes of banks cutting overall lending, it probably ignores the bilateral nature of relationships among banks. Trade finance, in particular, is based on bilateral trust between domestic and foreign banks. This aspect, which would require detailed data on bilateral relationships in the interbank market, should be explored in further research.

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Table 1: Summary statistics

Variable	Mean	Median	Sd	Obs.
Firm-level data				
Employment _{it}	199.0	82.0	629.0	19830
Sales _{it}	71.8	21.4	376.7	19899
Exports _{it}	32.9	8.6	187.7	19899
Dom sales _{it}	38.9	10.6	215.7	19899
Loans _{it}	13.6	4.5	44.5	19899
Ord LT loans _{it}	8.3	1.9	35.5	19899
Ord ST loans _{it}	3.1	1.1	9.5	19899
Export loans _{it}	1.6	0.1	5.3	19899
Import loans _{it}	0.7	0.0	5.6	19899
$\Delta \ln(\text{Sales})_{it}$	-0.009	0.013	0.242	19899
$\Delta \ln(\text{Exports})_{it}$	0.003	0.020	0.388	18639
$\Delta \ln(\text{Dom sales})_{it}$	-0.019	0.000	0.315	19867
$\Delta \ln(\text{Loans})_{it}$	0.030	0.029	0.474	18622
Exposure _{it}	0.160	0.147	0.108	19239
Bank-firm-level data				
Loans _{ibt}	2.5	0.8	10.0	105432
Ord LT loans _{ibt}	1.5	0.2	9.1	105432
Ord ST loans _{ibt}	0.6	0.2	2.1	105432
Export loans _{ibt}	0.3	0.0	1.2	105432
Import loans _{ibt}	0.1	0.0	0.9	105432
$\Delta \ln(\text{Loans})_{ibt}$	0.016	-0.011	0.439	90807
$\Delta \ln(\text{Ord LT loans})_{ibt}$	-0.058	-0.110	0.527	53851
$\Delta \ln(\text{Ord ST loans})_{ibt}$	0.015	0.019	0.682	71576
$\Delta \ln(\text{Export loans})_{ibt}$	0.035	0.030	0.622	30447
$\Delta \ln(\text{Import loans})_{ibt}$	0.048	0.035	0.555	14010
Exposure _{ibt}	0.152	0.107	0.157	105432

Source: authors' elaborations on Bank of Italy, CADS and SISF data. Notes: The table reports summary statistics on selected variables at the firm-level (upper panel) and at the bank-firm-level (lower panel). All monetary variables are in EUR millions. Employment is in number of workers.

Table 2: Summary statistics on trade finance

	Type of loan or guarantee				
	All	Ordinary short-term	Ordinary long-term	Export	Import
Loans					
No. banks with loans > 0	383	353	339	231	180
% share of top ten banks	65.9	62.7	68.4	77.8	73.6
% loans on total loans	100.0	22.8	60.8	11.6	4.9
No. banks with loans > 0 per firm (median)	5.0	4.0	3.0	3.0	3.0
% loans from main bank (median)	45.0	49.1	61.3	60.0	58.2
Guarantees					
No. banks with guarantees > 0	237	233	-	16	66
% share of top ten banks	77.8	73.5	99.9	96.5	
% guarantees on total guarantees	100.0	70.8	-	8.5	20.7
No. banks with loans > 0 per firm (median)	1.0	1.0	-	1.0	1.0
% guarantees from main bank (median)	100.0	100.0	-	100.0	100.0

Source: authors' elaborations on Bank of Italy data. Notes: The upper panel reports the following statistics: the number of banks with loans greater than zero for each type; the market share of top ten banks (i.e. their share on total loans in the sample); the share of each loan type on total loans in the sample; the median number of banks from which firms borrow each loan type; the median share of loans borrowed from the main bank. The lower panel reports similar statistics for guarantees.

Table 3: Trade finance by firm size

	% firms with export loans or guarantees	% firms with import loans or guarantees	% export loans or guarantees on exports	% import loans or guarantees on sales
Loans				
All firms	56.2	24.6	8.2	1.2
Small firms	59.2	24.0	9.5	1.2
Large firms	53.5	25.1	7.1	1.2
Guarantees				
All firms	10.3	26.8	0.5	0.5
Small firms	5.8	18.1	0.4	0.4
Large firms	14.3	34.6	0.6	0.7

Source: authors' elaborations on Bank of Italy, CADS and SISF data. Notes: The table reports selected the percentage share of firms with export loans or guarantees, the percentage share of firms with import loans or guarantees, the percentage share of export loans or guarantees on exports and the percentage share of import loans or guarantees on sales. Small firms are firms with sales below the median value. Statistics are based on 19746 observations.

Table 4: Credit supply shocks by loan type: baseline estimates
 Dependent variable: $\Delta \ln(\text{loan type})_{ibt}$

	Total loans (1)	Ordinary LT loans (2)	Ordinary ST loans (3)	Export loans (4)	Import loans (5)
$exposure_{bt-1}$	-0.252*** (0.054)	-0.230*** (0.064)	-0.350*** (0.096)	-0.131 (0.096)	-0.141 (0.117)
$assets_{bt-1}$	-0.006** (0.003)	-0.022*** (0.003)	0.008* (0.004)	-0.005 (0.006)	-0.006 (0.006)
$foreign_{bt}$	0.099*** (0.016)	0.110*** (0.024)	0.107*** (0.027)	0.047* (0.025)	-0.018 (0.033)
$abroad_{bt}$	0.034*** (0.013)	0.046*** (0.016)	0.011 (0.016)	0.017 (0.021)	0.018 (0.024)
$mainbank_{ibt}$	0.132*** (0.010)	0.180*** (0.009)	0.072*** (0.016)	0.062*** (0.014)	0.038* (0.020)
Firm-year FE	yes	yes	yes	yes	yes
Observations	41961	25488	32806	14332	6339
No. firms	4800	4415	4430	2854	1123
Clusters	414	371	375	234	187
R^2	0.285	0.357	0.342	0.432	0.432

Source: authors' elaborations on Bank of Italy, CADS and SISF data. Notes: Columns (1)-(5) report within-firm estimates of equation 5 on the sample of firms with multiple banks. The dependent variable is the change in the log of loans from bank b to firm i in year t (total loans in column (1) and each of the four loan types in the following columns). The explanatory variables are: $exposure_{bt-1}$ (bank b 's share of deposits held by non-residents on total deposits); $assets_{bt-1}$ (log of total assets); $foreign_{bt}$ (dummy for branches and subsidiaries of foreign banks); $abroad_{bt}$ (dummy for the ownership of branches and subsidiaries abroad); $mainbank_{ibt}$ (dummy equal to one if bank b is the main bank for firm i). All regressions include firm-year fixed effects. The coefficient on the constant is not reported. Standard errors are clustered at the bank level. The estimation period goes from 2009 to 2010. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Table 5: Credit supply shocks by loan type and year

	Dependent variable: $\Delta \ln(\text{loan type})_{ibt}$				
	Total loans (1)	Ordinary LT loans (2)	Ordinary ST loans (3)	Export loans (4)	Import loans (5)
Crisis year: 2009					
exposure_{bt-1}	-0.248*** (0.056)	-0.229*** (0.073)	-0.425*** (0.115)	-0.059 (0.122)	-0.249 (0.152)
Observations	20696	12408	16389	7212	3135
No. firms	3848	3493	3530	2256	861
Clusters	369	318	336	216	162
R^2	0.284	0.363	0.351	0.428	0.435
Crisis year: 2010					
exposure_{bt-1}	-0.239***	-0.203***	-0.248**	-0.193	0.030
Observations	21265	13080	16417	7120	3204
No. firms	4000	3644	3591	2259	877
Clusters	372	339	336	214	174
R^2	0.285	0.352	0.330	0.435	0.415
Pre-crisis year: 2007					
exposure_{bt-1}	-0.057 (0.087)	-0.046 (0.069)	0.101 (0.071)	0.259** (0.119)	0.244*** (0.092)
Observations	24172	13674	19436	8088	3877
No. firms	4500	4066	4156	2472	1035
Clusters	394	324	370	219	167
R^2	0.285	0.348	0.334	0.441	0.450
Pre-crisis year: 2008					
exposure_{bt-1}	-0.015 (0.122)	0.133 (0.116)	0.082 (0.178)	0.275* (0.140)	0.020 (0.128)
Observations	23108	13652	18447	7875	3742
No. firms	4273	3843	3934	2386	983
Clusters	370	308	343	215	158
R^2	0.268	0.339	0.322	0.414	0.383

Source: authors' elaborations on Bank of Italy, CADS and SISF data. Notes: Columns (1)-(5) report within-firm estimates of equation 5 on the sample of firms with multiple banks. The dependent variable is the change in the log of loans from bank b to firm i in year t (total loans in column (1) and each of the four loan types in the following columns). The explanatory variables are: exposure_{bt-1} (bank b 's share of deposits held by non-residents on total deposits); assets_{bt-1} (log of total assets); foreign_{bt} (dummy for branches and subsidiaries of foreign banks); abroad_{bt} (dummy for the ownership of branches and subsidiaries abroad); mainbank_{ibt} (dummy equal to one if bank b is the main bank for firm i). All regressions include firm fixed effects. The coefficients on assets_{bt-1} , foreign_{bt} , abroad_{bt} , mainbank_{ibt} and on the constant are not reported. Standard errors are clustered at the bank level. The estimation period is shown in the heading of each panel. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Table 6: Credit supply shocks by loan type: additional bank-level controls

	Dependent variable: $\Delta \ln(\text{loan type})_{ibt}$				
	Total loans (1)	Ordinary LT loans (2)	Ordinary ST loans (3)	Export loans (4)	Import loans (5)
exposure_{bt-1}	-0.342*** (0.071)	-0.320*** (0.085)	-0.374*** (0.113)	-0.151 (0.150)	0.000 (0.149)
capres_{bt-1}	-0.292 (0.281)	-0.872** (0.409)	0.046 (0.352)	0.062 (0.594)	0.392 (0.528)
Observations	39015	23038	31809	14068	6195
No. firms	4767	4319	4410	2847	1120
Clusters	344	304	328	213	169
R^2	0.302	0.379	0.348	0.438	0.439
exposure_{bt-1}	-0.335*** (0.069)	-0.293*** (0.100)	-0.390*** (0.109)	-0.160 (0.129)	-0.031 (0.156)
tier1_{bt-1}	-0.003 (0.003)	-0.002 (0.003)	0.000 (0.003)	-0.009** (0.003)	-0.001 (0.004)
Observations	38665	22764	31549	13963	6089
No. firms	4761	4309	4403	2844	1111
Clusters	344	304	329	214	171
R^2	0.302	0.380	0.351	0.442	0.442
exposure_{bt-1}	-0.336*** (0.063)	-0.292*** (0.097)	-0.393*** (0.108)	-0.199 (0.130)	-0.040 (0.152)
tier12_{bt-1}	-0.006* (0.003)	-0.003 (0.003)	-0.002 (0.004)	-0.012** (0.006)	-0.003 (0.004)
Observations	38665	22764	31549	13963	6089
No. firms	4761	4309	4403	2844	1111
Clusters	344	304	329	214	171
R^2	0.303	0.380	0.351	0.442	0.442
exposure_{bt-1}	-0.316*** (0.079)	-0.284*** (0.105)	-0.368*** (0.121)	-0.212 (0.145)	-0.000 (0.153)
ibknet_{bt-1}	0.000 (0.001)	0.000 (0.000)	0.000 (0.001)	-0.002* (0.001)	0.001 (0.001)
Observations	38943	23006	31745	14064	6192
No. firms	4766	4318	4408	2846	1120
Clusters	322	294	306	211	166
R^2	0.302	0.378	0.348	0.438	0.439

Source: authors' elaborations on Bank of Italy, CADS and SISF data. Notes: Columns (1)-(5) report within-firm estimates of equation 5 on the sample of firms with multiple banks. The dependent variable is the change in the log of loans from bank b to firm i in year t (total loans in column (1) and each of the four loan types in the following columns). The explanatory variables are: exposure_{bt-1} (bank b 's share of deposits held by non-residents on total deposits); assets_{bt-1} (log of total assets); foreign_{bt} (dummy for branches and subsidiaries of foreign banks); abroad_{bt} (dummy for the ownership of branches and subsidiaries abroad); mainbank_{ibt} (dummy equal to one if bank b is the main bank for firm i). The following controls are included in separate regressions: capres_{bt-1} (capital and reserves divided by total assets); tier1_{bt-1} (tier1 ratio); $(\text{tier1} + \text{tier2})_{bt-1}$ (sum of tier1 and tier2 ratio); ibknet_{bt-1} (share of net interbank position on total assets). All regressions include firm-year fixed effects. The coefficients on assets_{bt-1} , foreign_{bt} , abroad_{bt} , mainbank_{ibt} and the constant are not reported. Standard errors are clustered at the bank level. The estimation period goes from 2009 to 2010. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Table 7: Credit supply shocks by loan type: sum of loans and guarantees

	Dependent variable: $\Delta \ln(\text{loan type})_{ibt}$				
	Total loans + guar.	Ordinary LT loans	Ordinary ST loans + guar.	Export loans + guar.	Import loans + guar.
	(1)	(2)	(3)	(4)	(5)
$exposure_{bt-1}$	-0.250*** (0.051)	-0.230*** (0.064)	-0.260*** (0.095)	-0.130 (0.087)	-0.270*** (0.093)
$assets_{bt-1}$	-0.005* (0.002)	-0.022*** (0.003)	0.003 (0.004)	-0.005 (0.006)	0.002 (0.004)
$foreign_{bt}$	0.097*** (0.015)	0.110*** (0.024)	0.080*** (0.024)	0.050** (0.025)	-0.012 (0.030)
$abroad_{bt}$	0.030** (0.012)	0.046*** (0.016)	0.015 (0.016)	0.017 (0.022)	-0.004 (0.017)
$mainbank_{ibt}$	0.113*** (0.009)	0.180*** (0.009)	0.054*** (0.012)	0.063*** (0.013)	0.033* (0.017)
Firm-Year FE	yes	yes	yes	yes	yes
Observations	43644	25488	35523	14807	8349
No. firms	4913	4415	4750	3032	1914
Clusters	421	371	390	237	191
R^2	0.275	0.357	0.318	0.434	0.499

Source: authors' elaborations on Bank of Italy, CADS and SISF data. Notes: Columns (1)-(5) report OLS estimates of equation 5 on the sample of firms with multiple banks. The dependent variable is the change in the log of the sum of loans and guarantees from bank b to firm i in year t (total loans and guarantees in column (1) and each of the four types of loans and guarantees in the following columns). Ordinary guarantees are not disaggregated between short and long term and have been considered short-term. The explanatory variables are: $exposure_{bt-1}$ (bank b 's share of deposits held by non-residents on total deposits); $assets_{bt-1}$ (log of total assets); $foreign_{bt}$ (dummy for branches and subsidiaries of foreign banks); $abroad_{bt}$ (dummy for the ownership of branches and subsidiaries abroad); $mainbank_{ibt}$ (dummy equal to one if bank b is the main bank for firm i). All regressions include firm-year fixed effects. The coefficient on the constant is not reported. Standard errors are clustered at the bank level. The estimation period goes from 2009 to 2010. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Table 8: Credit supply shocks by loan type: OLS estimates

	Dependent variable: $\Delta \ln(\text{loan type})_{ibt}$				
	Total loans (1)	Ordinary LT loans (2)	Ordinary ST loans (3)	Export loans (4)	Import loans (5)
exposure_{bt-1}	-0.264*** (0.060)	-0.232*** (0.066)	-0.372*** (0.119)	-0.170** (0.081)	-0.001 (0.132)
assets_{bt-1}	-0.006** (0.003)	-0.020*** (0.003)	0.007 (0.004)	-0.004 (0.005)	-0.004 (0.005)
foreign_{bt}	0.096*** (0.016)	0.102*** (0.026)	0.098*** (0.031)	0.054*** (0.019)	-0.045 (0.028)
abroad_{bt}	0.030* (0.016)	0.043** (0.019)	0.008 (0.017)	0.012 (0.020)	-0.004 (0.021)
mainbank_{ibt}	0.105*** (0.008)	0.152*** (0.008)	0.060*** (0.010)	0.058*** (0.010)	0.068*** (0.024)
Year FE	yes	yes	yes	yes	yes
Observations	42697	25970	33213	14411	6356
No. firms	5245	4707	4688	2901	1135
Clusters	415	373	375	234	187
R^2	0.017	0.025	0.006	0.003	0.016

Source: authors' elaborations on Bank of Italy, CADS and SISF data. Notes: Columns (1)-(5) report OLS estimates of equation 5 on the sample of firms with multiple banks or single banks. The dependent variable is the change in the log of loans from bank b to firm i in year t (total loans in column (1) and each of the four loan types in the following columns). The explanatory variables are: exposure_{bt-1} (bank b 's share of deposits held by non-residents on total deposits); assets_{bt-1} (log of total assets); foreign_{bt} (dummy for branches and subsidiaries of foreign banks); abroad_{bt} (dummy for the ownership of branches and subsidiaries abroad); mainbank_{ibt} (dummy equal to one if bank b is the main bank for firm i). All regressions include year fixed effects. The coefficient on the constant is not reported. Standard errors are clustered at the bank level. The estimation period goes from 2009 to 2010. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Table 9: Credit supply shocks by loan type: firm-level estimates

	Dependent variable: $\Delta \ln(\text{loan type})_{it}$				
	Total loans (1)	Ordinary LT loans (2)	Ordinary ST loans (3)	Export loans (4)	Import loans (5)
exposure_{it-1}	-0.172*** (0.057)	-0.223*** (0.070)	-0.065 (0.134)	0.061 (0.175)	0.403 (0.329)
assets_{it-1}	0.005 (0.004)	-0.010** (0.005)	0.021*** (0.007)	0.019** (0.008)	0.011 (0.015)
leverage_{it-1}	-0.043* (0.024)	0.102*** (0.031)	-0.002 (0.047)	-0.073 (0.061)	-0.340*** (0.112)
roa_{it-1}	0.030 (0.060)	0.132* (0.075)	-0.227* (0.120)	0.091 (0.144)	0.263 (0.234)
Industry-year FE	2d	2d	2d	2d	2d
Main bank FE	yes	yes	yes	yes	yes
Observations	7485	6671	6715	4167	1649
Clusters	4698	4214	4249	2704	1083
R^2	0.061	0.064	0.069	0.074	0.133

Source: authors' elaborations on Bank of Italy, CADS and SISF data. Notes: Columns (1)-(5) report OLS estimates of equation 6. The dependent variable is the change in the log of loans from the entire banking system to firm i in year t (total loans in column (1) and each of the four loan types in the following columns). The explanatory variables are: exposure_{it-1} (weighted average of banks' share of deposits held by non-residents on total deposits, where the weights are equal to the banks' share on total loans to firm i at $t-1$); assets_{it-1} (log of firm i 's total assets); leverage_{it-1} (firm i 's ratio of total debt to assets); roa_{it-1} (firm i 's return on assets);). All regressions include a set of sector2d*year fixed effects and a set of bank dummies equal to one if bank b is the main bank for firm i . The coefficient on the constant is not reported. Standard errors are clustered at the firm level. The estimation period goes from 2009 to 2010. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Table 10: Exports and credit shocks

	$\Delta \ln(\text{export})_{it}$				
	(1)	(2)	(3)	(4)	(5)
exposure_{it-1}	-0.116*** (0.044)	-0.091** (0.045)	-0.105** (0.048)	-0.091* (0.050)	-0.087* (0.049)
assets_{it-1}		-0.010*** (0.003)	-0.011*** (0.003)	-0.008** (0.004)	-0.014*** (0.004)
leverage_{it-1}			0.064** (0.025)	0.063** (0.025)	0.096*** (0.027)
distressed_{it-1}					-0.003 (0.025)
$\text{exposure}_{it-1} \times \text{distressed}_{it-1}$					-0.249* (0.146)
Industry-year FE	2d	2d	2d	3d	2d
Main bank FE	yes	yes	yes	yes	yes
Observations	8034	7664	7422	7422	7415
Clusters	4829	4626	4502	4502	4497
R^2	0.231	0.239	0.243	0.277	0.245

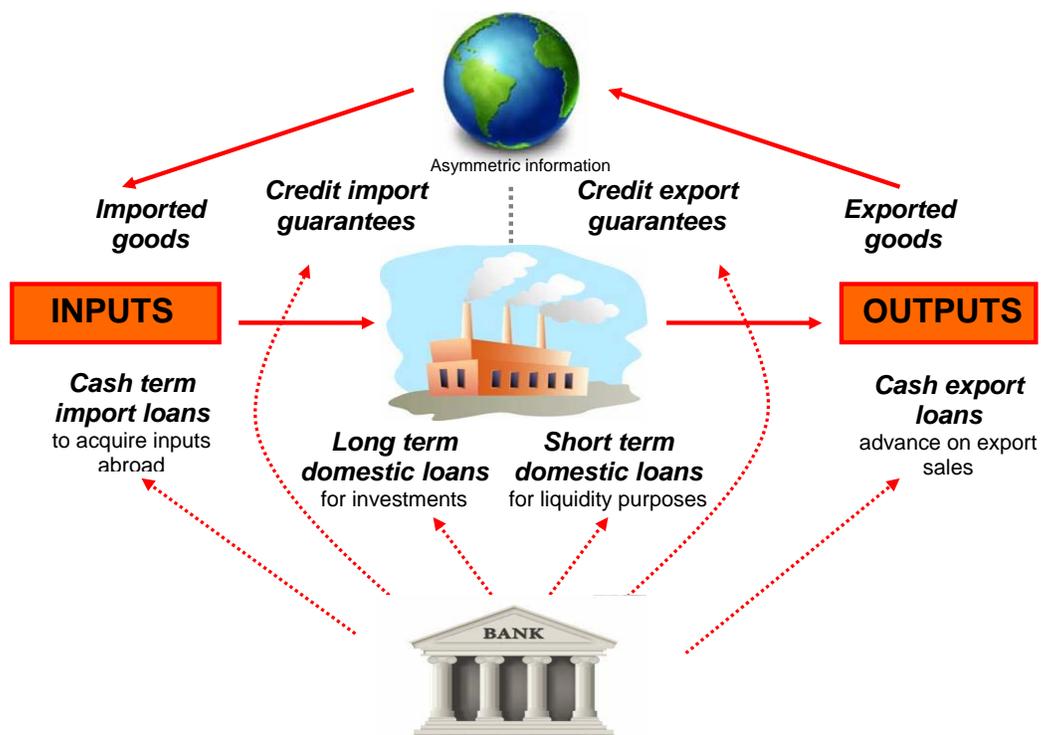
Source: authors' elaborations on Bank of Italy, CADS and SISF data. Notes: The table reports reduced form OLS estimates of equation 7. The dependent variable is the change in the log of exports of firm i in year t . The main explanatory variable (exposure_{it-1}) is the weighted average of banks' exposure to foreign funding (with weights equal to each bank' share in firm's total loans). We control for firm's log of total assets (assets_{it-1}) and ratio of financial debt to assets (leverage_{it-1}). Column 5 includes a dummy for financially distressed firms, defined as firms with sales below the median, return on assets below the median and leverage above the median. All regressions include interaction dummies between year and two-digit industry fixed effects (three-digit industry fixed effects in column 4) and a set of bank fixed effects for each firm's main bank. The coefficient on the constant is not reported. The estimation period goes from 2009 to 2010. Standard errors are clustered at the two-digit industry level. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Table 11: Domestic sales and credit shocks

	$\Delta \ln(\text{domsales})_{it}$				
	(1)	(2)	(3)	(4)	(5)
exposure_{it-1}	0.012 (0.042)	0.014 (0.045)	0.021 (0.046)	0.022 (0.046)	0.028 (0.047)
assets_{it-1}		-0.007** (0.003)	-0.006** (0.003)	-0.007** (0.003)	-0.009*** (0.003)
leverage_{it-1}			-0.024 (0.021)	-0.026 (0.022)	0.002 (0.023)
distressed_{it-1}					-0.026 (0.024)
$\text{exposure}_{it-1} \times \text{distressed}_{it-1}$					-0.047 (0.162)
Industry-year FE	2d	2d	2d	3d	2d
Main bank FE	yes	yes	yes	yes	yes
Observations	8086	7585	7357	7357	7357
Clusters	4943	4656	4539	4539	4539
R^2	0.272	0.275	0.276	0.317	0.277

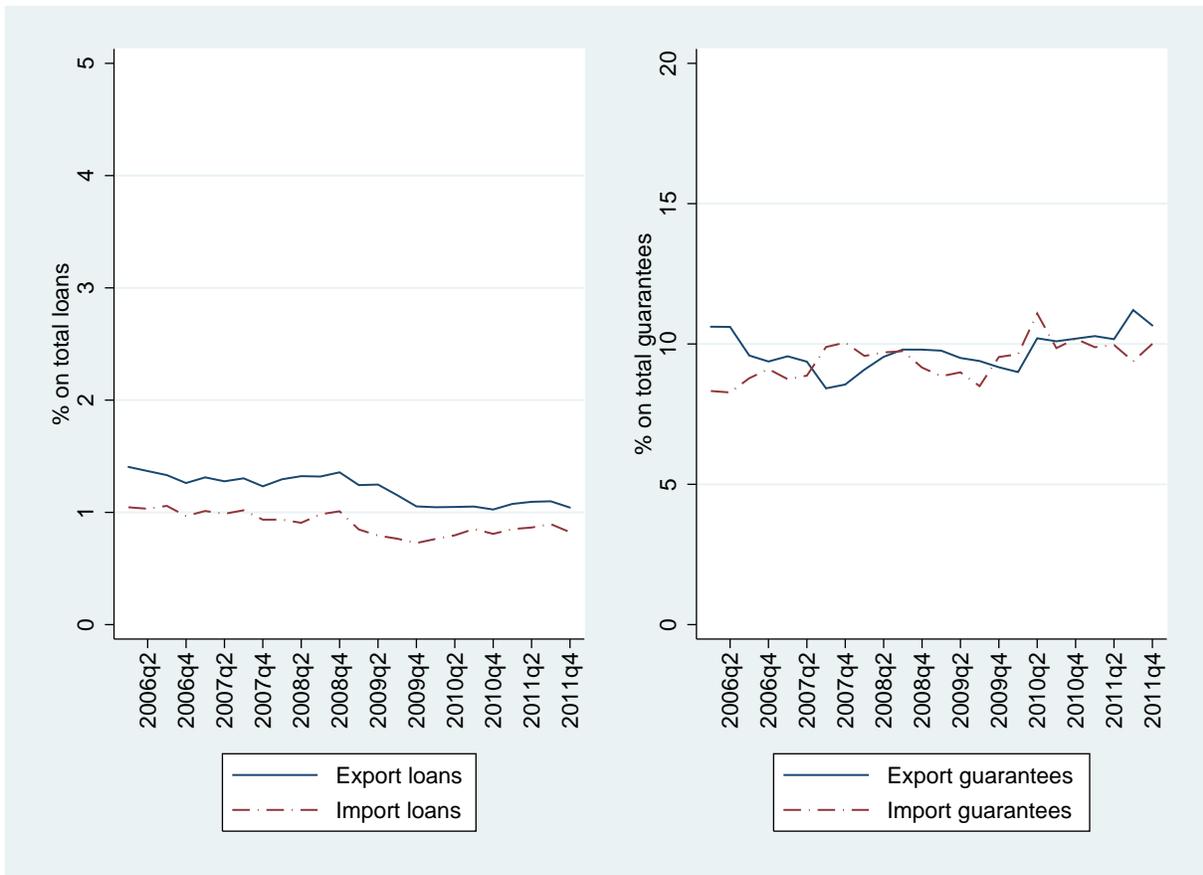
Source: authors' elaborations on Bank of Italy, CADS and SISF data. Notes: The table reports reduced form OLS estimates of equation 7. The dependent variable is the change in the log of domestic sales of firm i in year t . The main explanatory variable (exposure_{it-1}) is the weighted average of banks' exposure to foreign funding (with weights equal to each bank's share in firm's total loans). We control for firm's log of total assets (assets_{it-1}) and ratio of financial debt to assets (leverage_{it-1}). Column 5 includes a dummy for financially distressed firms, defined as firms with sales below the median, return on assets below the median and leverage above the median. All regressions include interaction dummies between year and two-digit industry fixed effects (three-digit industry fixed effects in column 4) and a set of bank fixed effects for each firm's main bank. The coefficient on the constant is not reported. The estimation period goes from 2009 to 2010. Standard errors are clustered at the two-digit industry level. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Figure 1: Bank finance and firms' international trade activities



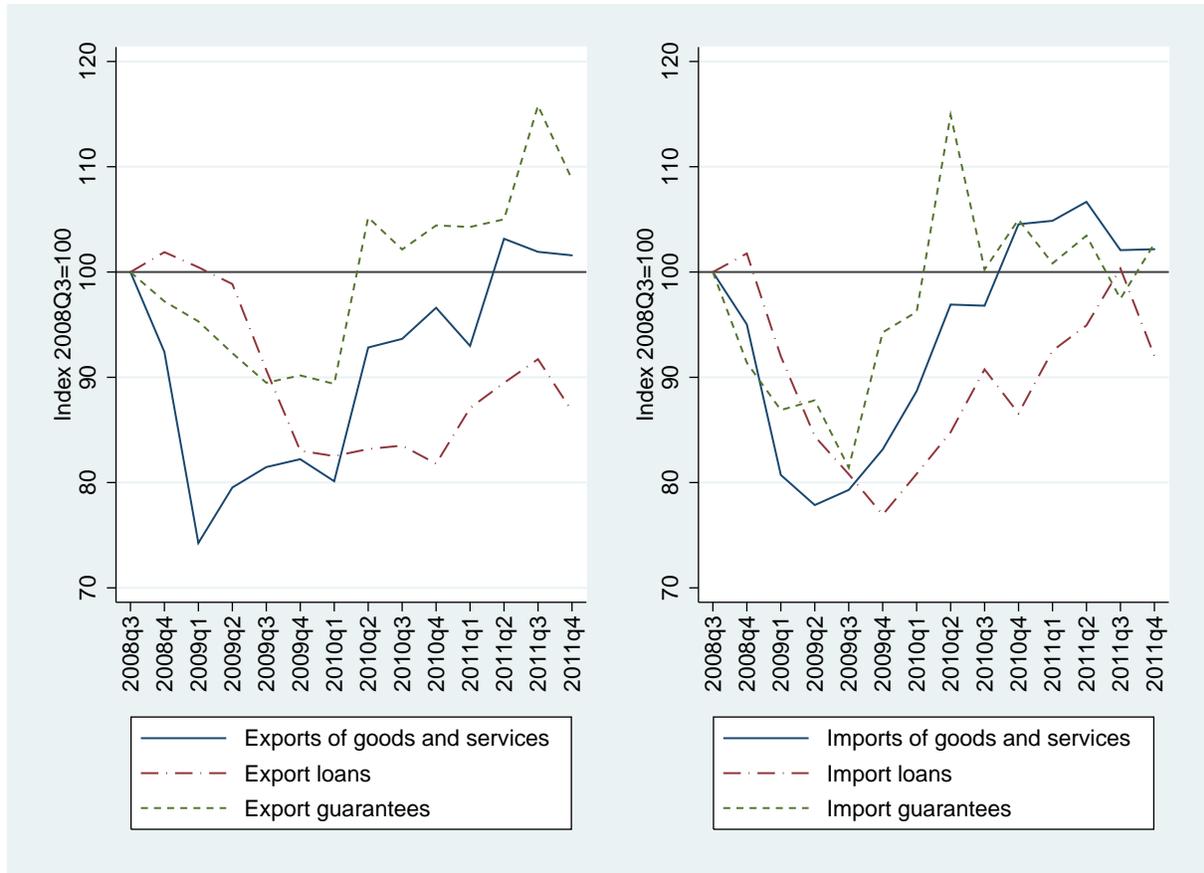
The figure represents a very simplified scheme of bank finance and firms' international trade activities.

Figure 2: Share of trade finance on overall bank lending (%)



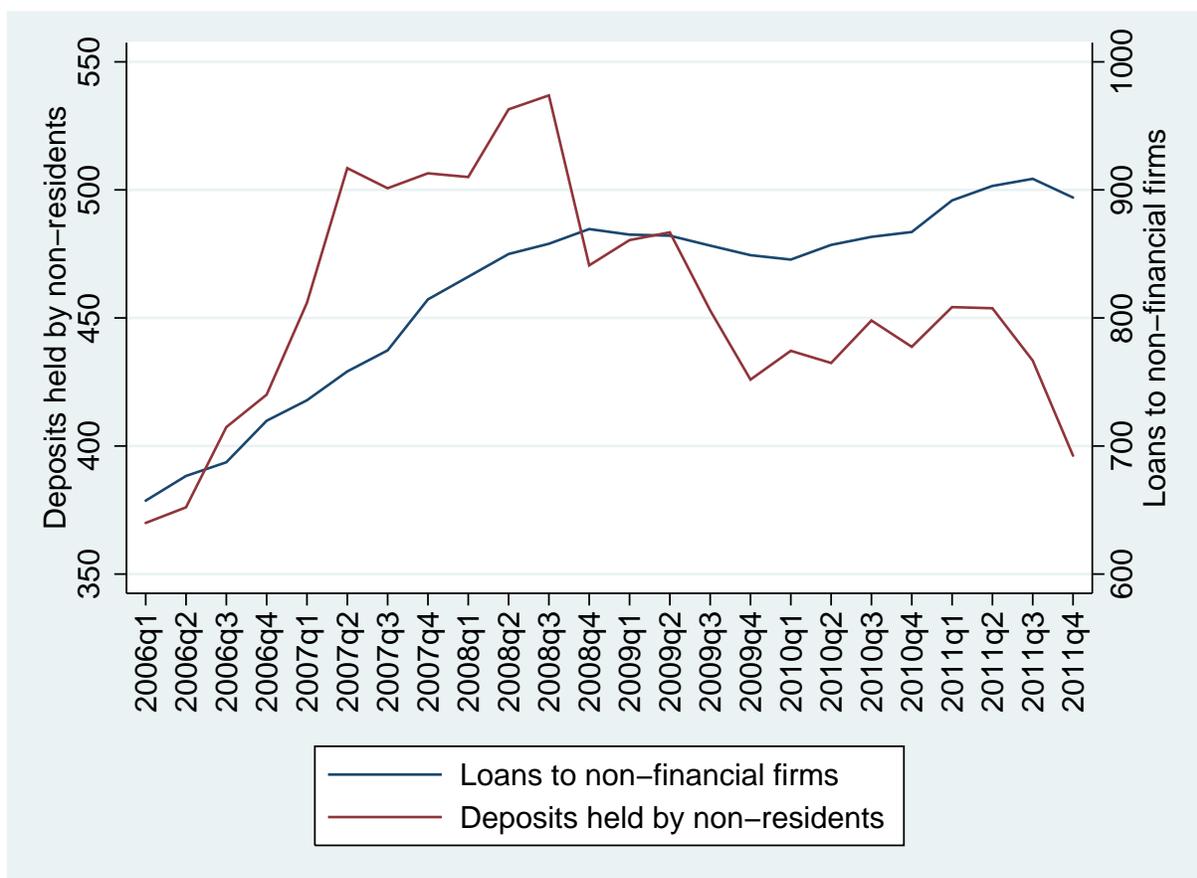
Source: authors' elaborations on Bank of Italy data. The figure reports the percentage share of export and import loans (left panel) and guarantees (right panel) on total loans and guarantees. Data are based on the universe of export, import and ordinary loans and guarantees reported by banks and other financial intermediaries to the Central Credit Register.

Figure 3: Trade finance and trade collapse



Source: authors' elaborations on Bank of Italy and Istat data. The figure reports the level of export loans, export guarantees, import loans, import guarantees (end-of-quarter stocks), exports of goods and services and imports of goods and services (quarterly flows): base index 2008Q3=100 (non-seasonally adjusted data). Data are based on the universe of export and import loans and guarantees reported by banks and other financial intermediaries to the Central Credit Register and the universe of exports of goods and services according to official statistics.

Figure 4: Banks' loans to non-financial firms and deposits held by non-residents



Source: Bank of Italy. The figure reports quarterly stocks of Italian banks' loans to Italian non-financial firms and deposits held by non-residents (EUR billions; non-seasonally adjusted data).

Appendix 1 - Sources and construction of the dataset

Data sources. Our data are derived from five sources: Central Credit Register, Supervisory Reports, ORBIS, Company Accounts Data Service (CADS) and Survey on Industrial and Service Firms (SISF).

Central Credit Register. The Central Credit Register is a database run by the Bank of Italy and used by banks and other financial institutions to assess their prospective borrowers' debt exposure. The Register includes all loans and guarantees extended by Italian banks and other financial institutions to Italian firms and individuals above a threshold level equal to EUR 75,000 (the threshold refers to the borrower's aggregate exposure vis-à-vis a given intermediary). The threshold level was reduced to EUR 30,000 at the beginning of 2009. To correct for the change in the threshold, we drop bank-firm pairs with total loans and guarantees lower than EUR 75,000 over the whole sample period. We collect quarterly stocks of loans and guarantees extended by Italian banks to Italian manufacturing firms. We use the drawn margin (i.e. the amount of credit actually disbursed or of guarantees actually granted to a customer), since it is a more precise measure of the amount of credit actually used by firms than the granted margin (i.e. the amount of credit or guarantees that the customer can use directly insofar as it derives from a fully effective contract that has been concluded, "accordato operativo"). We compute pro-forma loans data for all banks in our sample in order to control for mergers and other corporate restructuring activities. Since our firm-level data are only available on an yearly basis, we compute the annual average of end-of quarter stocks. We prefer to compute an average over each quarter rather than taking the end-of-year stocks since export and import loans usually have a short-term maturity. Our data are not corrected for loan securitizations (loans that are securitized are no longer reported to the Register). However, securitization activity was very weak during the crisis, especially after 2009, and it usually includes loans to households or long-term loans to firms, but not trade finance loans.

Supervisory Reports. We collect bank-level data on the end-of-year stocks of total deposits and deposits vis-à-vis non-residents from Bank of Italy's Supervisory Reports in order to compute our measures of exposure to the foreign funding shock. We compute pro-forma deposits for all banks in our sample in order to control for mergers and other corporate restructuring activities.

ORBIS. ORBIS is a commercial database provided by Bureau van Dijk, which is based on several sources, which include balance sheet information collected by local Chambers of Commerce, listed companies' databases, shareholders registers and national private databases. We collect data on capital requirements and liquidity ratios for banks located in Italy.

Company Accounts Data Services. CADS is a commercial database maintained by a consortium of banks for credit risk evaluation purposes. It contains balance sheet data for a sample of about 30,000 Italian firms every year. We obtain balance sheet data for firms in the manufac-

turing sector. CADs also reports firm-level exports, which are usually recorded in the notes to financial statements.

Survey on Industrial and Service Firms. SISF is an annual survey run by the Bank of Italy. It covers about 4,000 industrial and service firms with 20 or more workers. The sampling scheme is based on sector of activity, size class and region. The distribution of the sample is biased in favour of large firms, with 61 percent of the firms interviewed with 50 or more workers (compared with 30 percent in the target population). The survey collects annual data on investments, employment, turnover, profits, capacity utilization and financing.

Construction of the dataset. First, we merge firm-level data from CADs and SISF using a unique tax identifier. We drop firms with zero or missing exports.²⁷ For variables that appear in both datasets, we prefer to use SISF data, which are subject to stronger quality controls. The correlation between variables in the two datasets is 98 percent for total sales and 90 percent for exports. We drop observations with exports, sales or domestic sales increasing or decreasing by a factor of 4 with respect to the previous year. We also run several consistency checks. Second, we merge bank-firm data from the Register with our firm-level data. Firms that borrow less than 75,000 EUR from banks in the Central Credit Register are not included in our sample. They account for about 15 percent of the total number of firms for which data on exports are available. Third, we merge bank-firm data with bank-level data on the share of deposits held by non-residents from the Supervisory Reports and other bank-level indicators (capital requirements and liquidity ratios) from ORBIS. We end up with a sample of 26,358 bank-firm observations on average each year between 2007 and 2010. For the econometric analysis on the bank-firm dataset, we drop banks with extreme changes in total loans (defined as those below the 5th and above the 95th percentile for the annual growth rate in total loans (corresponding to 0.7 percent of observations)). We then collapse our data at the firm-level, ending up with 4,940 firms on average each year between 2007 and 2010. For the econometric analysis on the firm-level dataset, we drop firms that export less than one EUR million, in order to avoid that our results are affected by unusual changes in export levels in these small and occasional exporters.

²⁷In CADs data it is not possible to distinguish firms with zero exports and firms with missing values for exports. We therefore assign a missing value to exports for all observations with zero exports in CADs. Using data for the subsample of firms that appear in both CADs and SISF datasets, we find that the probability that exports are not reported in CADs data is higher for smaller firms.

Appendix 2 - Export and import loans and guarantees

The Central Credit Register reports information on loans and guarantees disaggregated by bank, firm, destination and risk type.

Loans (“crediti di cassa”) are classified according to the implicit type of risk and include the following forms: self-liquidating loans, term loans and revocable loans. Self-liquidating loans (“rischi autoliquidanti”) are credit transactions with a form of predetermined redemption, such as loans granted to make receivables from third parties immediately available to customers. Term loans (“rischi a scadenza”) are credit transactions with a contractual term and no form of predetermined redemption (such as mortgages and leasing contracts). Revocable loans (“rischi a revoca”) correspond to overdrafts.

Guarantees (“crediti di firma”) include transactions (endorsements, documentary credits, other credit guarantees, etc.) by means of which a bank takes over or guarantees the liability of a third party. They are recorded according to whether their main purpose is commercial or financial. We only consider commercial guarantees (“crediti di firma commerciali”).

Crucially, as anticipated, we also observe the destination of loans and guarantees according to three categories: export activity, import activity, other activity. The criterion is whether the loan or guarantee is explicitly provided to the customer for the purpose of an export transaction or of an import transaction of either goods or services.

Banks usually offer export and import loans as specific products, with their own standardized contractual terms, within their portfolio of loan contracts. The provision of export and import loans and guarantees usually requires several documents, such as sales contracts or orders, shipping forms or certificates of quality. This ensures that banks correctly report export and import loans in the Central Credit Register data. Only for a few very large firms it might be slightly more difficult for banks to correctly report the destination of each loan, since these firms might have non-standardized loan contracts. We check the robustness of our results to this reporting issue by excluding the largest Italian firms from our estimation sample.

Loans and guarantees that are not provided for export or import activities are included in the residual category (Bank of Italy 1991, p. II.22). Within the residual category of ordinary loans, we further distinguish between term loans, which usually have a long-term maturity and are used to finance fixed investments (equipment, capitalized costs, etc.), and self-liquidating and revocable lines, which are mainly used to finance short-term working capital for domestic sales or other purposes.

The vast majority of export loans are self-liquidating loans with a predetermined redemption, usually related to the receipt of the revenue from the importer. Import loans are instead almost always term loans, usually with a maturity lower than 12 months.

Table A3 reports trade finance intensity by two-digit sector. Leather, textile and wood products are among the sectors with the highest ratios of export loans on total loans, while motor vehicles and other transport equipment and coke and refined petroleum record the lowest values. The range is quite wide, with the percentage share of export loans on exports going

from 0.6 percent for other transport equipment and coke and refined petroleum to 10.0 percent for leather. A roughly similar ranking holds for import loans on sales. Export and import guarantees seem instead to be concentrated in just a few sectors (other transport equipment, industrial machinery, electrical equipment, radio and TV and precision instruments).

Further information on the average maturity of export and import loans can be obtained from an international survey of nine banks carried out by the International Chamber of Commerce (2010). The banks provided portfolio-level data on 5,223,357 transactions, with a total throughput between 2005 and 2009 of USD 2.5 trillion. Table A4 reports the average maturity and total number of transactions for seven different product types. The average maturity is around 2-4 months for export guarantees (export letters of credit confirmed), import loans and import guarantees (import letters of credit issued). The average maturity of export loans is between 3 and 9 months.

Table A1: **Sample composition**

Year	Firms	Banks	Bank-firm pairs
2007	5396	404	28338
2008	5013	377	27245
2009	4599	380	24690
2010	4753	383	25159
Avg. 2007-2010	4940	386	26358

Source: authors' elaborations on Bank of Italy, CADS and SISF data. Notes: The table reports the number of firms, banks and bank-firm pairs by year. See Section 3.3 and Appendix 1 for more details on the sample.

Table A2: **Exports of goods: annual growth rate in sample and aggregate data**

Year	Growth rate (sample exports)	Growth rate (total exports)	% sample exports on total exports
2007	13.8	9.9	47.8
2008	4.1	1.2	48.6
2009	-21.1	-20.9	47.0
2010	14.8	15.6	48.6
Avg. 2007-2010	2.9	1.5	48.0

Source: authors' elaborations on Bank of Italy, CADS and Istat data. Notes: The table reports the growth rate of nominal exports of goods in our sample and the corresponding aggregate figure from Italy's official statistics. The last column reports the percentage share of exports in our sample on total exports of goods from official statistics.

Table A3: Trade finance by two-digit sector

Sector	Export loans on exports	Export guarantees on exports	Import loans on sales	Import guarantees on sales
Food and beverage	6.9	0.1	1.3	0.1
Textile	9.8	0.1	1.8	0.8
Wearing apparel	8.0	0.1	1.2	1.3
Leather	10.0	0.1	3.0	0.5
Wood	8.9	0.1	3.7	0.6
Pulp and paper	5.7	0.4	0.9	0.1
Printing and publishing	8.2	0.2	0.2	0.1
Coke and refined petroleum	0.6	0.3	2.1	1.2
Chemicals	2.8	0.4	0.6	0.1
Rubber and plastics	6.3	0.1	0.4	0.1
Non-metallic minerals	8.0	0.2	0.3	0.2
Basic metals	4.4	0.4	2.3	0.8
Fabricated metals	7.1	0.5	0.9	1.1
Industrial machinery	4.6	1.1	0.2	2.1
Electrical equipment	5.6	2.8	0.3	1.5
Radio and TV	2.2	1.7	0.4	0.6
Precision instruments	3.9	1.6	0.5	2.4
Motor vehicles	1.9	0.1	0.1	0.0
Other transport equipment	0.6	6.1	0.1	5.5
Other manufacturing	8.1	0.1	0.6	0.2

Source: authors' elaborations on Bank of Italy, CADS and SISF data. Notes: The table reports the ratio of export loans on exports, export guarantees on exports, import loans on sales, import guarantees on sales by two-digit sector. Statistics are based on 19746 observations.

Table A4: Average maturity of export and import loans and guarantees in a survey of international banks

Type of loan or guarantee	Average maturity		Number of transactions
	(days)	(months)	
Export loans (corporate risk)	90	3	877053
Export loans (bank risk)	256	9	752356
Export letters of credit confirmed	53	2	405312
Guarantees and standby letters of credit	76	3	599014
Import loans (corporate risk)	115	4	584681
Import loans (bank risk)	91	3	808671
Import letters of credit issued	79	3	1196270

Source: International Chamber of Commerce (2010) data. Notes: The table reports the average maturity (number of days and months) and the number of transactions by type of loan or guarantee according to a survey of international banks.

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