Trade and finance: is there more than just "trade finance"? Evidence from matched bank-firm data*

Silvia Del Prete† and Stefano Federico‡

September 2012

Abstract

Using unique matched bank-firm data on export and import loans for a representative sample of Italian firms, this paper investigates the effects of credit shocks on trade during the recent economic crisis. We find that firms that borrowed from banks that were more exposed to a negative funding shock exported less relative to firms that borrowed from less exposed banks. When we disentangle the impact of the funding shock on various loan types, we find that import loans and loans for domestic activities were hit harder than export loans. This suggests that the contribution of finance to trade is not limited to the specific financing of export activities, but reflects a more general provision of credit to the exporting firm. *Keywords*: trade collapse; credit shocks; export loans; financial crisis. *JEL Classification*: F14; F40; G21; G32; L20.

Work in progress. Please do not quote or circulate.

*The authors wish to thank Eric Verhoogen, Jonathan Vogel and David Weinstein for useful advice. The views expressed in this paper are those of the authors and do not necessarily reflect those of the Bank of Italy.

†Bank of Italy. E-mail address: silvia.delprete@bancaditalia.it.

‡Bank of Italy. E-mail address: stefano.federico@bancaditalia.it.

Contents

1 Introduction **3**

2 Related literature **6**

3 Data **8**
3.1 Sources 8
3.2 Export and import loans and guarantees 10
3.3 Sample 13

4 Stylized facts on trade finance **14**
4.1 Aggregate data 14
4.2 Bank-firm-level data 16
4.3 Firm-level data 18
4.4 Quarterly bank-level data 20

5 Credit shocks and exports **21**
5.1 A simple model of trade finance 21
5.2 Measuring the credit shock 22
5.3 Estimation strategy 23
5.4 Results 25
5.5 Robustness 28

6 Credit shocks and trade finance **30**
6.1 Methodology 30
6.2 Results 31
6.3 Robustness 34
6.4 Public export credit guarantees 37

7 Concluding remarks **38**

Appendix 1 **65**

Appendix 2 **67**

1 Introduction

The role of banks in international trade has been under greater scrutiny since the trade collapse in the recent economic crisis, which has stimulated a rich literature. Some studies argue that credit shocks accounted for a significant fraction of the decrease in trade flows in 2008-2009 (Amiti and Weinstein 2011, Bricongne et al. 2011, Chor and Manova 2011, Paravisini et al. 2011), while other studies find that the trade collapse largely reflected demand factors (Eaton et al. 2011, Levchenko et al. 2011).

The lack of consensus in the literature may reflect how "trade finance" is measured.[1] From a theoretical point of view, banks contribute to international trade in several ways. 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 firms' export working capital or their imports of intermediate inputs. Third, they provide long-term loans for investments that expand firms' production capacity for exports.

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, as discussed by Ahn, Amiti and Weinstein (2011). Two important exceptions are Amiti and Weinstein (2011) and Paravisini et al. (2011). Using matched bank-firm data, they are able to overcome most of the measurement issues related to the use of industry-level proxies of trade finance. However, both studies share an important limitation, which is that they do not identify the actual amount of credit specifically devoted to export or import activities.

Loans might be used by exporters for activities that are unrelated to exports (working capital for domestic sales, fixed investments, etc.). Also, export and import loans may differ from other types of loans in terms of risk, maturity and collateral and may be therefore differently affected by

[1] Following Amiti and Weinstein (2011) and Chor and Manova (2011), 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 firms and its buyers or suppliers which follows commercial transactions without immediate payments.

bank shocks that reduce the supply of credit. This might create a bias in the estimates of the elasticity of exports to trade finance.

Ideally, one would like to observe, for each bank-firm relationship, not only the total amount of loans but also the amount of loans explicitly provided to support export or import. This is the special contribution and novelty of this paper. We use a unique matched bank-firm dataset on a representative 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 the 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.[2]

We start by reporting stylized facts on several aspects of trade finance, such as the concentration of the market for trade finance loans, the relationships between firms and banks providing trade finance and the industry-level variation in trade finance intensity. This represents a contribution to the existing body of knowledge, which is usually based on aggregate surveys (International Monetary Fund and Bankers' Association for Finance and Trade 2009, Finance, Credit and International Business Association 2009, International Chamber of Commerce 2010, 2011) or evidence from a single exporter (Antràs and Foley 2011).

We then investigate the effects of bank shocks on exports in the recent economic crisis. The trade collapse in Italy was similar in magnitude and timing to the experience of the other main countries. Between the third quarter of 2008 and the second quarter of 2009 exports of goods in value terms fell by 23 percent and imports by 27 percent. The recovery was more gradual, especially for exports, which were still below their pre-recession peak during the year 2011 (Figure 1). In the same period, credit to Italian non-financial firms decelerated first and then stagnated, with a heterogeneous behavior across banks. Some banks, especially those belonging to the top five banking groups, experienced higher funding constraints, which limited

[2]The 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.

their lending activities (Albertazzi and Marchetti, 2010). In particular, since the aftermath of the Lehman crisis Italian banks faced a marked decrease in deposits held by non-residents, as the tensions in the interbank market deepened and raising funding from foreign banks became more expensive (Figure 2).

Our detailed bank-firm data, covering the years 2006-2011, give us a unique perspective on banks' contribution to the trade collapse in the recent economic crisis. We exploit ex-ante variation in banks' exposure to foreign funding as an instrument for the decrease in the supply of credit to manufacturing firms. We estimate the effect of the credit shock on firm exports. We are also able to explore in detail how the credit shock impacts on the various loan types, including export and import loans. Beyond the unique detail on trade finance available in 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 have therefore a 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 findings are as follows. We find that firms that borrowed from banks that were more exposed to the funding shock exported less relative to firms that borrowed from less exposed banks. We also show that the decrease in loans was the main channel behind this outcome. When we disentangle the impact of the funding shock on the different types of loan, we find that the impact was significant for import loans and domestic loans, but not for export loans. The lower sensitivity of export loans to bank shocks can be explained with the short-term and self-liquidating nature of export working capital loans, which makes them less risky than longer-term loans. An additional explanation is related to public export credit guarantees available when firms export to riskier and more distant countries.

Overall, our findings suggest that the contribution of finance to trade is not limited to the specific financing of export activities, as it was often assumed in the previous literature, but reflects a more general provision of credit to the exporting firm.

The rest of the paper is organized as follows. In Section 2 we discuss related literature. Section 3 describes the data, while Section 4 presents stylized facts on trade finance. Section 5 contains our main results on the effects of the credit shock on trade. Section 6 focuses on how the credit shock impacts trade finance. Section 7 concludes.

2 Related literature

Our study is related to three main lines of research: the literature on financial factors and trade, the literature on international trade finance practices and the literature on the "real effects of finance".

The first line of research suggests that exporters are particularly vulnerable to financial market frictions. There are various reasons why financial factors may matter more for exports than for domestic sales (see the discussion Amiti and Weinstein 2011, Feenstra et al. 2011). 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, as assumed for instance in Melitz (2003). Thus, shocks originating from bank lending channel are potentially relevant for firms' trade activity.

Two studies analyze the effect of credit shocks on exports using matched bank-firm data. Amiti and Weinstein (2011) show that a deterioration in Japanese banks' market-to-book value is associated with a decrease in their clients' exports during the 1990s, after controlling for industry-time fixed effects. Parivisini et al. (2011) match bank-firm data with detailed customs data on Peruvian exports in 2007-2009, so that they are able to compare the effect of bank shocks across firms exporting the same product to the same destination. They use banks' ex ante exposure in foreign liabilities as an instrument for changes in the supply of credit in post-Lehman period,

the idea being that banks that used to rely more on foreign funding sources were forced to restrain their lending behavior in the crisis period when foreign liquidity dried up. 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.

The vast majority of studies use instead indirect proxies of trade finance. Specifically, Chor and Manova (2010) proxy 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 in countries with higher interbank rates during the financial crisis. Other studies using a similar set of trade finance indicators find much weaker evidence on the role of financial factors on trade (Levchenko et al. 2011). Behrens et al. (2010) do not find support for the hypothesis that financial shocks mattered more for exports than for domestic sales during the trade collapse.[3]

As argued by Ahn et al. (2011), however, such proxies are not necessarily correlated with trade finance. External finance dependence is usually defined as the share of capital expenditures financed without cash flow, but this has little to do with needs for trade finance. Trade credit intensity (usually measured as the ratio of trade credit on 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.[4]

In a related line of research, a set of recent studies provides a mainly theoretical analysis of the role of banks in international trade finance

[3]While this literature was largely inspired by the post-Lehman trade collapse, there was already a less recent literature on the role of financial factors in trade, especially in the context of models with heterogeneous firms with credit constraints (Chaney 2005, Greenaway et al. 2007, Manova 2011, Minetti and Zhu 2011, Muuls 2008).

[4]Ahn et al. (2011) use instead the mode of transport as a proxy for reliance on trade finance. The underlying assumption is that goods shipped by sea are likely to be more sensitive to financial factors than goods shipped by air or land, because of the longer transit times. They find that prices of goods shipped by sea increased more than prices of goods shipped by air or land during the crisis period. This could be taken as evidence that financial shocks, which should matter more for goods shipped by sea, played a role during the trade collapse.

practices. This literature explores how the choice of financing terms for cross-border commercial transactions (exporter finance, importer finance or bank finance) is influenced by firm, sector or country characteristics (Ahn 2011, Antràs and Foley 2011, Feenstra, Li and Yu 2011, Olsen 2010, Schmidt-Eisenlohr 2009). In addition, Antràs and Foley (2011) report evidence based on a single U.S.-based exporter of frozen and refrigerated food products and show that exporter finance is less likely than importer finance or bank finance in countries with a weaker enforcement of contracts or when the relationship between the exporter and the importer is long-lasting.

Finally, our paper is also related to a large literature on the real effects of finance (Bernanke 1983, Peek and Rosengren 2000, Kashyap and Stein 2000).[5] Recent studies (Khwaja and Mian 2008) disentangle a "bank lending channel" and a "firm borrowing channel". The former corresponds to the decrease in the amount of credit supplied by a bank that is exposed to a given shock. The latter refers to the reduction in the amount of credit borrowed by a firm, taking into account that the fall in bank lending may be at least partially offset by increasing credit borrowed by other banks or alternative sources of finance. The interaction between these two channels is complex, especially during a crisis period, in which transmission of information and evaluation of borrowing firms' creditworthiness become more complicated.

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 2011. Drawing on the 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

[5]This branch of the literature is very sizable. Related to our topic, we recall some papers on real outcomes of bank shocks: Carvalho, Ferreira and Matos (2012), Iyer, Lopes, Peydro and Schoar (2010), Jimenez, Mian, Peydro and Saurina (2010), Kalemli-Ozcan, Kamil and Villegas Sanchez (2010), Peek and Rosengren (2000), Ashcraft (2005).

with three firm-level datasets: Company Accounts Data Service (*Centrale dei Bilanci*); Bank of Italy's Survey of Industrial and Service Firms; Bank of Italy's Survey on Foreign Assets and Liabilities.

Central Credit Register is a database run by a special unit of 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 are recorded above the threshold level of EUR 75,000.[6] Since banks use the Register to assess the creditworthiness of their current or prospective borrowers, the quality of data is very high.

Furthermore, the amount of information provided in this database is unique. We are able to observe not only the actual amount of outstanding loans for each bank-firm pair, but we have information on the different types of loan. Specifically, we are able to identify the destination of each loan or commercial guarantee (export, import or other activities) and the nature of contractual terms (self-liquidating, revocable and term loans). A detailed explanation of the different types of loans and guarantees is given in section 3.2.

We derive firm-level information from three separate sources.[7] Company Accounts Data Service is 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 several balance-sheet variables, including total assets, total loans, trade credits, trade debits and cash flow.

The Survey of Industrial and Service Firms is carried out yearly by the Bank of Italy (Bank of Italy 2011) and covers a sample of about 4,000 Italian firms with at least 20 employees in manufacturing and service sectors. The data are of very high quality, being collected by economists at the local branches of the Bank of Italy, who often have a long-lasting relationship

[6]The threshold level was reduced to EUR 30,000 at the beginning of 2009. To correct for the change in the threshold, we drop firm-bank pairs with total loans and guarantees lower than EUR 75,000 over the whole sample period.

[7]All sources for firm-level data are currently available until 2010, except for the Survey of Industrial and Service Firms for which 2011 data is already available.

with the firms' management. We observe firms' sales, exports, employment and other firm-level variables.

The Survey on Foreign Assets and Liabilities is carried out yearly by the Bank of Italy on approximately 4,000 firms for the purpose of balance of payments compilation. It contains firm-level data on assets and liabilities versus non-residents. We use the end-of-year stock of trade credits and trade debits versus non-residents. This allows us to see whether there is any complementarity or substitution between trade credit and trade finance from banks.

We complement the data with additional bank-level information coming 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 Supervisory Reports. We also use data from the Bank of Italy's Census of banks on banks' structural characteristics (i.e. size, group structure, ownership of foreign branches and subsidiaries) that may serve as control variables. We also collect information on mergers and acquisitions.[8] Finally, we get other bank-level indicators, such as capital requirements, interbank ratios, liquidity ratios and market capitalization data from ORBIS.[9]

3.2 Export and import loans and guarantees

The Central Credit Register reports information on loans and guarantees for each bank-firm relationship.

Loans ("crediti di cassa") are classified according to the implicit type of risk and include the following forms: self-liquidating loans, term loans

[8]We compute pro-forma loans and balance sheet data for all banks in our sample in order to control for mergers, acquisitions, spin-offs and other corporate restructuring activities. In other words, we systematically aggregate target and bidder banks loans and balance-sheet data for all the mergers and acquisitions deals that took place in our sample period.

[9]ORBIS is a database provided by Bureau van Dijk. It contains information on more than 50 million companies worldwide. It 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 banks located in Italy (NACE Rev. 2 code: 6419 - Other monetary intermediation).

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 undertakes to take over or guarantee 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 both goods and services.[10] 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 domestic 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.

We end up with four types of loans: export loans, import loans, long-term domestic loans and short-term domestic loans. Similarly, we aggregate

[10]Feenstra, Li and Yu (2011) assume that banks cannot follow a loan once the money enters the firm. Our data suggest instead that loans can be explicitly made for export or import transactions. Indeed, banks usually offer export and import loans as specific products, with their own standardized contractual terms, within their portfolio of loan contracts. This ensures that banks correctly report export and import loans in the Central Credit Register data. In the case of very large firms, however, it might be less easy for banks to correctly report the destination of every loan, since these firms might have non-standardized loan contracts. We check the robustness or our results to this reporting issue by excluding the largest Italian firms from our estimation sample (see Section 5.4).

commercial guarantees in three types: export guarantees; import guarantees; domestic guarantees.

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

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. 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, often with a maturity lower than 12 months.

Notice that the forms of trade finance included in our data cover the intervention of banks during the entire export/import cycle, from working capital finance to trade payments. In contrast, the literature on international trade payments focuses only on the latter aspect, which usually arises at the very end of the export/import cycle (Antràs and Foley 2011, Schmidt-Eisenlohr 2011).[11] One of the main findings of this paper is indeed that trade finance by banks is about more than only facilitating trade payments, as it also includes more substantial forms of financing such as export working capital loans or import loans.

Loans and guarantees are recorded on a monthly basis. Since our firm-level data are only available on an yearly basis, we compute the annual

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

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.[12] For both loans and guarantees we use the drawn margin ("utilizzato"), i.e. the amount of credit actually disbursed or of guarantees actually granted to a customer.

In the econometric analysis we largely focus on export and import loans only, without including export and import guarantees. The reason is that the former require an actual disbursement of liquidity from the bank to the firm, while the latter only implies a potential commitment sometime in the future. Since they do not require an immediate provision of liquidity, guarantees might be less affected by the negative funding shock. Throughout the paper we will check that all our main findings hold if we consider both loans and guarantees.

3.3 Sample

We extract bank-firm data from the Central Credit Register for a sample of 16,392 manufacturing firms.[13] The sample includes firms that appear in either the Company Accounts Data Service, the Survey of Industrial and Services Firms or the Survey on Foreign Assets and Liabilities.[14] The sample accounts for 39 percent of employment and 67 percent of sales in Italy's manufacturing sector. On average between 2006 and 2010 there are 12,836 firms and 70,893 bank-firm pairs each year (Table 1). We use this sample for most of the stylized facts presented in Section 4.

Firm-level data on exports are available only for a subsample of firms in

[12] According to a survey of international banks, export loans have a maturity between 3 and 6 months, while import loans usually have a 3-month maturity (see Appendix 2 for further details).

[13] We consider only manufacturing firms since one of the reasons why credit shocks should 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). Services firms are considered in robustness checks.

[14] In addition to the above-mentioned 16,392 firms, there are 2,966 firms in the three firm-level datasets that do not borrow or borrow less than 75,000 EUR from banks in the Central Credit Register (15 percent of total number of firms). We do not include these firms in the sample.

the Survey of Industrial and Service Firms and in the Company Accounts Data Service.[15] This smaller sample includes 7,010 firms on average each year, corresponding to 39,804 bank-firm pairs. Exports from our firm-level data represent on average 48 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 3). We use this sample for the remaining stylized facts and for the econometric analysis, where we estimate the impact of the negative funding shock on export flows and on trade finance.

The composition of the two samples is quite similar (Table 2). They include both medium-large firms as well small firms (except very small firms, which are are not required to report a detailed balance sheet and are usually not covered by the surveys). The median number of employees is 59 in the large sample and 73 in the small sample.

For the econometric analysis, we clean the data in the following ways. 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). We drop small and occasional exporters, defined as firms that export less than one million of euro.

4 Stylized facts on trade finance

4.1 Aggregate data

We present several new stylized facts 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.

[15]Data on exports in the Company Accounts Data Service do not allow to reliably distinguish between firms with zero exports and firms with missing exports. We therefore transform zero exports in missing exports for firms in the Company Accounts Data Service. In the case of firms covered by both sources, we use export information from the Survey of Industrial and Service Firms, given its higher reporting quality and its extensive consistency checks. We also assign missing values for variables (exports, sales, employment) that increase or decrease by a factor of four with respect to the year before (see Appendix 1 for further details).

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. Figure 3 reports the end-of-quarter stock of export and import loans in nominal terms between 2006Q1 and 2011Q4. Export loans are equal to about 20 EUR billion on average over the sample period, while import loans are about 15 EUR billion (1.3 and 0.9 percent of Italy's GDP).

Export loans account for 1.2 percent of total loans reported to the Central Credit Register, while import loans account for 0.9 percent of total loans. This is in line with the finding by Amiti and Weinstein (2011) on Japanese banks, where "foreign bills bought" (receivables from export sales discounted by the bank) accounted for about 1 percent of total loans. We will show however that the share of export and import loans is significantly higher in our sample of manufacturing firms, as expected given their higher export propensity.

Export and import loans show similar trends over the sample period. At first, there is a gradual expansion until they reach a peak in 2008Q4. In 2009 there is a sudden decrease, especially for import loans. After a few quarters of stagnation, there is an increasing trend in 2011, with the exception of the last quarter (Figure 3).

Export and import guarantees are smaller than the corresponding loans (approximately 10 EUR billion each on average). In contrast to loans, they show a slightly increasing trend over the whole period under analysis, without any evidence of a decrease in 2009 (Figure 4).

To get a sense of the magnitude of trade finance relative to total trade values, we compute the ratio of export loans (end-of-quarter stock) on Italy's total exports of goods and services, and similarly the ratio of import loans on imports (Figure 5).[16] We include a six-month centered sum of export flows in nominal terms in the denominator, to take into account the fact that export loans at the end of a given quarter may reflect either discounts of receivables from past shipments or working capital to finance future shipments. We choose a 6-month window given the short-term nature of export and import

[16]Unfortunately we do not have data on newly covered business but only on the stock of outstanding loans at the end of a given quarter.

loans.[17]

We find that the ratio of export loans on exports is on average around 0.10, while the ratio of import loans on imports is almost 0.07. The ratio of export loans on exports shows an increase between 2008Q3 and 2009Q1, where it reaches a peak of 0.13. This reflects the increase in export loans despite the big collapse in export flows in the post-Lehman quarters. The ratio then gradually decreases until 2010Q2 and remains stable below 0.10 afterwards. The ratio of import loans on imports follows a similar pattern, although the increase in 2008-2009 is less pronounced.

4.2 Bank-firm-level data

Further evidence on trade finance can be drawn using our matched bank-firm data. Table 4 reports selected statistics, based on our large sample, for loans (upper panel) and guarantees (lower panel). We find that only a subset of banks provides export or import loans: less than 300 banks are indeed active in the market for export and import loans, compared to about 500 banks for domestic long-term loans or domestic short-term loans. Banks that do not lend for exports or imports tend to be 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 76.3 percent of export loans and 71.3 percent of import loans, compared to 61.8 percent for total loans. Almost 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.

[17] We obtain similar results with alternative definitions of the denominator (3 or 6-month of either past or future flows).

Export loans account for 9.3 percent of total loans in the large sample, with import loans accounting for 4.8 percent. The share of export and import loans in the large sample is larger than the corresponding share in the universe of the Central Credit Register. This reflects the higher involvement in international activities for firms in our sample, which tend to be larger and relatively more specialized in tradable sectors. Domestic long-term loans, which are mainly used to finance fixed investments, account for the majority of the remaining loan types. Import guarantees are more likely than export guarantees, accounting for 19.3 and 8.1 percent of total guarantees, respectively.

A median firm borrows from 5 different banks, in line with previous studies suggesting that multiple 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. 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, while a similar percentage is found for domestic long-term loans. The main bank provides a lower share of import loans and an even lower share of domestic short-term loans (55.6 and 46.3 percent, respectively).

An interpretation is that there are higher informational costs and asymmetries for international trade transactions as well as for longer-term loans such as those used for fixed investment (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.[18]

Guarantees tend to be extremely concentrated in a single intermediary.

[18]Our preliminary evidence on the role of the main bank in export and import loans is consistent with that branch of the literature on relationship banking arguing that banks differ in their organization and lending techniques and they specialize towards different groups of firms in accordance to the kind of information they can benefit in their credit relationships (see, for Italy, Albareto et al. 2011; Cannari, Pagnini and Rossi 2010). It was also shown that the main bank can exploit its private information on its borrowers to attenuate and smooth adverse credit fluctuations in crisis periods (see De Mitri et al. 2010).

This holds for both domestic and export or import guarantees. The median firm receives indeed 100 percent of its guarantees from its main bank.

Overall, the evidence points to a few differences between trade finance and the other forms of bank finance, the former being concentrated in a smaller number of banks and showing a large share of export loans from the main bank. It also suggests significant differences within trade finance, in particular between loans, where firms rely on various banks at the same time, and guarantees, where only one intermediary is called upon. The idea that firms rely completely on their main bank in order to finance their export or import transactions and to handle their foreign payments (Amiti and Weinstein 2011) therefore is confirmed for guarantees but finds only partial support in the case of loans.

4.3 Firm-level data

Table 5 reports firm-level statistics on export and import loans and , by firm status (upper panel) and by year (lower panel).[19]

First, we look at firm size, distinguishing between small firms (firms up to the 75th percentile in terms of sales) and large firms (firms above the 75th percentile). The threshold corresponds to approximately 45 EUR million in sales. Small firms are less likely to access export and import loans, relative to large firms (38.5 versus 43.1 percent for export loans, 19.2 versus 24.3 percent for import loans). Once small firms are granted with trade finance loans, these loans represent a larger share of their exports (8.2 versus 5.2 percent). 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. This is also why we find that the share of total loans on sales is higher for small firms.

We then focus on the export status. As expected, exporters are much more likely to get export loans than non-exporters (48.7 versus 3.1 percent).[20]

[19]The following statistics are based on the small sample, since we need information on firms' export status and export values.

[20]Export loans for non-exporters might refer to loans for export transactions that were recorded in the months immediately preceding or following a given year.

Exporters are also more likely to get import loans, although the difference relative non-exporters becomes smaller (23.3 versus 9.0 percent).

For a subsample of firms we observe the distribution of exports by geographical area for 2006-2008. We classify exporters in three categories based on their main destination area (euro-area, North America, rest of the world) and a residual category for firms for which there is no information on exports by area. Among export-oriented firms, those mainly exporting towards North America or the rest of the world are more likely to borrow trade finance by banks. This finding can be explained with the informational role of banks in trade finance, facilitating the matching between foreign parties. This role is more important when the distance between the exporter and the importer is larger (Antràs and Foley 2010). Banks enable firms to overcome information and regulation asymmetries across countries, due to differences in legal systems, contract enforcement, languages and cultures.

Analyzing the trend over time (lower panel of Table 5), we see that the ratio of export loans on exports reached a peak in 2009 (9.1 percent), falling back in 2010 to values in line with the 2006-2008 average. The annual trend is similar for import loans on sales as well as for total loans on sales. The share of firms with export loans also reached a peak in 2009, while the share of firms with import loans fell significantly between 2008 and 2009.

A broadly similar picture emerges for export and import guarantees (Table 6). Firms are more likely to receive import guarantees than export guarantees. Import guarantees are often used by exporters to the rest of the world, in line with the higher risk and lower frequency in dealing with counterparts located in distant countries. Both export and import guarantees account for a tiny share of exports or sales. The level of guarantees on exports or sales shows an increasing trend since 2009, while the share of firms with guarantees decreases in the same year.

Finally, table 7 reports trade finance intensity by two-digit sector. Leather, textile, other manufacturing and wood products are among the sectors with the highest ratios of export loans on total loans, while capital-intensive sectors such as transport equipment, coke and refined petroleum, precision instrument and radio and TV instruments record the

lowest values. The range is quite wide, with export loans on exports going from 10.1 for textile to 0.5 for office equipment. A 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).

4.4 Quarterly bank-level data

We aggregate quarterly loans at the bank level in order to see whether banks' share of export or import loans on total loans varies across the sample period. We estimate the following regressions:

$$\frac{L_{bt}^X}{L_{bt}^T} = \alpha_b + \sum_t \beta_t quarter_t + \epsilon_{bt} \quad (1)$$

$$\frac{L_{bt}^M}{L_{bt}^T} = \alpha_b + \sum_t \beta_t quarter_t + \epsilon_{bt} \quad (2)$$

where the dependent variable is the share of export loans (L_{bt}^X) on total loans (L_{bt}^T) by bank b in quarter t in equation (1) and the share of import loans (L_{bt}^M) on total loans in equation (2) and the explanatory variables include a full set of quarterly dummies and bank fixed effects. The latter take into account time-invariant differences across banks in terms of specialization in trade finance. The sample period begins in 2006Q1 and ends in 2011Q4.

Figure 6 reports the coefficients on the quarterly dummies, relative to their average, and the corresponding 95 percent confidence interval. The share of export loans on total loans share is higher than the average between 2007 and 2009 and lower afterwards, but the differences are never statistically significant. The share of import loans on total loans tends also to be lower than the time average between 2009 and 2011 (between 0.2 and 0.4 percentage points), but in this case the difference is statistically significant. Notice that there is no big fall in the share export or import loans on total loans fell in the post-Lehman quarters when the big trade collapse took place (2008Q4-2009Q2). The evidence points instead to a decline in later quarters, with no recovery in 2010-11, contrary to the evolution of export flows.

5 Credit shocks and exports

5.1 A simple model of trade finance

This section presents an extremely simplified model of trade finance, 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 $(x_1, x_2...x_n)$. We also assume that all inputs have to be purchased in competitive markets using working 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}).

$$Y_{it} = A_{it} L_{it}^{\theta} \tag{3}$$

By taking logs and differentiating we can obtain the following:

$$\Delta ln Y_{it} = \Delta ln A_{it} + \theta \Delta ln L_{it} \tag{4}$$

We assume that each firm borrows the entire working capital from only one bank, 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)[21], the change in loans from bank b to firm i can be written as a function of a an economy-wide trend α_t, credit supply shocks δ_{bt} and credit demand shocks η_{it}.

$$\Delta ln L_{ibt} = \alpha_t + \beta \delta_{bt} + \eta_{it} + \epsilon_{ibt} \tag{5}$$

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

Putting together (4) and (5) we obtain the following relationship between the change in the log of exports and credit supply shocks:

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

$$\Delta lnY_{it} = \alpha_t^{'} + \beta^{'}\delta_{bt} + \eta_{it}^{'} + \epsilon_{it}^{'} \tag{6}$$

where $\eta_{it}^{'}$ captures firm-level time-varying shocks (such as productivity growth and credit demand shocks). The equation shows that firms that borrow from a bank that was exposed to a negative credit supply shock export less (relative to the previous period) than firms that borrow from another bank that was not exposed to a negative shock. This equation will be the basis for our empirical analysis.

5.2 Measuring the credit shock

We exploit Italian banks' access to foreign funding before and during the crisis as a source of identification for the credit 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.[22] 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 (Figure 2). Two further steep decreases took place between 2009Q2 and 2009Q4 and between 2011Q2 and 2011Q4. At the end of 2011Q4 deposits held by non-residents were 26 percent less than at the peak in 2008Q3.

This shock can be considered as largely exogenous to firms' export behavior. The tensions in the interbank market reflected more concerns about banks' funding ability or investments in asset-backed securities than about their portfolio of loans to manufacturing firms. Notice also that credit to exporting firms in the manufacturing sector is only a relatively minor share of banks' total assets.

Exposure to foreign funding was heterogeneous across banks. Several small and local banks had a very negligible exposure, while other

[22]Deposits held by foreign banks account for more than 80 percent of total deposits held by non-residents on average.

intermediaries report a high share of deposits from non-residents. There is also significant variation among the largest banks. Among the top 20 banks, the share of deposits from non-residents goes from 10 percent in the first quartile to 38 percent in third quartile.

Finally, there is evidence that funding constraints significantly contributed to the change in credit supply. We will show later in the paper that a higher share of deposits held by non-residents at the end of a given year is associated with a lower supply of credit in the following year, controlling for credit demand shocks (Khwaja and Mian 2008).[23] At the aggregate level, funding constraints, especially for those banks that financed themselves in the interbank markets, were mentioned as the main factor behind lending practices of Italian banks after September 2008, together with the need to reduce risk-weighted assets (Bank of Italy 2009, 2010).

5.3 Estimation strategy

There are other issues to be dealt with concerning the estimation strategy. One issue is that we observe firm-level exports only at an annual frequency.[24] We are not able to exploit higher frequency data on loans nor to exploit the specific timing of the credit crisis in 2008-2009. We therefore relate exports 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 shock and real outcomes.

A second issue in estimating equation (6) is the correlation between credit supply shocks (δ_{bt}) and the unobserved component of credit demand shocks ($\eta_{it}^{'}$). 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

[23] Alternatively, we could take into account capital requirement indexes or liquidity constraints. However, we believe that the use of bank funding on foreign markets is a more powerful measure to capture banks' exposure to global shocks and its transmission to borrowing firms, due to the fact that this variable is able to approximate the linkages across financial markets and intermediaries during the crisis. We consider alternative measures of bank health in robustness exercises.

[24] Monthly data on exports are collected by the national statistical institute and in principle could be matched to our data using a unique tax identifier, but we are currently not able to link them to our data because of confidentiality requirements.

demand for credit as they perceive lower demand for their products. We control for industry-year fixed effects and, in robustness specifications, firm time-varying variables to take into account credit demand shocks.

We estimate the relationship between export growth and bank shocks in two alternative ways. We start with reduced form estimates, where a measure of credit shocks is directly included among the explanatory variables. The reduced form equation is the following:

$$\Delta lnY_{it} = \beta \sum_{b} \omega_{ibt-1} exposure_{bt-1} + \sum_{jt} \alpha_{jt} ind_{jt} + \sum_{b} \gamma_{b} bank_{ibt} + \epsilon_{it} \quad (7)$$

where the dependent variable is the delta log of exports for firm i in industry j in year t.

In order to build an aggregate bank exposure indicator to account for credit shocks at the firm level, we compute the average bank funding shock faced by each firm by constructing a weighted-average of the share of foreign deposits provided by financial institutions to all banks lending to the borrowing firm i in the previous year *t-1*. Similarly, we use as weight the share of total loans of each bank towards a given i firm at time *t-1*. Then, we assume that the credit shock experienced by the a firm at a given time is the weighted liquidity shock experienced by the banks it was borrowing from in the previous year. The weights correspond to each bank's share on firm's total loans (ω_{ibt-1}). 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 only provides a portion of a firm's loans.

We control for three-digit industry-year fixed effects (corresponding to about 120 manufacturing sectors). Unfortunately we do not have data on destination of exports, so we are not able to control for destination countries fixed effects. This could be an issue if, for instance, exporters to a group of countries were disproportionately affected by the crisis and exposed banks disproportionately lend to exporters to that group of countries. To control

for the non-random matching between firms and banks, we include bank fixed effects for each firm's main bank. Standard errors are clustered at the three-digit industry level.

We then explore the channels behind the relationship between bank exposure to foreign funding shocks and firm exports. We estimate an instrumental variables (IV) equation, regressing the log change of exports on the log change of total loans borrowed by firm i in year t:

$$\Delta lnY_{it} = \beta \sum_{b} \Delta lnL_{ibt} + \sum_{jt} \alpha_{jt} ind_{jt} + \sum_{b} \gamma_b bank_{ibt} + \epsilon_{it} \qquad (8)$$

where the delta log of total loans is instrumented with the weighted average of the exposure variable at $t-1$ ($\sum_{b} \omega_{ibt-1} exposure_{bt-1}$). Since a firm might use any bank to compensate for the lending channel, we include all banks in our analysis and we construct the aggregate amount of credit borrowed by a given firm from all banks at the end of each year.In robustness exercises we further control for demand factors by using additional firm-level time-varying variables (size, profitability, leverage, etc.).

The equations are estimated over 2008-2010, since 2008 is the first year when deposits held by foreign residents started to decrease.

5.4 Results

Results of the OLS estimation of equation 7 are reported in Table 8, column 1. We find that the coefficient on the weighted-bank exposure variable is negative and significant. In particular, moving from the 1st to the 3rd quartile of the exposure variable (which corresponds to a share of foreign deposits increasing by 10 percentage points) the export growth rate decreases by 0.7 percentage points. This evidence indicates that firms borrowing from banks that are more exposed to a negative funding shock are more likely to experience a lower growth of exports. This suggests that firms are not able to completely offset their loss of bank credit by drawing on alternative sources such as other financial intermediaries, suppliers or internal capital markets.

The reduced form estimate shows that firms borrowing from exposed

banks export less relative to firms borrowing from non-exposed banks. We then explore the channels behind this effect. We can presumably suppose that the negative effect on exports of the credit shock takes place trough changes in the total amount of loans granted by banks to the borrowing firm. We could include a direct measure of bank finance (total loans) as an explanatory variable instead of the banks' exposure variable. However, the OLS estimate would be biased (see section 5.3) because the outstanding amount of loans we observe is actually an equilibrium level between credit supply and credit demand. This might potentially generate endogeneity issues, since credit demand factors are correlated with firm-level exports (our dependent variable).

In order to overcome this endogeneity issue, we estimate our equation using IV techniques. We instrument the change in total loans borrowed by a given firm with the weighted-measure of banks' exposure to funding shocks. Column 2 of Table 8 reports the second-stage results and shows a positive and significant effect on firms' export growth rate of the change in total loans. The first stage, reported in the lower panel of column 2, shows that our measure of banks' funding constraints is a good instrument for the growth rate of credit to firms, given the negative and significant coefficient and the F-statistics equal to 7.6. The elasticity of export to credit is estimated to be around 0.78, considerably higher than 0.26 reported by Paravisini et al. (2011). This might reflect the lack of controls for shocks in destination markets. This issue will be discussed in more depth in section 5.5.

We also reports naive OLS estimates where the change in the log of total loans provided by banks to each firm in our sample is directly included among the explanatory variables. Compared to the IV estimate, the OLS estimate in column 3 is much lower, suggesting an under-estimation bias in the OLS as already found by Paravisini et al. (2011). Finally, column 4 replicates the OLS estimate where the change in each of the four type of loans is included among the regressors. This highlights the strong positive correlation between the growth rate of export and export loans, import loans and domestic long-term loans.

A relevant issue to examine is whether the impact of the credit shock is more severe for small firms than large ones, since in the case of credit tightening small and more opaque borrowers are less likely to access alternative sources of external finance to support sales. To this aim we estimate both our reduced form OLS and IV models separately for small and large firms. Small firms are defined as firms up to the 75th percentile in terms of sales. Our findings for the whole period under analysis are reported in Table 9. As expected, the banks' exposure variable is negatively and significantly correlated with the export growth rate of small firms but not of large firms. This might reflect large firms' ability to overcome bank lending constraints by gathering finance in internal capital markets or accessing external sources (Khwaja and Mian 2008). The first stage shows indeed that the instrument is negatively correlated with the change in log loans, but only in the case of small firms. This suggests that large firms manage to offset the decrease in lending from exposed banks by borrowing from non-exposed banks.[25]

In order to better investigate the timing of the bank credit shock on the export growth rate of their borrowing firms, we replicate our analysis by year (Table 10, upper panel). We exploit the repeated episodes of contraction in foreign funding since 2008. This analysis could provide interesting insights into the specific timing of credit shocks. It also tackles concerns about inconsistent standard errors due to serially correlated outcomes (Bertrand

[25]We have demonstrated that negative shocks to banks' liquidity may translate into a decrease in lending to firms, which in turn may have indeed an impact on firms' activity. However, such bank lending channel may not have any aggregate effect if firms can compensate for bank-specific loan losses by borrowing more from banks with greater deposits or liquidity funds or alternatively if the firm can compensate for the external finance by tapping into internal cash reserves or other forms of informal financing (e.g. family loans or corporate loans). As noted among others by Khwaja and Mian (2008), this might be especially true for large firms, while small firms usually tend to receive the bulk of financing from banks. If there is a perfect substitution in case of credit shocks between the 'bank lending channel' and the 'borrowing firm channel', the final effect on real outcome will be just close to zero. We therefore intend to consider whether firms that suffered from a lower credit supply were able to at least partially offset the fall in credit with alternative sources. In future work we plan to use balance sheet data on loans from other financial intermediaries and trade debits to see whether large firms are better able to substitute bank loans with alternative source of financing.

et al. 2004). Using the model in reduced form on the whole sample of firms, we find that the negative effect of the credit shock on exports becomes larger and significant in 2010; the coefficients are still negative but not significant in 2008 and 2009, despite being the years in which the post-Lehman trade collapse took place. As expected the effect of a credit shock on export is more severe for small firms (lower panel). Indeed, we find that banks' exposure to funding shocks on foreign markets exerted a negative impact on the export growth rate of small firms already in 2008 and then replicated the magnitude of its negative impact in 2010. Moreover, there is no evidence of an effect on exports in a pre-crisis period, such as 2007, both for large and small firms. We are thus confident that we are correctly accounting for the impact of banks lending firm's exposure to liquidity shocks and that our findings are not driven by a non-random matching between lenders and borrowers.

5.5 Robustness

In table 11 we conduct several robustness tests to check the sensitivity of our findings. We modify our baseline reduced-form estimate in the following ways. We cluster standard errors at the main bank level rather than at the industry level, but standard errors are almost unchanged (column 1). In column 2 we include additional firm-level variables: firm size (the log of total assets), profitability (return on assets) and financial risk (leverage). These controls might capture differential trends in export growth rates for larger, more profitable or less leveraged firms. This lowers the sample size, since such variables are only available for firms with balance-sheet data. The coefficient on the exposure variable is slightly lower but still significant at the 10 percent level. The additional firm-level variables are instead not significant. Column 3 includes the interaction between year and four-digit sector (corresponding to 310 sectors) fixed effects. The coefficient on the exposure variable is even larger and still significant.

Column 4 includes a dummy equal to one if a firm has received public export credit guarantees between 2006 and 2008. This is based on very preliminary data on a sample of firms that were granted public guarantees

from Italy's export credit agency (SACE).[26] Again this does not have any impact on the exposure variable. The coefficient on the public guarantee dummy is positive but not significant. For further discussion of the role of public export credit guarantees, we refer the reader to section 6.4.

Column 5 modifies the exposure variable, considering not only loans but also guarantees in order to compute the weighted average of banks' exposure to foreign funding. The coefficient becomes smaller and is no longer significant. This might be explained with the different nature of guarantees. Since they do not require an immediate disbursement of funds but only a potential exposure in the future, they might be less sensitive to the negative funding shock. This is also in line with the relatively stable evolution of guarantees over time, even in the aftermath of the Lehman crisis. Further evidence on this issue will be reported in section 6.3.

Column 6 estimates the reduced form equation using the change in the log of domestic sales instead of exports as dependent variable. The coefficient on the exposure variable is basically zero and not significant. This finding is in line with Amiti and Weinstein (2011) and suggests that exports are more responsive to credit shocks than domestic sales. This might reflect the fact that exports require more finance than domestic sales, either because of longer freight times, of the higher risk in dealing with foreign counterparts or of the higher fixed costs of export. It is also worth noting that our sample mainly includes firms that export a large share of their output. A median exporting firm sells abroad about one half of its output. The residual nature of domestic sales for a large fraction of firms in our sample might contribute to explaining why the exposure variable is significant for exports but not for domestic sales.

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. Using data on

[26]The database reports a list of the main firms that received export credit guarantees from SACE between 2006 and 2008, with additional information on the type of guarantee and the exporting country. SACE provides either direct guarantees to the exporting firm or indirect guarantees to the bank that takes the risk from the exporting firm.

the destination of exports by main geographical area collected in the SISF survey for the years 2006-2008 (euro area, North America, rest of the world and a residual category for firms for which no information on the destination of exports is available), we include area-sector-year fixed effects instead of sector-year fixed effects and find that the exposure variable is still negative and significant.

It has been argued that bank finance might be more important for firms that export to riskier or more distant countries, if for instance export relationships with distant countries are more infrequent and the lack of trust between the exporter and importer induce them to rely on bank finance. While 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 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.

6 Credit shocks and trade finance

6.1 Methodology

We have shown that the credit shock has a negative impact on firms' exports and that the likely channel is through a decrease in total loans. This section looks at the effect of credit shock on the various types of loan, with a view to highlighting the role of trade finance in the transmission of the credit shock on exports.

Equation (5) shows that the change in loans for firm i is a function of credit supply shocks and credit demand shocks. The OLS estimate of equation (5) is biased if credit demand shocks (η_{it}) are correlated with credit supply shocks (δ_{bt}). Specifically, the OLS coefficient is equal to the sum of the true coefficient and a term given by the ratio of the covariance between credit demand and credit supply shocks and the variance of credit supply shocks. For instance, the OLS estimate is upward biased if worse banks are

more likely to pair with worse firms or, in other words, if banks with negative liquidity shocks are more likely to lend to firms that simultaneously receive a negative credit demand shock.

A consistent estimator can be obtained including firm-time fixed effects (Khwaja and Mian 2008). This amounts to comparing the effect of bank shocks on loans for the same firm at a given time borrowing from different banks. 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 for Italian firms, thus reducing sample selection issues.

We estimate therefore a within-firm version of equation (5):

$$\Delta lnL_{ibt} = \beta exposure_{bt-1} + \sum_{it} \alpha_{it} firm_{it} + \epsilon_{ibt} \tag{9}$$

where the dependent variable is the delta log of the total amount of loans that firm i borrows from bank b, $exposure_{bt-1}$ is the share of deposits held by non-residents on total deposits for bank b and $\sum_{it} \alpha_{it} firm_{it}$ is a set of firm-year fixed effects. We are comparing loans from banks with a different exposure to the funding shock to the same firm, thus implicitly controlling for credit demand shocks.[27]

We estimate equation (9) for total loans and for each type of loan separately. We make a distinction between export loans, import loans, domestic long-term loans and domestic short-term loans.[28]

6.2 Results

Table 12 reports the results estimating equation 9 on different loan types. Beyond controlling for firm-year fixed effects that absorb credit demand shocks, we also control for structural bank characteristics that are potentially

[27]Following Albertazzi and Marchetti (2010), we use unconsolidated data instead of consolidated data, since the former have a larger variability and granularity. There is anyway a high level of correlation between indicators based on unconsolidated data and those based on consolidated data

[28]All dependent variables are trimmed at the 5th and 95th percentile of their distribution. Replicating our estimates using the 1st and 99th percentile, our main findings are confirmed.

correlated with the credit shock transmission mechanism. We include in all regressions: a dummy *dtop5* that is equal to 1 if a given bank belongs to a top five Italian banking groups; a dummy (*smallbank*) equal to 1 if a given bank reports total assets lower than 7 EUR billion; a dummy *dforeign* equals 1 if a given bank has branches or subsidiaries abroad, and a dummy *mainbank* that is equal to 1 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). The bank-level share of deposits provided by non-residents at the end of $t-1$ is our core explanatory variable, which should capture banks' ex-ante exposure to the global shock leading to short-term funding constraints. Standard errors are clustered at bank-level, to take into account correlations in error terms across observations related to the same bank, which simultaneously finance different borrowers.

Focusing on the change in log of total loans (Table 12, column (1)), we find that the higher is the share of deposits collected on foreign markets, the lower is the bank's capability to extend credit to manufacturing firms. In other terms, we show that a given firm at a given date experiences a decrease of its loans from 'exposed' banks relative to 'non-exposed' banks. The estimated coefficient is significant at the 1 per cent level, even controlling for credit demand shocks and for several bank-level characteristics. For a bank that moves from the first to the third quartile of the exposure variable (which corresponds to an increase by 19.8 percentage points in the share of foreign deposits), the growth rate of its total loans decreases by about 3 percentage points. More exposed banks experience therefore a significantly lower dynamics in their credit granted to borrowing firms.

When we disentangle the various types of loans (Columns 2-5), we find interesting differences. In particular, more exposed banks to funding shocks on foreign markets reduce significantly both domestic long-term loans and import loans, while the effect on domestic short-term loans turns out to be less statistically significant. However, we do not find a significant effect on export loans. This last evidence could be due to the lower risk of export working capital loans, which are typically self-liquidating loans and guaranteed by the underlying goods being exported. The lower sensitivity

of export loans to bank shocks can be further explained with export loans being of very short-term maturity and therefore less exposed to funding constraints and to regulatory rules that link maturity assets to maturity liabilities. Finally, export loans, especially toward riskier and more distant countries, might also be guaranteed by the public export credit agency.

Concerning the other control variables at bank-level, our findings show that banks belonging to a top-five banking group strongly reduced loans. These results are in line with the view that during the crisis years the top-five banking groups suffered more from capital and funding constraints, which are only partly captured by our exposure variable. The estimated coefficients are negative and significant for domestic long-term loans, domestic short-term loans and import loans. Conversely, this bank feature does not matter for export loans, confirming our previous finding that export loans are less sensitive to bank shocks. This result might also be related to a 'flight to quality effect' found in the banking literature, where 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 instead other less efficient firms.

We also find that the main bank plays a relevant and positive effect on all types of credit, as expected since the main bank usually has an advantage relative to other lenders due to its private information on the borrower's quality. However, 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 export, import or domestic short-term loans. This might be related to the fact the main bank's private information might be especially useful to provide finance for riskier and longer-term loans (which are not backed by account receivables etc.). This effect might be even stronger during a crisis period (see De Mitri et al., 2010).

Finally, the small bank dummy is almost never significant, while the dummy signalling whether a bank has branches or subsidiaries abroad is positive and significant only for domestic long-term loans and import loans. This might reflect that the financial support to the entire production cycle

of the export-oriented firms is not related to the foreign activities of Italian banks, which have mainly an informative role in reducing asymmetries across countries due to different rules, languages, etc.

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. Results are shown in Table 13. We find that exposure to foreign funding has a strongly negative and significant effect on total credit growth in 2009 and 2010, while no effect is recorded in 2008. The lack of effects on 2008 can perhaps be explained by the timing of the shock: the contraction in the foreign funding took place in the last quarter of 2008, without determining a sudden decrease in loans. Furthermore, remember that we average loans over all quarters of a given year.

The regression on export loans shows that the coefficient on the exposure variable becomes increasingly negative over time, although it is never significant. This confirms the previous evidence that export loans were not affected by bank shocks. We also report for the year 2007, where we do not find a significant relationship between foreign funding and the growth rate of total loans. A weakly significant and positive coefficient is found for working capital and import loans, reflecting the large availability of foreign funding in that year. Among the control variables, we find a larger coefficient on the main bank dummy in the crisis years relative to the non-crisis year. This is in line with recent studies suggesting that the main bank has exerted a sort of 'protection' from credit shocks, especially in 2009-10 when funding on the foreign interbank market became increasingly stringent for Italian banks.

6.3 Robustness

In a robustness check, presented in Table 14, we add alternative indicators of bank health to our baseline regressions on total loans. The aim is to capture other bank-level constraints, mainly related to capital adequacy requirements or funding issues, that might also affect banks' capability to extend finance to borrowing firms. This exercise also represents a robustness check on our core indicator of banks' exposure, measured on the share of foreign deposits. As a

matter of fact, the negative effect on credit stemming from the foreign funding channel is confirmed also when we control for the alternative bank-health indicators, thus providing further support to our main results.

We find that various capital ratios (capital and reserves on total assets, Tier 1 and the sum of Tier 1 and Tier 2 ratios) do not matter for credit growth (columns 1-3). One possible explanation is that capital requirements are set in accordance to international regulations and that their effect on lending policies is non-linear and may be only felt once banks are close or below the regulatory thresholds. The net position on the interbank market of deposits seems to be positively associated with credit supply (column 4), signalling that liquidity constraints - together with the funding channel - may exert a limitation on bank's capability to finance their clients.

In column 5 we include a dummy variable for the banks that received government funds 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 does not change the magnitude and significance of the exposure variable. The coefficient on the public aid variable is positive. This can be interpreted either as a positive effect of recapitalization on lending or weaker lending standards before the recapitalization which probably contributed to the banks' difficulties.[29]

Finally, in column 6 we restrict the sample to banks that are listed on the stock market and include the log of market-to-book value (averaged over the last three months before the end of each year). Despite the large decrease in the number of banks included in the sample, we still find that the coefficient on the exposure variable is negative and significant. The coefficient on

[29]Further 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 about 0.8 EUR billion at the beginning of 2012 (Bartiloro et al. 2012).

the market-to-book value is positive, suggesting that banks that were more trusted on the stock market were able to expand lending more than the other banks.

Among further robustness checks, we consider not only loans but also guarantees. The findings are very similar, with the exception of domestic short-term loans and guarantees for which the exposure variable is no longer significant. All coefficients are slightly lower, as it might be expected given that guarantees only imply a potential commitment in the future and are therefore less affected by a negative funding shock.

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. All the main findings are unchanged (unreported estimates).

One important issue is that Central Credit Register does not include 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 anyway from resident banks. According 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). While this phenomenon is small, it might be significant for large and very large firms. Also, large firms are more likely to have non-standardized loan contractual agreements (which may imply that loans are reported as domestic working capital even if they are used for export). They are also more likely to replace credit from less exposed banks to or from other financing sources (internal financing, trade credits, etc.). We have already shown in table 9 that excluding the top quartile of firms in our sample the results become even stronger.

Another 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 increase rather than 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).

There are other minor issues concerning our bank-firm data. The first is related to loan securitization. Once loans are securitized, they are no longer included in the loans database provided by the Central Credit Register. While there was indeed an increase in loan securitization during the first part of the global financial crisis (between 2008 and 2009), it is worth noting that securitized loans are mainly loans to households and, even when they are loans to non-financial firms, they usually have a long-term maturity. The short-term of export and import loans makes them unlikely to be part of securitized loans.

Another potential concern is that the Central Credit Register only reports those firms that are still active and borrow loans above the threshold at the latest date (i.e. at the date of consultation). This could leave to a survival bias if firms are credit rationed or exit out of the market. However, this should be more of an issue in long panel data rather than in short panel data such as ours.

6.4 Public export credit guarantees

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 influenced 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 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. Second, 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).[30]

[30]Felbermayr et al. (2012) report that 3.4 percent of Germany's exports were covered by public export credit guarantees in 2010. Interestingly, they notice first a decreasing trend from 2000 (3.3 percent) to 2007 (1.8 percent), followed by a rapid increase during

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.

Finally, we are able to provide a direct check using preliminary firm-level data on guarantees provided by SACE. We have already shown in Section 5.5 that the inclusion of a dummy equal to one for firms that received public guarantees did not have any influence on our reduced-form estimates. We now separately consider firms that received public export credit guarantees and firms that did not receive them. In unreported estimates we find that in both samples export loans are not significantly influenced by banks' exposure to foreign funding. The coefficient is closer to zero for firms that received public guarantees, in line with the expectation that, once guaranteed, export loans should be even less responsive to the liquidity shock.

7 Concluding remarks

The contribution of trade finance to exports has been the subject of a burgeoning literature, especially since the trade collapse in 2008-2009. Progress in this area has been hampered by the lack of detailed data on banks' export and import loans to firms. To the best of our knowledge, this paper is the first to provide evidence based on matched bank-firm data where the loan destination (i.e. whether loans are specifically directed to finance exports, imports or other activities) is explicitly identified.

Our unique dataset allows us to shed new light on the role of trade finance during the recent trade collapse and, more generally, on the impact of financial shocks on exports. In this context, our findings challenge much of the conventional wisdom on trade finance.

One common assertion in the literature is that trade finance is somewhat special and different from the other forms of bank finance, due to the higher complexity of dealing with foreign counterparties. We show instead that trade finance shares many features with the other, more conventional forms

the financial crisis. According to the authors, this might reflect a substitution of public for private insurance during the crisis.

of bank finance. While the market for trade finance is concentrated in a fewer number of banks, firms are able to borrow export and import loans not only from their main bank but also from other banks. The view of a single bank taking care of all cross-border transactions on behalf of its customer does not receive much support in the data, at least as far as Italy (a country where multiple banking is quite common) is concerned.

It has also been argued that there was a contraction in trade finance in the post-Lehman quarters. We find little evidence of such a contraction at the end of 2008. In fact, the ratio of export loans to export flows increased between 2008 and 2009, suggesting that trade finance actually supported trade rather than contributing to its collapse immediately after the Lehman crisis. The share of export and import loans on total loans in the banking system also did not decrease during the first part of the financial crisis. We find instead that trade finance constraints became more important in the second stage of the financial crisis, as funding on the foreign interbank market became increasingly harder for Italian banks. This result might be specific to Italy and the other few euro-area countries which recorded significant outflows of private capital since 2009.

We show that firms that borrowed from banks that were more exposed to the negative shock on foreign funding exported less. We also show that the reduction in banks' total loans to firms was the likely channel behind this real outcome. However, when we disentangle the impact of the funding shock on the different types of loan, we find that the impact was significant for import loans, fixed investment and other domestic loans, but less so for export loans. This suggests that the effect of bank shocks on exports is not only limited to the specific financing of export transactions through the issue of letters of credit or export working capital loans, but reflects a more general liquidity support to the exporting firm.

The lower sensitivity of export loans to bank shocks can perhaps be explained with the lower risk of export working capital loans, which are typically self-liquidating loans and therefore are guaranteed by the underlying transaction. Export loans, especially toward riskier and more distant countries, might also be guaranteed by the public export credit agency.

In contrast, import loans, like fixed investment loans, are likely to be riskier, as banks bet on firms' ability to produce and sell their output on the market in the future. The evidence that export loans are less responsive to the funding shock is consistent with a view of export credit as a very short-term, standardized and low-risk form of finance (International Chamber of Commerce 2010, 2011).

It is worth noting that our methodology, in line with recent studies using matched bank-firm data, identifies the credit shock 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.

References

Albertazzi U., Marchetti D.J. (2010), Credit Supply, Flight to Quality and Evergreening: An Analysis of Bank-Firm Relationships after Lehman, Bank of Italy Working Papers, no. 756.

Ahn J. (2011), A theory of domestic and international trade finance, IMF Working Papers, no. 262.

Ahn J., Amiti M., Weinstein D.E. (2011), Trade finance and the great trade collapse, American Economic Review, 101(3), 298302.

Amiti M., Weinstein D.E. (2011), Exports and financial shocks, Quarterly Journal of Economics, 126, 1841-1877.

Antràs P., Foley C. F. (2011), Poultry in motion: a study of international trade finance practices, NBER Working Paper no. 17091.

Ashcraft A.B. (2005), Are Banks Really Special? New Evidence from the FDIC-Induced Failure of Healthy Banks, American Economic Review, vol. 95(5), pp. 1712-1730.

Banerjee A., Duflo E. (2008), Do firms want to borrow more? Testing credit constraints using a directed lending program, mimeo.

Bank of Italy (1991), Centrale dei rischi: Istruzioni per gli intermediari creditizi, Circolare no. 139, latest update on April 29, 2011.

Bank of Italy (2009), Annual Report.

Bank of Italy (2010), Annual Report.

Bank of Italy (2011), Supplement to the Statistical Bulletin: Sample Surveys - Survey of Industrial and Service Firms: 2010, no. 37.

Bank of Italy (2012), Supplement to the Statistical Bulletin: Financial Accounts, no. 39.

Bartiloro L., Carpinelli L., Finaldi Russo P., Pastorelli S. (2012), Laccesso al credito in tempo di crisi: le misure di sostegno a imprese e famiglie, Bank of Italy Occasional papers, no. 111.

Behrens K., Corcos G., Mion G. (2010), Trade crisis? What trade crisis?, CEPR Discussion Papers, no. 7956.

Berger A.N., Udell G.F. (2006), A more complete conceptual framework for SME finance, Journal of Banking & Finance, 30, pp. 2945-2966.

Bertrand M., Duflo E., Mullainathan S. (2004), How Much Should We Trust Differences-in-Differences Estimates?, The Quarterly Journal of Economics, 119(1), pp. 249-275.

Bricongne J.C., Fontagne L., Gaulier G., Taglioni D. (2011), Firms and the global crisis: French exports in the turmoil, forthcoming.

Carvalho D.R., Ferreira M.A., Matos P.P. (2012), Lending Relationships and the Effect of Bank Distress: Evidence from the 2007-2009 Financial Crisis, working paper.

Chaney T. (2005), Liquidity constrained exporters, mimeo.

Chor D., Manova K. (2011), Off the cliff and back: credit conditions and international trade during the global financial crisis, Journal of International Economics, forthcoming.

Detragiache E., Garella P., Guiso L. (2000), Multiple versus Single Banking Relationships: Theory and Evidence, The Journal of Finance, vol. 55(3), pp. 11331161.

Eaton J., Kortum S., Neiman B., Romalis J. (2011), Trade and the global recession, working paper.

Feenstra R.C., Li Z., Yu M. (2011), Exports and Credit Constraints Under Incomplete Information: Theory and Evidence from China, NBER Working Papers, no. 16940.

Felbermayr G.J., Heiland I., Yalcin E. (2012), Mitigating Liquidity Constraints: Public Export Credit Guarantees in Germany, mimeo.

Finance, Credit and International Business Association (2009), International Credit and Collections Survey.

International Chamber of Commerce (2010), Report on findings of ICC-ADB Register on Trade Finance: Statistical analysis of risk profile of trade finance products, Document No. 470/1147 (Rev), September.

International Chamber of Commerce (2011), Rethinking Trade Finance.

International Monetary Fund and Bankers' Association for Finance and Trade (2009), Trade Finance Survey: A Survey Among Banks Assessing the Current Trade Finance Environment.

Iyer R., Lopes S., Peydro J.L., Schoar A. (2010), The Interbank Liquidity Crunch and the Firm Credit Crunch: Evidence from the 2007-09 Crisis, mimeo.

Kalemli-Ozcan S., Kamil H., Villegas-Sanchez C. (2010), What Hinders Investment in the Aftermath of Financial Crises: Insolvent Firms or Illiquid Banks?, National Bureau Working Papers, no. 16528.

Kashyap A.K., Stein J.C. (2000), What Do a Million Observations on Banks Say about the Transmission of Monetary Policy?, American Economic Review, vol. 90(3), pp. 407-428.

Khwaja A., Mian A. (2008), Tracing the impact of bank liquidity shocks: evidence from an emerging market, American Economic Review, 98(4), pp. 1413-1442.

Jimenez G., Mian A., Peydro J.L., Salas S. (2010), Local Versus Aggregate Lending Channels: The Effects of Securitization on Corporate Credit Supply in Spain, National Bureau Working Papers, no. 16595.

Levchenko A., Lewis L., Tesar L. (2011), The role of financial factors in the trade collapse: a skeptic's view, in Chauffour J.P., Malouche M. (eds.), Trade finance and trade during financial crises, Washington DC, The World Bank, pp. 133-147.

Manova K. (2011), Credit constraints, heterogeneous firms and international trade, Review of Economic Studies, forthcoming.

Melitz M.J. (2003), The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity, Econometrica, vol. 71(6), pp. 1695-1725.

Minetti R., Zhu S.C. (2011), Credit constraints and firm export: Microeconomic evidence from Italy, Journal of International Economics, vol. 83(2), pp. 109-125.

Muuls M. (2008), Exporters and credit constraints. A firm-level approach, National Bank of Belgium Working Papers, no. 139.

Olsen M. (2010), Banks in international trade: incomplete international contract enforcement and reputation, working paper.

Paravisini D., Rappoport V., Schnabl P., Wolfenzon D. (2011), Dissecting the effect of credit supply on trade: evidence from matched credit-export data, National Bureau of Economic Research working papers, no. 16975.

Peek J., Rosengren E. (2000), Collateral Damage: Effects of the Japanese Bank Crisis on Real Activity in the United States, American Economic Review, vol. 90(1), pp. 30-45.

Petersen M., Rajan R. (1994), The Benefits of Lending Relationships: Evidence from Small Business Data, Journal of Finance, vol. 49(1), pp. 3-37.

SACE (2012), Annual Report, Rome.

Schmidt-Eisenlohr T. (2012), Towards a theory of trade finance, working paper.

U.S. Department of Commerce (2008), Trade finance guide: a quick reference for U.S. exporters, International Trade Administration.

Zia B.H. (2008), Export incentives, financial constraints, and the (mis)allocation of credit: micro-level evidence from subsidized export loans, Journal of Financial Economics, 87, 498-527.

Table 1: **Samples**

Sample	**Firms**	**Banks**	**Bank-firm pairs**
Large sample			
2007	13055	541	71763
2008	13406	546	76069
2009	13008	554	72354
2010	12025	558	66757
Average	12874	550	71736
Small sample			
(firms with non-missing values on exports)			
2007	7397	490	41910
2008	6889	494	40369
2009	6708	503	38187
2010	6659	505	38170
Average	6913	498	39659

Source: authors' elaborations on Bank of Italy data (large and small samples).
Notes: The table reports the number of firms, banks and bank-firm pairs by year.

Table 2: **Summary statistics: firms**

Variable	Mean	Median	Sd	Obs.
Large sample				
No. employees	135	59	451	61950
Sales	46619	15139	273486	64179
Exports	26383	6619	159105	35050
Total loans	9292	3484	34535	64179
Fixed investment loans	5402	1324	29022	64179
Working capital loans	2575	1104	7322	64179
Export loans	869	0	3464	64179
Import loans	446	0	3740	64179
Small sample				
(firms with non-missing values on exports)				
No. employees	175	73	559	34871
Sales	61937	18504	335619	35050
Exports	26383	6619	159105	35050
Total loans	11594	3871	38806	35050
Fixed investment loans	6978	1546	30991	35050
Working capital loans	2838	1027	8570	35050
Export loans	1221	15	4482	35050
Import loans	557	0	4838	35050

Source: authors' elaborations on Bank of Italy data (large and small sample). Notes: The table reports summary statistics on firm-level variables. All monetary variables are in EUR millions. Employment is in number of workers.

Table 3: **Exports of goods: annual growth rate in firm-level and aggregate data**

Year	**Growth rate (firm-level)**	**Growth rate (aggregate)**	**% firm exports on aggr. exports**
2007	14.1	9.9	48.3
2008	4.0	1.2	48.9
2009	-21.1	-20.9	47.3
2010	15.1	15.6	49.1
Average	3.0	3.4	48.4

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

Table 4: **Summary statistics on trade finance**

	All	Type of loan or guarantee: Domestic short-term	Domestic long-term	Export	Import
Loans					
No. banks with loans > 0	544	508	479	282	258
% share of top ten banks	61.8	60.9	63.0	76.3	71.3
% loans on total loans	100.0	27.8	58.1	9.3	4.8
No. banks per firm (median)	5.0	4.0	3.0	3.0	3.0
% loans from main bank (median)	44.4	46.3	63.1	63.6	55.6
Guarantees					
No. banks with guarantees > 0	358	354	-	23	87
% share of top ten banks	75.6	71.1	-	99.9	95.0
% guarantees on total guarantees	100.0	72.6	-	8.1	19.3
No. banks 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 (large sample). Notes: The table reports selected statistics by type of loan or guarantee.

Table 5: **Export and import loans by firm status and year**

	% Firms with export loans	% Firms with import loans	% Export loans on exports	% Import loans on sales
By firm status				
All firms	39.6	20.5	7.3	1.0
Small firms	38.5	19.2	8.2	1.1
Large firms	43.1	24.3	5.2	1.0
Non exporters	3.1	9.0	.	0.6
Exporters	48.7	23.3	7.3	1.2
- Euro area	52.9	24.2	7.8	1.1
- North America	56.5	22.6	6.6	0.9
- Rest of the world	55.0	24.6	7.7	1.4
- No information	44.3	22.5	7.0	1.2
By year				
2007	38.9	21.8	6.6	1.0
2008	40.3	21.4	7.4	1.1
2009	41.9	19.8	9.1	1.2
2010	38.7	18.7	7.0	1.1

Source: authors' elaborations on Bank of Italy data (small sample). Notes: The table reports statistics on export and import loans by firm status and year.

Table 6: **Export and import guarantees by firm status and year**

	% Firms with export guarantees	% Firms with import guarantees	% Export guarantees on exports	% Import guarantees on sales
By firm status				
All firms	10.6	22.4	0.7	0.5
Small firms	6.5	16.1	0.5	0.4
Large firms	22.8	41.2	1.0	0.8
Non exporters	4.3	6.2	.	0.1
Exporters	12.2	26.4	0.7	0.6
- Euro area	12.5	29.6	0.4	0.4
- North America	11.4	17.9	0.2	0.2
- Rest of the world	24.8	42.3	0.8	1.2
- No information	8.7	20.2	0.8	0.5
By year				
2007	13.3	23.4	0.6	0.4
2008	10.3	23.7	0.5	0.4
2009	9.3	20.9	0.8	0.5
2010	9.4	21.3	0.8	0.5

Source: authors' elaborations on Bank of Italy data (small sample). Notes: The table reports statistics on export and import guarantees by firm status and year.

Table 7: **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	6.8	0.1	1.3	0.1
Textile	10.1	0.1	1.7	0.8
Wearing apparel	8.8	0.1	1.4	1.3
Leather	9.3	0.1	2.9	0.5
Wood	8.5	0.1	4.0	0.5
Pulp and paper	5.5	0.4	0.9	0.1
Printing and publishing	7.9	0.1	0.2	0.1
Coke and refined petroleum	0.7	0.3	1.9	1.2
Chemicals	2.8	0.3	0.6	0.1
Rubber and plastics	6.3	0.1	0.5	0.2
Non-metallic minerals	7.8	0.2	0.4	0.2
Basic metals	4.4	0.4	2.4	0.8
Fabricated metals	6.9	0.6	0.9	1.3
Industrial machinery	4.8	1.1	0.2	2.0
Office equipment	0.5	0.4	0.9	0.3
Electrical equipment	5.7	2.7	0.4	1.4
Radio and TV	2.4	2.9	0.7	0.7
Precision instruments	3.9	1.4	0.5	2.1
Motor vehicles	1.9	0.1	0.1	0.0
Other transport equipment	0.7	6.2	0.2	5.0
Other manufacturing	8.4	0.4	0.6	0.2

Source: authors' elaborations on Bank of Italy data (small sample). 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.

Table 8: **Exports and credit shocks**

Dep. variable	Δ**ln(export)**$_{it}$			
	RF	**IV**	**OLS**	
	(1)	(2)	(3)	(4)
exposure$_{it-1}$	-0.069**			
	(0.032)			
Δln(loans)$_{it}$		0.789*	0.059***	
		(0.472)	(0.011)	
Δln(export loans)$_{it}$				0.050***
				(0.008)
Δln(import loans)$_{it}$				0.025***
				(0.009)
Δln(dom. LT loans)$_{it}$				0.017**
				(0.009)
Δln(dom. ST loans)$_{it}$				0.001
				(0.003)
Year-3digit industry FE	yes	yes	yes	yes
Main bank FE	yes	yes	yes	yes
Observations	12233	10944	11100	8787
Clusters	118	118	119	118
Adjusted R^2	0.176	-	0.172	0.182
First-stage: Δln(loans)$_{it}$				
exposure$_{it-1}$	-	-0.095**	-	-
		(0.040)		
F	-	7.59	-	-

Source: authors' elaborations on Bank of Italy, CADS and SISF data. Notes: 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. Column (1) reports the OLS estimate of equation 7 (reduced form). Column (2) reports the IV estimate of equation 8, where the change in the log of loans is instrumented with the weighted average of banks' exposure to foreign funding. Columns (3) report OLS estimates of equation 8. Column (4) reports the OLS estimate of equation 8, where the change in the log of loans is replaced by the change in the log of each loan type. Standard errors are clustered at the three-digit sector level. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Table 9: **Exports and credit shocks: small versus large firms**

Dep. variable	Δln(export)$_{it}$			
	Small firms		**Large firms**	
	RF	IV	RF	IV
	(1)	(2)	(3)	(4)
exposure$_{it-1}$	-0.127**		0.005	
	(0.049)		(0.057)	
Δln(loans)$_{it}$		0.850**		-0.253
		(0.409)		(0.924)
Year-3digit industry FE	yes	yes	yes	yes
Main bank FE	yes	yes	yes	yes
Observations	8951	8831	3272	3123
Clusters	115	115	104	104
Adjusted R^2	0.165	e(r2$_a$)	0.222	0.0728
First-stage: Δln(loans)$_{it}$				
exposure$_{it-1}$	-	-0.158*	-	0.061
		(0.087)		(0.173)
F	-	5.19	-	0.24

Source: authors' elaborations on Bank of Italy, CADS and SISF data. Notes: 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. Columns (1) and (3) report OLS estimates of equation 7 for small and large firms, respectively. Columns (2) and (4) report IV estimate of equation 8, where the change in the log of loans is instrumented with $exposure_{it-1}$. Small firms include firms up to the 75th percentile in terms of total sales, large firms include firms above the 75th percentile. Standard errors are clustered at the three-digit sector level. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Table 10: **Exports and credit shocks by year**

Dep. variable	Δ**ln(export)**$_{it}$			
	Crisis years			**Pre-crisis**
	2008	2009	2010	2007
	(1)	(2)	(3)	(4)
	All firms			
exposure$_{it-1}$	-0.081	-0.095	-0.122*	-0.003
	(0.062)	(0.067)	(0.066)	(0.061)
Sector FE	yes	yes	yes	yes
Main bank FE	yes	yes	yes	yes
Observations	4287	3878	4068	4515
Clusters	110	112	117	108
Adjusted R^2	0.038	0.088	0.026	0.016
	Small firms			
exposure$_{it-1}$	-0.197**	-0.159	-0.194**	-0.026
	(0.095)	(0.098)	(0.093)	(0.078)
Year-3digit industry FE	yes	yes	yes	yes
Main bank FE	yes	yes	yes	yes
Observations	3145	2849	2957	3391
Clusters	106	109	110	104
Adjusted R^2	0.022	0.073	0.016	0.019

Source: authors' elaborations on Bank of Italy, CADS and SISF data. Notes: 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. Columns (1)-(4) report OLS estimates of equation 7 (reduced form) by year. Standard errors are clustered at the three-digit sector level. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Table 11: **Exports and credit shocks: robustness**

Dep. variable	Δln(export)$_{it}$					Δln(dom sales)$_{it}$
	(1)	(2)	(3)	(4)	(5)	(6)
exposure$_{it-1}$	-0.069**	-0.063*	-0.073**	-0.070**		0.007
	(0.033)	(0.037)	(0.035)	(0.032)		(0.035)
exposureguar$_{it-1}$					-0.040	
					(0.033)	
ln(assets)$_{it-1}$		-0.004				
		(0.003)				
roa$_{it-1}$		-0.072				
		(0.092)				
leverage$_{it-1}$		0.003				
		(0.021)				
guarantee$_i$				0.017		
				(0.021)		
Year-3digit industry FE	yes	yes	no	yes	yes	yes
Year-4digit industry FE	no	no	yes	no	no	no
Main bank FE	yes	yes	yes	yes	yes	yes
Observations	12233	11132	12233	12233	12382	10965
Clusters	235	116	310	118	118	116
Adjusted R^2	0.176	0.184	0.188	0.176	0.177	0.198

Source: authors' elaborations on Bank of Italy, CADS and SISF data. Notes: The dependent variable is the change in the log of exports of firm i in year t in columns (1)-(5) and the change in the log of domestic sales in column (6). The main explanatory variable ($exposure_{it-1}$) is the weighted average of banks' exposure to foreign funding. Standard errors are clustered at the three-digit sector level in all columns except for column (1) (main bank level) and column (3) (four-digit sector level). Column (2) includes additional firm-level controls. Column (3) includes four-digit industry and year interacted fixed effects. Column (4) includes a dummy equal to one if a firm has received public export credit guarantees between 2006 and 2008. In column (5) $exposureguar_{it-1}$ is a weigthed average of banks' exposure to foreign funding, where both loans and guarantees are used to compute the weights of each bank. Column (6) replaces the dependent variable with the change in the log of domestic sales. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Table 12: **Effect of credit supply shocks by loan type**

	Dependent variable: Δln(loan type)$_{ibt}$				
	Total loans	**Fixed investment loans**	**Working capital loans**	**Export loans**	**Import loans**
	(1)	(2)	(3)	(4)	(5)
exposure$_{bt-1}$	-0.143***	-0.120**	-0.147*	-0.087	-0.190***
	(0.054)	(0.057)	(0.081)	(0.082)	(0.069)
mainbank$_{ibt}$	0.135***	0.185***	0.088***	0.071***	0.036*
	(0.013)	(0.014)	(0.017)	(0.015)	(0.021)
top5group$_{bt}$	-0.078***	-0.083***	-0.052**	-0.036	-0.035*
	(0.023)	(0.026)	(0.022)	(0.028)	(0.020)
smallbank$_{bt}$	-0.020	0.007	-0.036*	-0.002	0.000
	(0.020)	(0.024)	(0.020)	(0.021)	(0.018)
abroad$_{bt}$	0.045**	0.036*	0.005	-0.002	0.034*
	(0.021)	(0.021)	(0.025)	(0.029)	(0.020)
Firm-year FE	yes	yes	yes	yes	yes
Observations	66622	40212	52150	22436	10329
No. banks	451	393	411	242	195
Adjusted R^2	0.121	0.0957	0.158	0.179	0.197

Source: authors' elaborations on Bank of Italy, CADS and SISF data. Notes: Columns (1)-(5) report OLS estimates of equation 9 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 main explanatory variable ($exposure_{it-1}$) is bank's exposure to foreign funding. Standard errors are clustered at the bank level. All regressions include firm-year fixed effects. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Table 13: **Effect of credit supply shocks by loan type and year**

	Dependent variable: Δln(loan type)$_{ibt}$				
	Total loans	**Fixed investment loans**	**Working capital loans**	**Export loans**	**Import loans**
	(1)	(2)	(3)	(4)	(5)
			Year: 2008		
exposure$_{bt-1}$	-0.027	0.032	0.004	-0.040	-0.075
	(0.090)	(0.101)	(0.138)	(0.128)	(0.106)
Observations	23523	13912	18724	7923	3829
R^2	0.279	0.346	0.326	0.419	0.385
			Year: 2009		
exposure$_{bt-1}$	-0.169***	-0.170**	-0.223**	-0.055	-0.221*
	(0.055)	(0.071)	(0.109)	(0.125)	(0.115)
Observations	21086	12672	16611	7274	3195
R^2	0.287	0.365	0.356	0.432	0.433
			Year: 2010		
exposure$_{bt-1}$	-0.183***	-0.159***	-0.212**	-0.121	-0.298***
	(0.052)	(0.056)	(0.083)	(0.090)	(0.100)
Observations	22013	13628	16815	7239	3305
R^2	0.288	0.353	0.333	0.439	0.410
			Year: 2007		
exposure$_{bt-1}$	-0.029	-0.043	0.132*	0.099	0.138*
	(0.088)	(0.072)	(0.071)	(0.112)	(0.082)
Observations	24706	14032	19804	8149	3949
R^2	0.291	0.355	0.342	0.440	0.450

Source: authors' elaborations on Bank of Italy, CADS and SISF data. Notes: Columns (1)-(5) report OLS estimates of equation 9 on the sample of firms with multiple banks by year. 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 main explanatory variable ($exposure_{it-1}$) is bank's exposure to foreign funding. All regressions include firm-year fixed effects. Standard errors are clustered at the bank level. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Table 14: **Effect of credit supply shocks by loan type: additional controls**

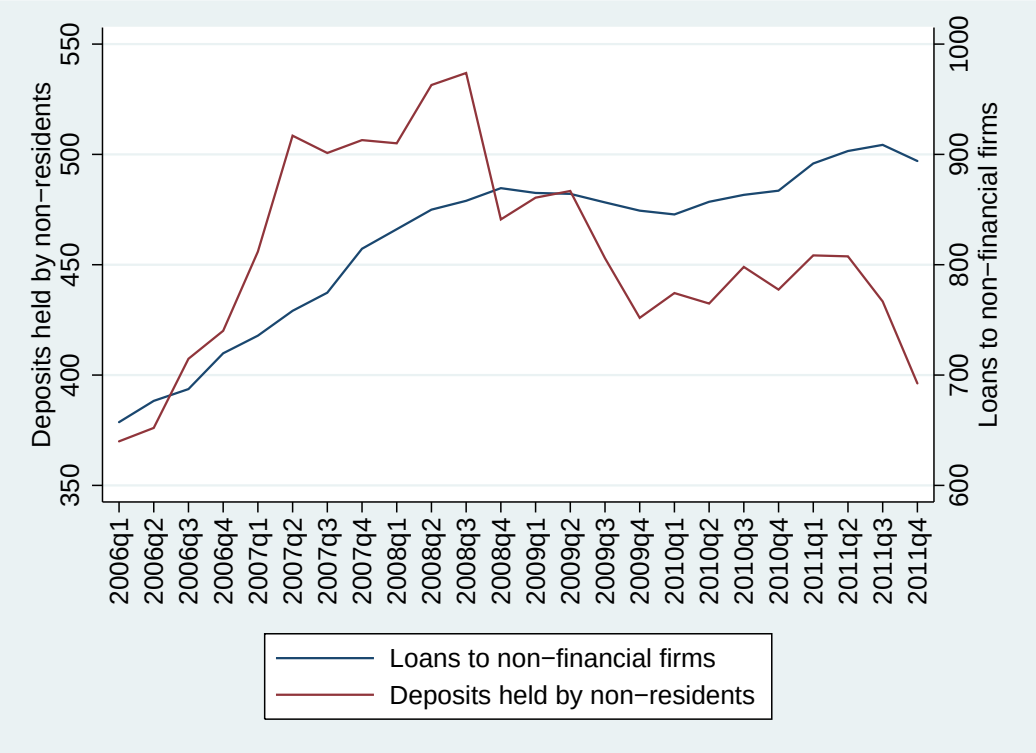
	Dependent variable: Δln(total loans)$_{ibt}$					
	(1)	(2)	(3)	(4)	(5)	(6)
exposure$_{bt-1}$	-0.177*	-0.179**	-0.184**	-0.158*	-0.139***	-0.362***
	(0.090)	(0.085)	(0.084)	(0.084)	(0.054)	(0.098)
capres$_{bt-1}$	-0.006					
	(0.283)					
tier1$_{bt-1}$		0.001				
		(0.002)				
(tier1 + tier2)$_{bt-1}$			-0.002			
			(0.003)			
ibknet$_{bt-1}$				0.001*		
				(0.001)		
(public aid)$_{bt-1}$					0.025**	
					(0.012)	
mtb$_{bt-1}$						0.045**
						(0.021)
Observations	61822	61536	61540	61701	66622	34647
No. banks	369	370	371	345	451	23
R sq.	0.305	0.305	0.305	0.307	0.289	0.436
Adj R sq.	0.128	0.127	0.127	0.130	0.122	0.151

Source: authors' elaborations on Bank of Italy, CADS and SISF data. Notes: Columns (1)-(5) report OLS estimates of equation 9 on the sample of firms with multiple banks, with additional measures of bank health. 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 main explanatory variable ($exposure_{it-1}$) is bank's exposure to foreign funding. $capres_{bt-1}$ is capital and reserves divided by total assets. $tier1_{bt-1}$ is tier1 ratio. $(tier1 + tier2)_{bt-1}$ is the sum of tier1 and tier2 ratio. $ibknet_{bt-1}$ is the share of net interbank position on total assets. $(publicaid)_{bt-1}$ is a dummy equal to one if a bank received public aid through the issue of hybrid capitalization instruments that were entirely subscribed by the Treasury. mtb_{bt-1} is the log of market-to-book value (only available for listed banks). Standard errors are clustered at the bank level. All regressions include firm-year fixed effects. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Figure 1: **Exports and imports of goods**

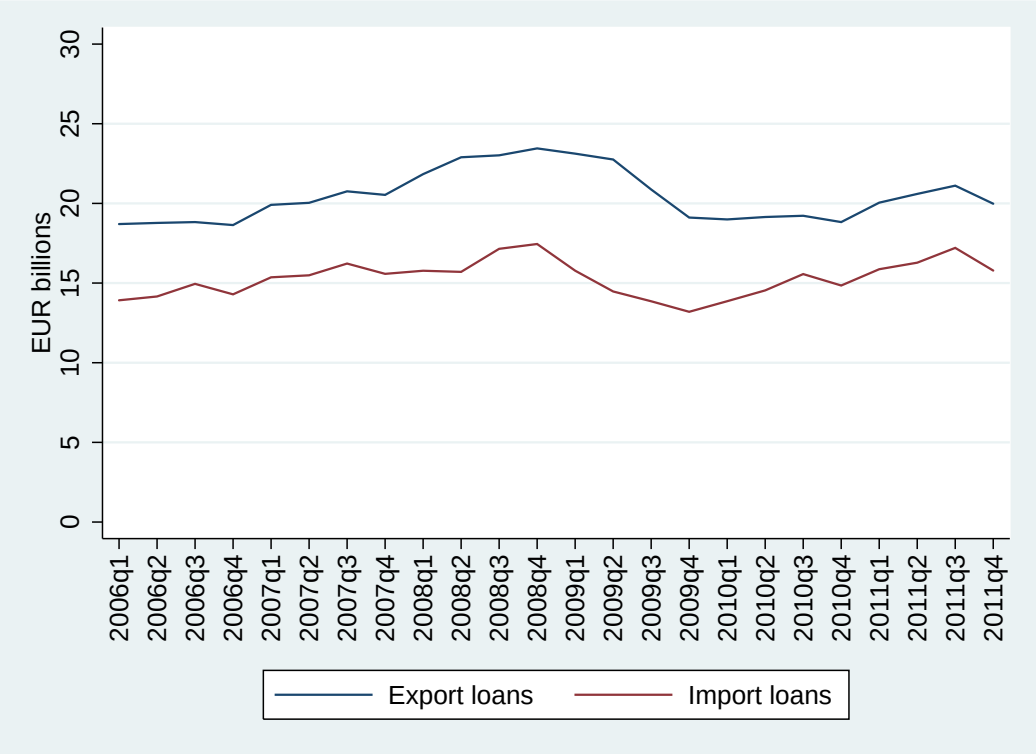
Source: Istat. The figure reports Italy's quarterly exports and imports of goods at current prices (EUR billions; seasonally adjusted data).

Figure 2: **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).

Figure 3: **Export and import loans**

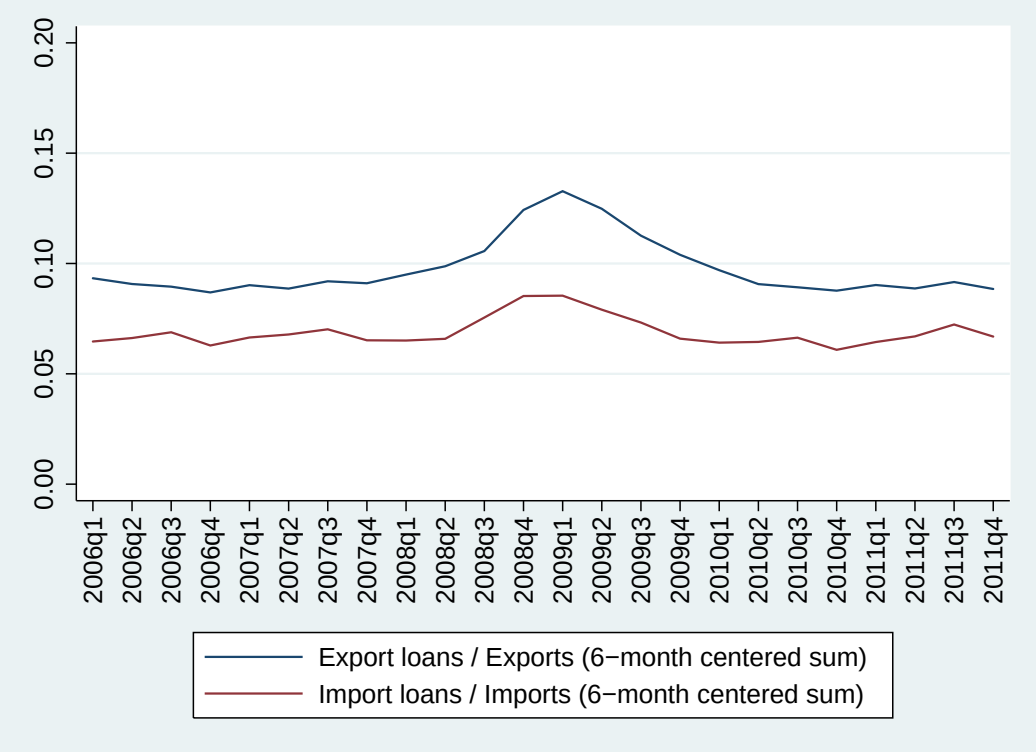


Source: authors' elaborations on Bank of Italy data. The figure reports Italy's end-of-quarter stocks of export and import loans (EUR billion; non-seasonally adjusted data).

Figure 4: **Export and import guarantees**

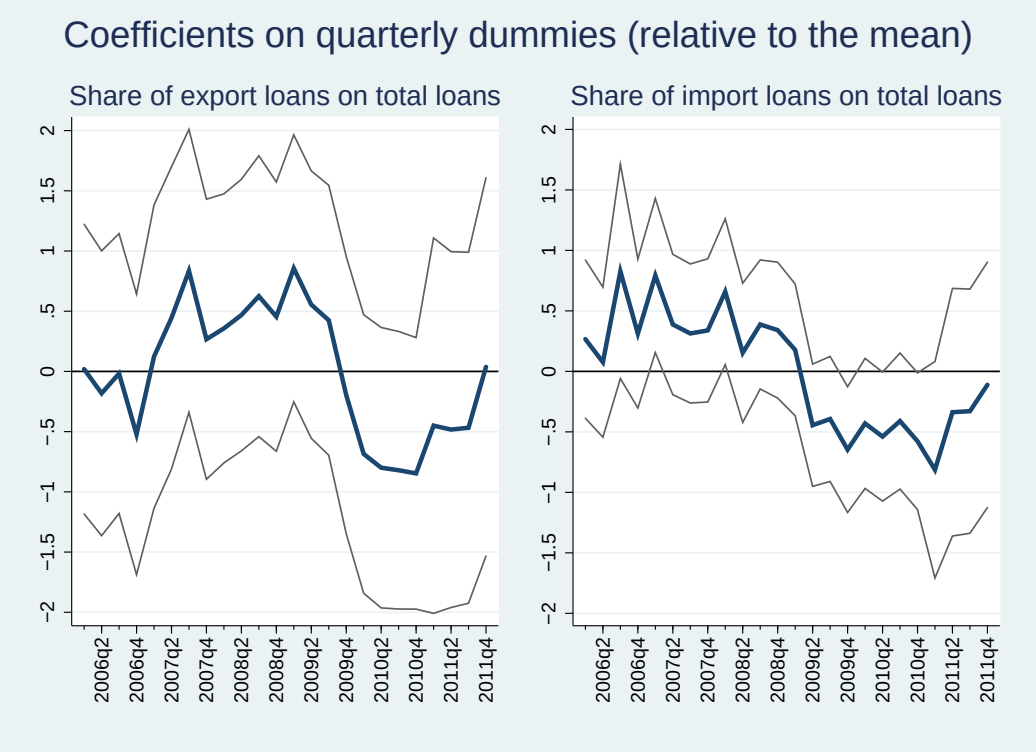
Source: authors' elaborations on Bank of Italy data. The figure reports Italy's end-of-quarter stocks of export and import guarantees (EUR billions; non-seasonally adjusted data).

Figure 5: **Ratio of export and import loans on trade values**



Source: authors' elaborations on Bank of Italy and Istat data. The figure reports the ratio of Italy's end-of-quarter stocks of export and import loans on the 6-month centered sum of Italy's exports and imports of goods and services, respectively (non-seasonally adjusted data).

Figure 6: **Coefficients on quarterly dummies (relative to the mean)**



Source: authors' elaborations on Bank of Italy data. The figure reports the coefficients on quarterly dummies (relative to the mean) from OLS estimation of equations (1) and (2), where the the share of export loans on total loans (left panel) or the share of import loans on total loans (right panel) is regressed on a full set of quarterly dummies and bank fixed effects. The thin lines represent the 95 percent confidence interval. The sample includes 287 banks for a total of 6800 observations. R-squared: 0.843 (export loans); 0.799 (import loans).

Appendix 1 - Firm-level data

Our firm-level data are derived from three sources: Company Accounts Data Service (CADS), Survey on Industrial and Service Firms (SISF), Survey on Foreign Assets and Liabilities (SFAL).

Company Accounts Data Services. The Company Accounts Data Services 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 industrial and service sectors (excluding firms operating in financial and insurance activities, holding and real estate activities, which report balance sheet data with a different structure compared to other services or manufacturing firms).

Survey on Industrial and Service Firms. The Survey on Industrial and Service Firms is an annual survey run by the Bank of Italy. The reference population is composed of Italian firms with 20 or more workers in the industrial and non-financial service sectors. The sampling scheme isa 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 to 30 percent in the target population). The survey collects annual data on investments, employment, turnover, profits, capacity utilization and financing.

Survey on Foreign Assets and Liabilities. The Survey on Foreign Assets and Liabilities is an annual survey run by the Bank of Italy for the compilation of balance of payments statistics. It covers medium and large firms in the industrial and non-banking service sectors. The sampling scheme is based on firm size (measured by total assets), location and past ownership of foreign affiliates. The survey collects annual data on direct investment, portfolio investment and other investment assets, including the stocks of trade credit and trade debit versus non-residents.

Construction of the dataset. We merge our firm-level data using a unique tax identifier. For variables that appear in more than one dataset, we prefer to use SISF data, which are subject to stronger quality controls, CADS data and finally SFAL data. We impute missing values to variables that increase or decrease with respect to the previous year by a factor of 4 (exports, sales, employment, assets). We carry several consistency checks (exports less than or equal to sales; trade credits or debits versus non-residents less than or equal to total trade credits or debits or total assets). Since CADS data do not allow to reliably distinguish

between zero exports and missing exports, we impute a missing value to exports when they are zero in CADS data (unless they are also zero in SISF data).

Appendix 2 - Average maturity of export and import loans

Our bank-firm data on export and import loans and guarantees report information on the stock of outstanding loans at the end of each quarter. There is only a very limited breakdown of loans according to their residual maturity (less than one year versus one year or more). The vast majority of export and import loans have a residual maturity of less than one year. Further information on the average maturity of export and import loans is reported by International Chamber of Commerce (2010), based on a survey of nine international banks. 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 A.1 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 A.1: **Average maturity of export and import loans and guarantees in a survey of international banks**

Type of loan or guarantee	**Average maturity**		**Number of**
	(days)	**(months)**	**transactions**
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.