

Bank Lending Technologies and the Great Trade Collapse: Evidence from EU Micro-data

Giovanni Ferri*, Pierluigi Murro**

Abstract

The first wave of the global financial crisis – emanating from the US subprime debacle and the bankruptcy of Lehman – hit Europe in the last part of 2008 and through 2009. Coupled with it was the Great Trade Collapse (GTC), whereby trade crumpled intensely. With banks in a tailspin, credit rationing intensified – as measured in various different ways – particularly for the small and medium sized enterprises (SMEs). The extent of such retrenchment in the supply of credit could reflect not only the worsened general condition of the European banks but also vary at the micro level depending on the lending technologies being used in the firm-main bank rapport. Using the EFIGE database, we try to assess the extent to which differences in the lending technologies impact export and foreign activities in seven EU countries (Austria, France, Germany, Hungary, Italy, Spain and the UK).

1. Introduction

Along with the Great Financial Crisis of 2008-2009 came the Great Trade Collapse. Indeed, following the bankruptcy of Lehman Brothers, in the nine months from November 2008 international trade wrinkled by a record 22% suggesting a trade contraction even more intense than the epochal drop at the beginning of 1930. Since the peak of the financial crisis preceded that abrupt contraction in trade, it became natural to think of financial constraints as the main culprit behind the trade collapse. However, as we will detail in the section on the review of the literature, there seems to be no consensus on whether financial constraints actually played a key role in thwarting international trade.

Against that background, we try to shed new light on whether financial constraints impaired trade in 2009 in a large sample of firm data from seven European economies (Austria, France, Germany, Hungary, Italy, Spain, the United Kingdom). The wave from Lehman collapse supposedly amplified market imperfections, further boosting the importance of the credit channel of monetary policy transmission. The credit channel may be subdivided into the balance sheet channel and the bank lending channel. The policy amplifying effect of the balance sheet channel depends on the fact that the increased cost of debt lowers the firms' net worth and raises their riskiness. On its part, the bank lending channel magnifies monetary policy as banks render their loan supply more restrictive. In turn, loan supply restriction generally means that more firms will be likely rationed for credit. Indeed, a simple look at the evolution of the credit conditions as recounted by the Bank Lending Survey tells us that banks' loan supply to the small and medium-sized enterprises (SMEs; the most sensitive segment of firms to the evolution in bank lending policies) significantly tightened from the

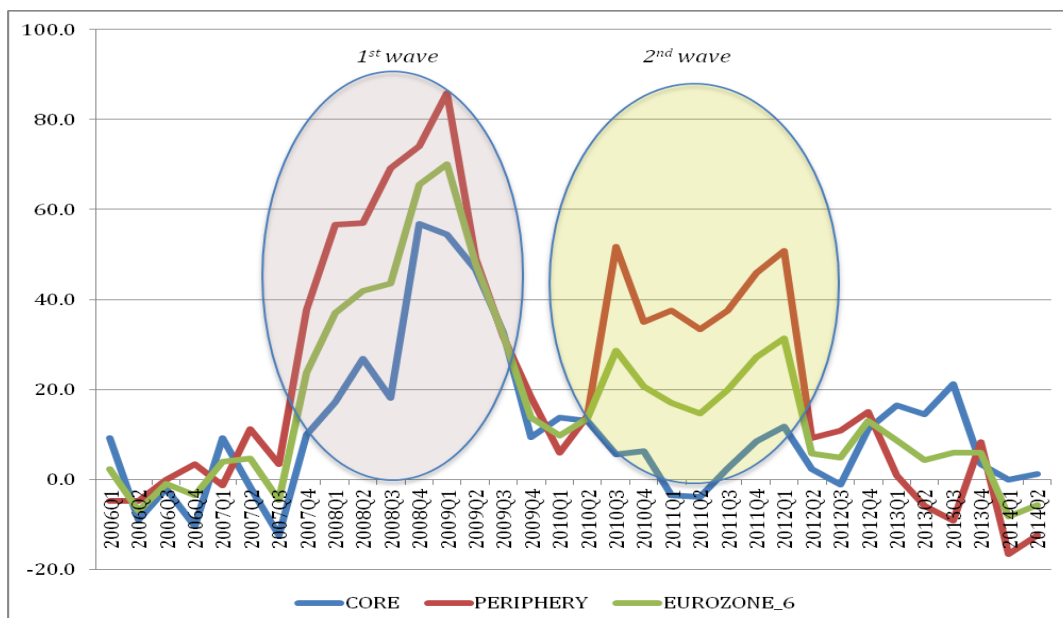
* LUMSA University, CERBE and MoFIR; e-mail: g.ferri@lumsa.it;

** LUMSA University and CERBE; e-mail: p.murro@lumsa.it (Corresponding author);

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fourth quarter of 2007 and particularly in 2008 and early 2009 (Figure 1). In this first wave of the crisis, though the extent of the credit restriction was somewhat larger for the three peripheral countries considered (Italy, Portugal and Spain) vis-à-vis the three core countries considered (France, Germany and the Netherlands), the two groups experienced qualitatively analogous trends. Thereafter, the degree of restriction almost stopped increasing until the second quarter of 2010. However, from the third quarter of 2010 to the first quarter of 2012 the two groups moved in opposite directions. While the degree of restriction didn't increase or even decreased for the core countries, it started increasing again intensely for the countries at the periphery. Finally, since the second quarter of 2012 the degree of restriction seemed to ease in both groups. The retrenchment in the loan supply during the crisis is believed to have contributed to depress the real economy of the Eurozone and particularly that of the peripheral countries.

Figure 1. Degree of restriction in loan supply to SMEs in the Eurozone: Core vs. Periphery



Source: Our computations on data drawn from the ECB's Bank Lending Survey. A positive (negative) number implies increasing (decreasing) degree of restriction of banks' loan supply to SMEs by the equivalent percentage. CORE = simple mean of France, Germany, the Netherlands; PERIPHERY = simple mean of Italy, Portugal, Spain; EUROZONE_6 = simple mean of France, Germany, Italy, the Netherlands, Portugal, Spain.

The aim of this paper is to venture into an empirical analysis of the transmission to the drop in trade of the (unexpected) financial shock coming from the first wave of the global crisis. In particular, we investigate whether the extent of trade impairment in 2009 – the time of most intense loan supply restriction – was affected by the lending technologies employed by the main bank of that firm. We do that referring to the large EFIGE database, covering seven countries: five of them belonging to the Eurozone (Austria, France, Germany, Italy and Spain) and two outside the Eurozone (Hungary and the UK).

Following what reported by the interviewed firm, we distinguish whether her main bank adopts a transactional lending technology or a relational lending technology. Next, we test whether in 2009, the time of heightened credit constraints, firms' export/import performance worsened at both the extensive and the intensive margin. We also distinguish firms by size – small and medium-sized enterprises (SMEs) vs. large enterprises – as well as by sector – Traditional, Scale intensive, Specialized or High tech along the Pavitt (1984) sector groupings.

To anticipate, our results bring consistent support to the fact that: (i) transactional lending increased the probability of firms experiencing a drop in inputs from abroad in 2009; (ii) relational lending lessened the probability of firms either suffering a drop in export in 2009 or exiting exports in 2009; (iii) the above impacts of the lending technology on the drop of inputs from abroad, on the drop of exports, and on exiting exports materialized only for SMEs; (iv) firms in the specialized suppliers sectors experienced the strongest effect of the lending technology on the drop of inputs from abroad, on the drop of exports, and on exiting exports.

In the remainder of the paper, Section 2 draws on the relevant literature providing a reference framework for our study and specifies our testable hypotheses. In Section 3 we describe our data and methodology. Section 4 reports and comments our main results. Finally, in Section 5 we synthesize the main thrust of the chapter and try to draw the main policy implications.

2. Literature review and testable hypotheses

2.1 Literature review

2.1.1 Great Financial Crisis and Great Trade Collapse

The Great Financial Crisis (GFC) of 2008-2009 was coupled with a Great Trade Collapse (GTC). International trade crumpled intensely after Lehman Brothers bankruptcy produced a world-wide tsunami. Scholars started even drawing a parallel with the drop trade suffered in the Great Depression of the 1930s (Eichengreen and O'Rourke, 2009). Since the GTC followed the GFC in time, various authors conjectured that financial constraints were a chief contributor to the sudden drop in trade (Baldwin, 2009).

Though the initial evidence stressed that firms perceived the lack of demand as the most serious cause of trade contraction (Levchenko et al., 2009), heightening financial constraints were hardly irrelevant in the event. On one hand, some works dismissed the primacy of credit constraints in the trade collapse. For instance, Asmundson et al. (2011) report that shocks to trade finance were not the major factor in the decline in trade: while bank- intermediated trade finance fell in value during the crisis, it fell by less than merchandise trade, so that the share of world trade supported by bank- intermediated trade finance increased. By the same token, Paravisini et al. (2011) analyzing the

impact of the 2008 financial crisis on Peruvian exports find that Peruvian banks played an important role in the international transmission of the crisis, and, through this channel, the international credit crunch negatively affected Peruvian export performance. Yet, though the credit crunch had a first order effect on firms' exports, it explains less than 15% of the decline in its volume during the 2008 crisis. In addition, they find no evidence that exports were more sensitive to credit than domestic sales.

On the other hand, however, several studies did find supportive evidence that heightening credit rationing had a negative impact on trade. Among the others, even though stressing a composition effect explanation – i.e. the crisis hit hardest heavy manufacturing that has a large trade component – Francois and Woerz (2009) admit the drop in credit played a role in the GTC. In turn, drawing on evidence from 23 historical banking crises, Iacovone and Zavacka (2009) show that export growth was especially slow in sectors that were particularly reliant on external finance (e.g. electric machinery). They interpret those findings as suggesting that credit problems could have played a role in the GTC. Also, Mora and Powers (2009), using survey data, document that trade-credit problems were the number two cause of the trade collapse (after demand). In addition, using firm-level data from six emerging market economies in Asia, Coulibaly et al. (2011) try to disentangle the effect of falling demand from that of financial constraints on sales and find that: i) sales declined by less for firms with better pre-crisis financial conditions; ii) in the credit crunch some firms relied more on trade credit from suppliers as an alternative to bank credit; iii) export-intensive firms with comparable financial vulnerability resorted less to trade credit as an alternative source of finance, and hence experienced sharper declines in sales than the domestically-oriented firms. Thus, according to them, credit frictions contributed to the disproportionately large decline in international trade during the crisis. In line with that but referring to the Asian crisis of 1997, Love and Zaidi (2010) show that trade credit cannot truly substitute bank loans in a credit crunch situation. Furthermore, Chor and Manova (2012) study the collapse of international trade flows during the global financial crisis using detailed data on monthly US imports. They find that countries with more intense credit crunch exported less to the US at the peak of the crisis and this effect was larger in sectors that require extensive external financing, have limited access to trade credit, or have few collateralizable assets. On their part, Contessi and de Nicola (2012) report that banks responding to an IMF survey identified the fall in the demand for trade activities as the major source of decline in the value of trade finance but attributed about 30% of the fall to the reduced credit availability at either their own institutions or counterparty banks. Finally, Auboin and Engemann (2014) analyze the effect of trade credit on trade on a macro level through a whole cycle by using Berne Union data on export credit insurance for the period of 2005–2011. They identify a

significantly positive effect of insured trade credit, as a proxy for trade credits, on trade and show that this effect is very strong and remains stable over the cycle, not varying between crisis and non-crisis periods. Accordingly, they conclude that dwindling trade credit likely caused the GTC.

2.1.2 Bank lending technologies and credit rationing

Among academics there is the perception that opaque firms, especially the SMEs due to their usually higher opaqueness, lack appropriate financing and need to receive special support, such as government programs that increase lending.¹ Unsurprisingly, SMEs are largely dependent on banks for their external finance. Banks lend to SMEs by means of a variety of technologies. Berger and Udell (2006) define a lending technology as a unique combination of primary information source, screening and underwriting policies/procedures, loan contract structure, and monitoring strategies/mechanisms. Among the various lending technologies used to finance SMEs, the literature has thus far focused on two classes: transaction-based lending technologies and relationship lending technologies (see, e.g., Berger and Udell, 2006, Bartoli et al., 2013). These two lending technologies are normally distinguished by the information that the bank uses in granting and monitoring the loan. Transactional lending technologies are based primarily on hard information (quantitative information, such as that derived from balance sheets and/or collateral guarantees), while relationship lending technologies assign a key role to soft information (qualitative information obtained via personal interaction). The literature suggests that large banks hold a comparative advantage in transactional lending, while the smaller or local banks have an edge in relationship lending (Stein, 2002). Moreover, the conventional view in the literature is that relationship lending is the obvious way to manage the opaqueness of SMEs (De la Torre et al., 2010).

Boot (2000) defines relationship lending as “the provision of financial services by a financial intermediary that: i. invests in obtaining customer-specific information, often proprietary in nature; and ii. evaluates the profitability of these investments through multiple interactions with the same customer over time and/or across products”. This definition relies on two main aspects: eliciting the release of “proprietary” information from the client to the bank and the presence of multiple interactions between the two parties. Several papers have analyzed the impact of relationship lending on the financing of the SMEs. On data for Italy, Angelini et al. (1998) find that the intensity of relationship banking reduces the probability of rationing, even though the lending rates charged by the banks tend to increase as the firm-bank relationship lengthens. Bartoli et al. (2011) find evidence that during the harshest phase of the 2008 Financial Crisis Italian banks tended to support

¹ See, for example, Berger and Udell (1998) and De la Torre et al. (2010) for a discussion of how opaqueness can affect bank lending.

borrowers characterized by more intense informational tightness. For the US, Berger and Udell (1995) show that a longer firm-bank relationship lowers the cost of credit and reduces also the requirements of collateral guarantees. Cole (1998) finds that a lender is less likely to grant credit to a firm if the customer relationship has lasted for one year or less, or if the firm deals with other financial counterparts. Considering Belgian enterprises, Degryse and Van Cayseele (2000) identify the role of relationship banking along two different dimensions: borrowing rates increase with the length of the firm-bank relationship, while borrowing rates decrease when the scope of the firm-bank relationship – defined as the purchase of additional information intensive services (other than the loan) – increases.

In the latest years, both the theoretical and the empirical literatures have started to study also the transaction lending technologies. In particular, some authors suggest that transaction lending is not a single homogeneous lending technology but should be separated into a number of distinct transaction technologies used by financial institutions. Berger and Udell (2006) underline that transactions technologies include financial statement lending, small business credit scoring, asset-based lending, factoring, fixed-asset lending, and leasing. They define and describe each of these lending technologies, highlight its distinguishing features, and show how the technology addresses the opacity problem. Also the empirical literature tries to explain the transaction-based lending technologies (see, for example, Berger and Frame, 2007; Berger et al., 2005).

Finally, some recent studies (see, e.g., Berger and Udell 2006; Beck et al. 2011; Ferri and Murro 2014) have begun to discuss the conventional view that suggests that more centralized and hierarchical organizational structures can have a negative impact on lending to SMEs. These authors propose a new paradigm for bank SME finance, arguing that large banks can be as effective in SME lending through transactional lending technologies and centralized organizational structures instead of relationship lending. Uchida et al. (2006) tested the importance of the various lending technologies. Their results suggest that the banks, even though possibly employing mainly some specific criteria to lend, tend to use the various lending technologies at the same time. Using Italian data, Bartoli et al. (2013) obtain similar results. These results confirm that the same firm tends to receive credit via different lending technologies. However, an additional finding shows that more soft information is produced when the bank uses relationship lending technology as the primary technology individually or coupled with transactional lending technologies. Thus, contrasting the “hardening of soft information” hypothesis (Petersen, 2004), it appears that the way soft information becomes embodied in the lending decision might still differ between relational vs. transactional banks/technologies.

Using the same EFIGE database that is employed here and applying a method analogous to the one proposed by Bartoli et al. (2013), Ferri et al. (2014) showed that in 2009: i) the use of transactional lending technologies worsened credit rationing throughout the entire sample; ii) the production of soft information proved to lower the probability of credit rationing only when associated with a relational lending technology.

2.2 Testable hypotheses

Following the literature we entertain two hypotheses. First, *ceteris paribus*, a firm matching with a transactional lending main bank has a larger probability to end up damaged in its trade performance in 2009 (*H1*). This hypothesis descends from considering that the problems due to asymmetric information are magnified during a deep recession such as that of 2009 (e.g., De Haas and Van Horen, 2013; Kremp and Sevestre, 2013). Our second hypothesis is based on the strand of literature underscoring the potential beneficial effects of relationship lending in terms of firm access to bank credit (Boot, 2000; Degryse et al., 2009). Namely, we could expect that the extent of damage to firms' trade is lower when the firm couples with a relational main bank (*H2*).

3. Data and methodology

3.1 Empirical methodology and data description

We analyze the role of lending technologies on the firms' cross-border activities during the first wave of the GFC. To test our hypotheses we consider an empirical model of the probability that firms reduced their cross-border activities during the 2009. We model cross-border activities as:

$$y_i = a_1 x_i + z_i d_{11} + u_i$$

where y_i is our measure of export (or other cross-border operations), x_i is a vector of the lending technologies used by the main bank, z_i is a vector of control variables, and u_i is the residual.

Our main data source is the EU-EFIGE dataset, a database collected within the EFIGE project (European Firms in a Global Economy: internal policies for external competitiveness) supported by the Directorate General Research of the European Commission through its 7th Framework Programme and coordinated by the Bruegel Institute. This database combines measures of firms' international activities (e.g., exports, imports, FDI) with quantitative and qualitative information on R&D, innovation, labor organization, financing and organizational activities. The data consists of a representative sample (at the country level for the manufacturing industry) of almost 15,000 surveyed firms (above 10 employees) in seven European economies (Austria, France, Germany,

Hungary, Italy, Spain, the United Kingdom). The data was collected in 2010, covering the years from 2007 to 2009. Special questions related to the behavior of firms during the crisis were also included in the survey.²

The data collection was performed through a survey carried out by a professional Contractor, with the aim of gathering both qualitative and quantitative information at the firm level. The questionnaire submitted to the firms covers six different broad areas: a) the firm ownership structure; b) workforce characteristics (skills, type of contracts, domestic vs. migrant workers, training); c) investment, technological innovation, R&D (and related financing); d) export and internationalization processes; e) market structure and competition; f) financial structure and bank-firm relationships. Moreover, to ensure standard statistical representativeness of the collected data, the dataset was built so as to fulfill two main criteria: 1) the availability of an adequately large target sample of firms, initially set at around 3,000 firms for large countries (France, Germany, Italy, Spain and the UK), and some 500 firms for smaller countries (Austria and Hungary); 2) a proper stratification of the sample in order to ensure representativeness of the collected data ex-ante and ex-post for each country, considering in particular three dimensions: sector composition, regions and size class.³

Table 1 presents some descriptive statistics. At the mean, the surveyed firms have been in business for 34 years; beyond 60% of them have fewer than 50 employees (below 4% of the firms have more than 500 employees); 22% of them are part of a group. The majority of firms are located in Germany, France, Italy and Spain (80% of the total), while 14% of the firms are located in UK, 3.3% in Hungary and 3% in Austria; alternatively, 82.7% of the firms belong to the Eurozone. Moving on to their financial set up, the average length of the relationship with the main bank is 16 years, on average firms have three banks and the share of loans obtained from the main bank is 59% of the total banking loans received. On average 4% of the firms in the sample are rationed. Table 1 shows also the summary statistics of the two lending technology indices (see below Sub-Section 3.2). The lending factors related to transactional technology are relatively more frequently emphasized, in fact the mean of the index of transactional lending is 0.469, while the mean for the relational index is 0.268. This result shows that transactional lending is the most widespread lending technology.

3.2 Cross-border variables, lending technology indices and control variables

² As the survey has been run in early 2010, information is mostly collected as a cross-section for the last available budget (year 2008), although some questions cover the period 2007-09 and/or the behavior of firms during the crisis.

³ For more information about the survey, see Altomonte and Aliquante (2012).

Our aim is to empirically verify the role of the lending technologies in supporting firms' cross-border activities during the first wave of the GFC. The EFIGE survey provides us with information on the impact of the Crisis on cross-border activities. In particular, we focus on two questions: "During 2009, did you experience a reduction or an increase in terms of value of your export activities in comparison with 2008?" and "During 2009, did you experience a reduction in terms of value of inputs purchased from abroad in comparison with 2008?". Nearly 73% of the firms that answer the questions declare a reduction in the export activities during 2009. Instead, 38% of the firms experienced a reduction in terms of value of inputs purchased from abroad in comparison with 2008 (Table 1). Using this information, we construct two variables. The first is Drop export 2009, a dummy variable equal to one if the firm experiences a reduction in the value of export during 2009. The second variable (Drop input from abroad 2009) is a dummy that takes the value of one if the firm reduces the value of inputs purchased from abroad in 2009. Finally, we construct a dummy variable (Exit export) identifying the virtual exit from exports of marginal exporters. This dummy is equal to one if the firm in 2008 exported less than 9% of its total sales (25% of the sample) and experienced a reduction of its exports larger than 50% in 2009.

We consider two indicators of lending technology similar to those in Bartoli et al. (2013).⁴ We capture the characteristics of the different lending technologies using the question "Which type of information does the bank normally use/ask to assess your firm's credit worthiness?" (F.16 in the EFIGE survey). In answering this question the firm was required to choose among seven factors (with the possibility of multiple answers, see the Appendix). Most of these factors are related to one of the lending technologies. We then link the factors more closely associated with each lending technology based on the Berger and Udell (2006) classification scheme. We focus on the two macro classes of lending technologies from this classification: transactional lending and relationship lending.⁵

To identify the transactional technology we use two of the seven criteria (balance sheet information and historical records of payments and debt service) that represent quantitative information for the bank. From these two factors we created the transactional lending index, as the average of the two dummy variables which take a value of one if the firm chose them as relevant lending factors by its main bank. The virtue of using an average index is that it can be directly compared with the other

⁴ These indices, based on previous literature (see, e.g., Uchida et al., 2006, Murro, 2010), are imperfect proxies for the use of different lending technologies, since they are based on the firms' perception of the lending factors used by the bank in granting its loans, and thus may be capturing the banks' screening process imprecisely. However, constructing these indices using the firms' perspectives has some advantages. Previous researches on SME finance suffer from the problem that the lending technologies are usually not identified (Kano et al., 2011). Our data allows us to perceive the actual features of the bank at the time the firm is asked. Thus, we can distinguish between lending technologies.

⁵ Berger and Udell (2006) consider six different *transaction-based lending* technologies: (i) financial statement lending, (ii) small business credit scoring, (iii) asset-based lending, (iv) factoring, (v) fixed-asset lending, and (vi) leasing, together with *relationship lending*.

index since both indices are constructed from dummy variables and thus take a value in the [0,1] range. Under relationship lending, the bank relies primarily on private information gathered through contact over time with the firm, its owner and the local community to address the opacity problem. We construct the relationship lending index using the factors that seem most related to private information accumulation by banks through close relationships. The index is an average of two dummy variables which take a value of one if the firm chose as relevant information: interviews with the management on firm's policy and prospects and brand recognition.

Finally, we discuss the other variables included in the regressions. To account for the fact that more productive and larger firms are less likely to be rationed, we include labor productivity, measured as the value added per worker and firm size (measured as the log of total employees). We also include the age of the firm, a dummy variable indicating whether the firm belongs to a group, the degree of financial leverage, given by the ratio of total loans to the sum of the total loans and the firm's assets, and the capital intensity (fixed assets per worker). Finally, we control for the country in which the firm is located. In particular, we include a country fixed effect and GDP per capita in the country in 2009.

4. Results

4.1 Baseline estimates

In this section we investigate the impact of the lending technology used by the firm's main bank on the external activities of the firms during the 2009. Following the literature on SME financing and internationalization (see, e.g., Bartoli et al., 2014), we expect that, *ceteris paribus*, a firm with a relational bank as a main bank has a larger probability to continue its cross-border activities during the GFC. In fact, as asymmetric information is magnified during a deep recession, the more opaque firms could suffer more credit rationing and be forced to exit foreign markets (or at least reduce their activities).

Table 2 reports OLS and Probit results for the three measures of cross-border activities described above (section 3.2). In particular, columns 1-2 show the regressions in which we consider a measure of drop in exports as dependent variable. Instead, columns 3-4 display the results for the reduction in terms of value of inputs purchased from abroad in comparison with 2008. Finally, columns 5-6 report the results when we use our proxy for the exit from exports as dependent variable. The findings in columns 1-2 of Table 2 show that relationship lending has a negative and significant impact at the 10% level on the probability that the firm experiences a reduction in terms of value of its export activities in comparison with 2008. This is in line with the theoretical predictions (H2 of Section 2.2) that the probability of credit rationing is smaller when the main

bank prefers to use the relationship lending technology. We also find that transactional lending has an insignificant positive effect on export activities' reduction. As expected, firms in countries with higher GDP are less likely to reduce their export activities.

In columns 3-4, we investigate the impact of lending technologies on the probability that a firm reduced its purchase of inputs from foreign countries (to test our H1). In line with our predictions, the results show that a firm matching with a transactional lending main bank has a larger probability to end up damaged in its external activities. In particular, the Probit coefficient equals 0.167 and is significant at the 10% level (the coefficient of relationship lending is positive, but insignificant). As for the control variables, the findings display that capital intensity (defined as the ratio of total assets to the number of employees) and labor productivity (defined as the ratio of value added to the number of employees) seem to reduce the likelihood of import inputs' drop. Finally, belonging to a group, larger size and longer age of the firm appear to have insignificant effects on imports.

In columns 5-6 we report analogous regressions where we consider our proxy for the exit from exports. Results are in line with theoretical predictions. The coefficient of relationship lending is negative (-0.517 in the Probit regression) and significant at the 1% level. These results suggest that the persistence of firms' internationalization is favored by the existence of strong bank-firm relationships. The results for the control variables are generally consistent with the findings of the extant empirical literature. As for firm characteristics, the estimates suggest that older and larger firms are less likely to stop their export activities. In fact, we find that firms with more employees and older firms are significantly more likely to continue exporting.

4.2 Sub-sample estimates

In Tables 3-6, we report the results on subsamples based on size and sectors of a firm. For Tables 4-6, Panels A and B display estimates for the OLS and Probit, respectively. We first split the sample based on a firm's size (Table 3). In columns 1-4 we display the results for the drop in export value in 2009. The results show that relationship lending has a negative effect on the reduction of the export value for SMEs, i.e., those with less than 50 employees. The Probit coefficient on relationship lending is -0.242 and significant at the 1% level (column 2). By contrast, although relationship lending has a negative coefficient also for larger firms (-0.005, column 4), the effect is statistically insignificant. Thus, the estimated positive effect of relationship lending on the export of SMEs could be picking up the fact that the existence of strong bank-firm relationships is able to solve problems of credit rationing during a recession in particular for SMEs (see, Beck et al., 2014). About the drop of the input from foreign countries, the findings show that transactional lending is detrimental for input imports only for SMEs (the coefficient is equal to 0.239 and significant at 1%

level). The impact of transactional lending on the import of inputs is positive but not significant for large firms. These results are consistent with theoretical predictions.

Finally, Tables 4-6 split the sample into four types of industries based on the Pavitt taxonomy (Pavitt, 1984). The four types of industries can be ranked according to the level of sophistication and technological content of production. *(i)* Traditional sectors (such as textiles, food, tobacco, paper) are characterized by highly standardized processes and established technologies. Most of their innovations are acquired from external sources. *(ii)* Scale-intensive sectors (e.g., iron, glass, car manufacturing, metal products) are characterized by a level of sophistication somewhat higher than traditional industries. They typically import innovations from external sources but sometimes also develop them internally. *(iii)* Specialized industries (such as mechanical machinery, electronics, telecommunication appliances) can be positioned on an even higher level of sophistication and technological content. Firms in these industries typically produce machinery and software for other industries; their innovations often arise from complex interactions with the users of their products. *(iv)* Finally, high-tech industries (e.g., chemical and bioengineering) feature the highest degree of sophistication, technological content, and R&D intensity. Notice that, although these four categories of industries have different distributions of firm size, this should not have a confounding effect because we control for firm size in all the regressions.

The results show that the positive effect of relationship lending is more relevant for firms in specialized industries. In particular, relationship lending seems to reduce the probability of a drop in input imports from foreign countries and the probability of exit from exports. The coefficients are significant at the 1% level and equal to -0.498 and -2.156 for the drop of input and the exit from exports, respectively (columns 3 of Table 5 and 6). Considering the exit from exports, relationship lending appears to be beneficial also for firms in traditional sectors.

5. Conclusions

The first wave of the global financial crisis – emanating from the US subprime debacle and the bankruptcy of Lehman – hit Europe in the last part of 2008 and through 2009. With banks in a tailspin, credit rationing intensified – as measured in various different ways – particularly for the small and medium sized enterprises (SMEs). The extent of such retrenchment in the supply of credit could reflect not only the worsened general condition of the European banks but also vary at the micro level depending on the lending technologies being used in the SME-main bank rapport.

Using the EFIGE database, Ferri et al. (2014) had found that the extent of SME credit rationing in seven EU countries (Austria, France, Germany, Hungary, Italy, Spain and the UK) varied along

with differences in the lending technologies and in the status of the firm-main bank relationship contributed to the phenomenon.

The research question we tackled in this paper is whether the type of lending technology used by a firm's main bank affected the extent to which that firm's international trade was damaged in the 2009 situation of credit crunch. In a large sample of enterprises, we proved that the use of transactional (relational) lending technologies generally amplified (reduced) the extent of trade impairment. Specifically, we reached four main results. First, transactional lending increased the probability of firms experiencing a drop in inputs from abroad in 2009. Second, relational lending lessened the probability of firms either suffering a drop in export in 2009 or "virtually" exiting exports in 2009. Third, the above impacts of the lending technology on the drop of inputs from abroad, on the drop of exports, and on exiting exports materialize only for SMEs. Fourth, firms in the specialized suppliers sectors experienced the strongest effect of the lending technology on the drop of inputs from abroad, on the drop of exports, and on exiting exports.

Thus, our evidence contributes to the debate on whether the Great Trade Collapse (GTC) of 2009 was related to the concurrent credit crunch. It seems that firms engaging with relational (transactional) lending main banks suffered less (more) in terms of their trade performance. Particularly important appears the finding that a non-trivial share of SMEs and firms in the key specialized suppliers sectors might have been spared to give up exporting – thus avoiding to suffer the curse of the sunk costs of exports – thanks to their main bank adopting relational lending technologies. Along with the adage of Beck et al. (2014), maybe at that time "arm's length was too far".

Our findings have a bearing not only for a better understanding of the economic dynamics in 2009 but offer potential suggestions in view of the following second wave of instability – centered around the sovereign EU crisis – as well as on the prospect for the Eurozone Banking Union. Specifically, in the face of external shocks the ability of banks to know better their borrowers' true risk class – owing to production of soft information and use of it via relationship lending – can attenuate the extent to which the shock is transmitted to the real economy. This is particularly the case for the possible effects of curtailing international trade, something that is so important to sustain the prospects of enterprises in Europe where domestic demand has been stagnating for so many years. Two issues then arise. First, maybe we need better theories to represent banking with extensive consequences for regulation, supervision and business practice (Ferri and Neuberger, 2014). Second, instead of relying solely on the mechanistic method of the risk weighted asset approach (e.g., Basle 2 and 3), regulation should probably encompass also banking business models in evaluating the true risk behind banks (Ayadi et al., 2012; Masera, 2011).

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Table 1. Summary statistics

Variables	Number of Observations	Mean	Standard Deviation	Min	Max
<i>Dependent Variables</i>					
Drop export 2009*	5,521	0.730	0.444	0	1
Drop input from abroad 2009*	5,787	0.380	0.485	0	1
Exit export*	4,039	0.077	0.266	0	1
<i>Lending technologies and bank variables</i>					
Transactional lending*	9,135	0.469	0.391	0	1
Relational lending*	9,127	0.268	0.330	0	1
Relationship length	6,758	16.104	14.029	1	99
Number of banks	14,655	3.089	2.531	1	60
Share of the main bank	6,874	58.922	33.138	0	100
<i>Control variables</i>					
Age	14,726	34.532	30.629	0	368
Number of employees	8,819	129.863	4,130.988	1	386,170
Size (Log Number of employees)	8,819	3.480	1.107	0	12.864
Labor productivity	9,645	52.19	45.17	-420.94	1928.5
Capital intensity	10,885	41.11	84.12	0	3616.3
Group *	14,760	0.221	0.415	0	1
Leverage	11,665	0.374	0.117	0	0.999
GDP (2009)	14,760	38597.73	6921.52	13741	45562
Italy *	14,760	0.205	0.403	0	1
Austria *	14,760	0.030	0.171	0	1
France *	14,760	0.201	0.401	0	1
Germany *	14,760	0.199	0.399	0	1
Hungary *	14,760	0.033	0.179	0	1
Spain *	14,760	0.192	0.394	0	1
UK *	14,760	0.140	0.347	0	1

Note: * denotes a (0, 1) dummy variable.

Table 2: Baseline estimates

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	OLS Drop export 2009	Probit Drop export 2009	OLS Drop input from abroad 2009	Probit Drop input from abroad 2009	OLS Exit export	Probit Exit export
Transactional lending	0.000 (0.060)	0.008 (0.194)	0.049* (0.025)	0.167** (0.080)	0.025 (0.018)	0.147 (0.121)
Relational lending	-0.043* (0.022)	-0.140* (0.073)	0.045 (0.045)	0.121 (0.127)	-0.074*** (0.017)	-0.517*** (0.194)
Age	0.001 (0.000)	0.002 (0.001)	0.001 (0.000)	0.002 (0.001)	-0.000*** (0.000)	-0.005*** (0.001)
Size	0.002 (0.009)	0.007 (0.028)	0.006 (0.016)	0.017 (0.048)	-0.029** (0.010)	-0.275*** (0.056)
Labour productivity	-0.020 (0.023)	-0.055 (0.068)	-0.074*** (0.018)	-0.327*** (0.109)	-0.009 (0.026)	-0.051 (0.158)
Capital intensity	-0.020 (0.000)	-0.057 (0.044)	-0.019* (0.008)	-0.043** (0.021)	0.007 (0.018)	0.056 (0.113)
Leverage (2009)	-0.137 (0.137)	-0.425 (0.448)	-0.186 (0.146)	-0.585 (0.414)	0.123 (0.143)	0.644 (0.966)
Group	0.022 (0.019)	0.067 (0.060)	0.016 (0.024)	0.052 (0.071)	-0.018 (0.021)	-0.165 (0.145)
GDP (2009)	-0.004*** (0.000)	-0.072*** (0.002)	0.006*** (0.001)	-0.036*** (0.007)	-0.004*** (0.001)	0.094*** (0.009)
Constant	0.975*** (0.102)	3.521*** (0.280)	0.395*** (0.104)	1.621*** (0.267)	0.281** (0.079)	-4.016*** (0.654)
+ Country dummies	Y	Y	Y	Y	Y	Y
Observations	1,766	1,766	1,758	1,758	1,290	1,285
R-squared	0.031		0.152		0.052	
Pseudo R-squared	.	0.0269	.	0.128	.	0.104

Note: The table reports regressions coefficients. The dependent variable and the estimation method are reported at the top of each column. All of the regressions include country fixed effects. In parentheses are robust standard errors which are clustered by country. (*): coefficient significant at 10% confidence level; (**): coefficient significant at 5% confidence level; (***): coefficient significant at less than 1% confidence level.

Table 3: Sub-samples for size (Drop export and drop input from abroad)

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	SME		Large		SME		Large	
	OLS Drop export 2009	Probit Drop export 2009	OLS Drop export 2009	Probit Drop export 2009	OLS Drop input from abroad 2009	Probit Drop input from abroad 2009	OLS Drop input from abroad 2009	Probit Drop input from abroad 2009
Transactional lending	-0.010 (0.045)	-0.030 (0.151)	0.004 (0.095)	0.016 (0.296)	0.076** (0.029)	0.239*** (0.046)	0.024 (0.065)	0.104 (0.227)
Relational lending	-0.078** (0.027)	-0.242*** (0.088)	0.000 (0.027)	-0.005 (0.086)	0.015 (0.018)	0.044 (0.056)	0.056 (0.129)	0.151 (0.374)
Age	0.001 (0.001)	0.003 (0.002)	0.000 (0.001)	0.001 (0.002)	0.001* (0.000)	0.002* (0.001)	0.001 (0.001)	0.002 (0.002)
Size	-0.035 (0.022)	-0.112 (0.080)	0.020 (0.020)	0.063 (0.059)	0.000 (0.013)	0.028 (0.037)	-0.019 (0.026)	-0.062 (0.084)
Labour productivity	-0.075** (0.024)	-0.239** (0.107)	0.000 (0.000)	0.078 (0.144)	-0.119*** (0.028)	-0.530*** (0.052)	-0.000 (0.000)	-0.168 (0.128)
Capital intensity	-0.020 (0.018)	-0.054 (0.047)	-0.000 (0.000)	-0.056 (0.070)	-0.010*** (0.002)	-0.012* (0.007)	-0.000 (0.000)	-0.086 (0.097)
Leverage (2009)	-0.248 (0.221)	-0.785 (0.756)	-0.039 (0.110)	-0.136 (0.334)	-0.302 (0.206)	-0.958* (0.561)	-0.007 (0.177)	-0.029 (0.486)
Group	0.035 (0.041)	0.115 (0.143)	0.004 (0.029)	0.013 (0.083)	0.021 (0.044)	0.063 (0.134)	-0.000 (0.018)	0.010 (0.059)
GDP (2009)	-0.004*** (0.001)	-0.064*** (0.005)	-0.000*** (0.000)	-0.077*** (0.003)	-0.002** (0.001)	-0.003 (0.005)	0.000*** (0.000)	-0.061*** (0.004)
Constant	1.168*** (0.166)	3.809*** (0.401)	0.825*** (0.157)	3.310*** (0.494)	0.715*** (0.095)	0.539 (0.436)	0.399* (0.171)	2.831*** (0.350)
+ Country dummies	Y	Y	Y	Y	Y	Y	Y	Y
Observations	1,035	1,034	731	731	988	987	770	770
R-squared	0.037		0.038		0.141		0.186	
Pseudo R-squared	.	0.0318	.	0.0332	.	0.119	.	0.154

Note: The table reports regressions coefficients. The dependent variable and the estimation method are reported at the top of each column. All of the regressions include country fixed effects. In parentheses are robust standard errors which are clustered by country. (*): coefficient significant at 10% confidence level; (**): coefficient significant at 5% confidence level; (***): coefficient significant at less than 1% confidence level.

Table 4: Sub-samples for sectors (Drop export)

Panel A: OLS				
VARIABLES	(1) Drop export 2009 Traditional	(2) Drop export 2009 Scale intensive	(3) Drop export 2009 Specialized	(4) Drop export 2009 High tech
Transactional lending	-0.101 (0.058)	0.005 (0.071)	0.152 (0.084)	0.098 (0.117)
Relational lending	-0.081 (0.088)	0.022 (0.035)	-0.089 (0.077)	-0.016 (0.172)
+ controls	Y	Y	Y	Y
+ Country dummies	Y	Y	Y	Y
Observations	671	545	308	242
R-squared	0.049	0.059	0.067	0.036
Panel B: Probit				
VARIABLES	(1) Drop export 2009 Traditional	(2) Drop export 2009 Scale intensive	(3) Drop export 2009 Specialized	(4) Drop export 2009 High tech
Transactional lending	-0.297* (0.172)	0.043 (0.297)	0.495* (0.274)	0.262 (0.325)
Relational lending	-0.234 (0.245)	0.107 (0.152)	-0.330 (0.283)	-0.050 (0.474)
+ controls	Y	Y	Y	Y
+ Country dummies	Y	Y	Y	Y
Observations	670	544	305	237
Pseudo R-squared	0.0397	0.0618	0.0586	0.0154

Note: The table reports regressions coefficients. The dependent variable and the estimation method are reported at the top of each column. All of the regressions include country fixed effects and control for firm characteristics including log(number of employees), log(capital intensity), log(labor productivity), age, group, leverage and the GDP of the country in 2009. In parentheses are robust standard errors which are clustered by country. (*): coefficient significant at 10% confidence level; (**): coefficient significant at 5% confidence level; (***): coefficient significant at less than 1% confidence level.

Table 5: Sub-samples for sectors (Drop input from abroad)

Panel A: OLS				
VARIABLES	(1)	(2)	(3)	(4)
	Drop input from abroad	Drop input from abroad	Drop input from abroad	Drop input from abroad
	2009	2009	2009	2009
	Traditional	Scale intensive	Specialized	High tech
Transactional lending	0.016 (0.042)	0.037 (0.052)	0.271** (0.089)	-0.004 (0.050)
Relational lending	0.018 (0.054)	0.084 (0.051)	-0.131* (0.065)	0.194 (0.136)
+ controls	Y	Y	Y	Y
+ Country dummies	Y	Y	Y	Y
Observations	750	512	248	248
R-squared	0.114	0.263	0.263	0.172
Panel B: Probit				
VARIABLES	(1)	(2)	(3)	(4)
	Drop input from abroad	Drop input from abroad	Drop input from abroad	Drop input from abroad
	2009	2009	2009	2009
	Traditional	Scale intensive	Specialized	High tech
Transactional lending	0.032 (0.128)	0.177 (0.225)	1.027*** (0.316)	0.002 (0.167)
Relational lending	0.074 (0.155)	0.250* (0.148)	-0.498*** (0.159)	0.545 (0.366)
+ controls	Y	Y	Y	Y
+ Country dummies	Y	Y	Y	Y
Observations	750	511	247	248
Pseudo R-sq	0.0962	0.215	0.224	0.145

Note: The table reports regressions coefficients. The dependent variable and the estimation method are reported at the top of each column. All of the regressions include country fixed effects and control for firm characteristics including log(number of employees), log(capital intensity), log(labor productivity), age, group, leverage and the GDP of the country in 2009. In parentheses are robust standard errors which are clustered by country. (*): coefficient significant at 10% confidence level; (**): coefficient significant at 5% confidence level; (***): coefficient significant at less than 1% confidence level.

Table 6: Sub-samples for sectors (Exit export)

Panel A: OLS				
VARIABLES	(1) Exit export Traditional	(2) Exit export Scale intensive	(3) Exit export Specialized	(4) Exit export High tech
Transactional lending	0.001 (0.022)	-0.009 (0.050)	0.115 (0.075)	0.101 (0.078)
Relational lending	-0.041* (0.017)	-0.054 (0.054)	-0.218** (0.073)	-0.002 (0.101)
+ controls	Y	Y	Y	Y
+ Country dummies	Y	Y	Y	Y
Observations	460	451	226	153
R-squared	0.072	0.052	0.109	0.121
Panel B: Probit				
VARIABLES	(1) Exit export Traditional	(2) Exit export Scale intensive	(3) Exit export Specialized	(4) Exit export High tech
Transactional lending	0.057 (0.128)	-0.118 (0.282)	0.965*** (0.335)	2.051** (0.946)
Relational lending	-0.304** (0.152)	-0.343 (0.366)	-2.156*** (0.364)	-0.350 (0.825)
+ controls	Y	Y	Y	Y
+ Country dummies	Y	Y	Y	Y
Observations	425	450	190	103
Pseudo R-squared	0.118	0.0976	0.188	0.266

Note: The table reports regressions coefficients. The dependent variable and the estimation method are reported at the top of each column. All of the regressions include country fixed effects and control for firm characteristics including log(number of employees), log(capital intensity), log(labor productivity), age, group, leverage and the GDP of the country in 2009. In parentheses are robust standard errors which are clustered by country. (*): coefficient significant at 10% confidence level; (**): coefficient significant at 5% confidence level; (***): coefficient significant at less than 1% confidence level.

Appendix: Survey question

F16. *Which type of information does the bank normally use/ask to assess your firm's credit worthiness?*

- Collateral
- Balance sheet information
- Interviews with management on firm's policy and prospects
- Business plan and firms' targets
- Historical records of payments and debt service
- Brand recognition
- Other