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## Bank Credit and Trade: Evidence from Germany

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**Bank Credit and Trade:  
Evidence from Germany\***

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Abstract

The massive decline in international trade in 2008/09 is often attributed to the global deterioration in financial conditions after the bankruptcy of a US investment bank, Lehman Brothers. This paper examines the association between external finance and firm activity in Germany in more detail. In particular, we explore a novel data set that matches a full sample of quarterly bank-firm lending data with detailed information on borrowers and lenders. Our results indicate that foreign sales are insensitive to variations in external finance. While German banks affected by the crisis have significantly reduced their credit supply, exporting firms seem to be particularly good borrowers, which have been offered alternative financing options.

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## **1. Introduction**

The massive decline in world trade in the fourth quarter of 2008 has led to a growing interest into the procedures of trade financing. Firm practices of funding trade transactions have attracted attention for at least two reasons. First, cross-border shipping collapsed in the aftermath of the bankruptcy of Lehman Brothers, as global credit conditions tightened dramatically, potentially indicating that shipping activities might have considerable capital needs.<sup>1</sup> Second, to the extent that external credit is of greater relevance for exports than for domestic sales, this asymmetry may explain why international trade has fallen substantially more than overall economic activity during the crisis.<sup>2</sup>

Based on such reasoning, a number of papers have recently examined the empirical association between financial factors and trade activity. Not surprisingly, there is generally broad support for the hypothesis that shipping is sensitive to financial constraints, possibly in line with other types of business operations.<sup>3</sup> For French firms, for instance, Bricongne, Fontagné, Gaulier, Taglioni and Vicard (2012) document that firms sizably reduce cross-border shipments if they have experienced an incident of failing to pay its creditors over the past twelve months and, therefore, can be considered to be less creditworthy. Chor and Manova (2012) find that, during the global financial crisis, the decline in exports to the United States was stronger for countries with tighter credit markets and for industries which are more heavily dependent on external finance.

The empirical evidence, however, turns out to be more mixed for the claim that credit constraints affect cross-border shipments and domestic deliveries differently. Amiti and Weinstein (2011) find that the deterioration of the financial position of Japanese banks caused a decline in their client firms' exports relative to their domestic sales. In similar fashion, Ahn, Amiti and Weinstein (2011) argue that trade financing needs differ by mode of transportation, with external financing being particularly important for shipments with long time lags; they

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<sup>1</sup> While the financial crisis hampered the availability, and raised the cost, of credit, trade may have also been affected by other features of the crisis, such as the sharp correction in equity markets or an increase in uncertainty; see, for instance, Novy and Taylor (2013).

<sup>2</sup> Bems, Johnson, and Yi (2013) note that the decline in real world trade from the first quarter of 2008 to the first quarter of 2009 exceeded the fall in real world GDP by roughly a factor of four.

<sup>3</sup> Aghion, Askenazy, Berman, Cette, and Eymard (2012), for example, analyze the effects of credit constraints on the R&D investment of firms.

find that goods shipped by sea indeed experienced an increase in prices relative to goods shipped by air or land during the crisis period.<sup>4</sup>

Behrens, Corcos, and Mion (2013), in contrast, note that variables proxying for the financial structure of firms, such as the share of debt in total liabilities, had no measurable effect on changes in firm-level exports-to-turnover ratios in Belgium. For Peru, Paravisini, Rappoport, Schnabl, and Wolfenzon (2012) find that the sensitivity of exports to credit shocks does not vary with measures characteristic for cross-border trade, such as the distance to the destination market, the mode of transportation, or the method of payment.

In this paper, we further explore the empirical association between financial conditions, especially a firm's access to external finance, and firm activity, especially exports. In particular, we aim to identify the causal effect of disruptions in the credit supply on the sales of German firms. Since a firm's use of credit endogenously responds to its production decisions, we use the health of banks as instrument for credit use, thereby following Amiti and Weinstein (2011) and Paravisini, Rappoport, Schnabl, and Wolfenzon (2012).

We contribute to the literature along various lines. At the heart of our analysis is a novel data set of pair-wise bank-firm relationships in Germany. To this data, we match information on lender and borrower characteristics. As a result, we are able to examine firms' borrowing behavior by financial institution such that a firm's use of external finance from a crisis-affected bank is directly observed. We are also able to explore possible patterns of substitution of credit from liquidity-constrained providers to other, potentially more healthy institutions. Our period of analysis is from 2005 to 2011 which covers wide fluctuations in financing conditions and firm-level sales, including the global recession of 2008-2009. Figure 1 illustrates the sharp drop in economic activity in Germany after the collapse of Lehman Brothers.

Previewing our main results, we find that exporters were hit strongly by the credit shortage after the Lehman collapse, even after controlling for other features of the firm such

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<sup>4</sup> Ahn (2011) provides a formalization of the idea that cross-border trade transactions are particularly sensitive to financial shocks. Specifically, he argues that international trade finance loans are riskier than domestic trade finance loans. In the model, the banks' screening tests for a borrower, the borrower's domestic trading partners and its foreign trading partners differ in precision levels (or, more precisely, costs). As a result, "international transactions are subject to higher default risks than domestic transactions because the screening test for foreign firms is more likely to misclassify bad firms as good." (Ahn, 2011, p. 17)

as size, age or industry; the decline in credit supply led to no measurable reduction in export activity.

The remainder of the paper is structured as follows. Section 2 reviews the relevant literature, followed by a detailed description of the various data sources and our matching approach. The heart of our paper is Section 4, which motivates our empirical methodology and presents the results. Finally, Section 5 briefly concludes.

## **2. Related Literature**

For a long time, financial aspects of cross-border trade transactions have been discussed, if anything, primarily by financial experts and trade practitioners. Beck, Demirgüç-Kunt and Maksimovic (2008), for instance, examine differences in financing patterns across countries and firms, finding that exporting firms use more bank, lease, and trade finance.<sup>5</sup> Auboin and Meier-Ewert (2003) explore possible institutional responses to shortages in the availability of trade finance instruments during the emerging markets crisis of the late 1990s, from the design of the regulatory framework to the role of regional and multilateral institutions.

With the sudden, severe and synchronized slump in trade, however, in the midst of a financial crisis, issues in trade finance have also become a topic of growing interest for trade economists. To examine the financial vulnerability of cross-border trade transactions, a broad range of issues have been analyzed, including the methods of payment that are typically used in international trade, the determinants of firm-level access to bank-intermediated trade finance, and the external financial dependence of sectors and countries. Bems, Johnson, and Yi (2013) provide an excellent overview of the literature; they note that credit shocks have indeed played a major secondary role in explaining the collapse in trade, accounting for about 20 percent of the decline.<sup>6</sup>

For our analysis, three strands of the literature are of particular relevance. A first line of research is concerned with the borrowing behavior of firms in general. Berger, Miller,

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<sup>5</sup> Interestingly, while a large empirical literature on firm-level trade consistently shows that exporters display significantly different firm characteristics than domestic sellers, these studies rarely provide systematic evidence for financial variables.

<sup>6</sup> According to Bems, Johnson, and Yi (2013), changes in expenditure across sectors account for about 65-80 percent of the trade collapse, while the remaining share is attributed to inventory adjustments.

Petersen, Rajan, and Stein (2005) is a prominent example; they investigate whether organizational differences in banks lead to a comparative advantage in lending to specific firms. From a theoretical point of view, the likelihood that a relationship between a firm and its bank is an exclusive one should decrease with bank size. Similarly, empirical findings indicate that the probability of a single lending bank decreases as firm size increases. Therefore, the larger the size of the firm the higher the number of banks it engages with and the larger the loans. Memmel, Schmieder, and Stein (2007) examine evidence from Germany, using the same data sets as we do. They analyze whether information asymmetries can be mitigated by relationship banking and how the firm's credit quality influences the likelihood of choosing a relationship lender. They find that small, young and R&D intensive firms as well as firms with a high credit quality choose a relationship lender.

Another set of papers explores the recent financial crisis as an identification strategy for examining the relationship between finance and trade. Chor and Manova (2012) use monthly US industry import data from November 2006 to October 2009 to identify channels that are responsible for the sharp decline in trade. Focusing on the cost of capital, which is approximated by interbank rates, and distinguishing between industries, they find that the higher the external finance need of the industry, the higher the decline in trade during a financial crisis. Damijan and Kostevc (2011) provide a summary of recent empirical research about entering and surviving in the export market and the role of financial conditions. They conclude that, during a financial crisis, trade finance plays an important role for (especially) small firms. Smaller firms have tighter requirements due to lower internal funds, and it is therefore harder for them to receive credit compared to larger companies which also often have access to other sources.

Our analysis is most closely related to recent work that tries to establish causal finance-trade relationships based on micro evidence. Amiti and Weinstein (2011) match micro data from banks and companies in Japan, covering the period from 1990 to 2010. They find that a decline in financial conditions can explain the large drop in relative trade flows. Behrens, Corcos, and Mion (2010) analyze the export behavior of Belgian companies, using quarterly data, and compare the change in exports before the crisis in the first season (S1-2007 to S1-2008) with the first season after the crisis (S1-2008 to S1-2009). The focus on the first quarter is reasoned by potential seasonality problems that could arise otherwise. They show that the sharp drop in trade relative to GDP is mainly due to the intensive margin. In contrast to Amiti and Weinstein (2011), financial conditions are not the most important factor

for explaining this observation; the reduction in demand is much more influential. Finally, domestic suppliers are as affected as exporters by the financial shock. That is why there is no trade crisis but an overall output crisis. Bricongne, Fontagne, Gaulier, Taglioni, and Vicard (2010) use monthly export information and data about credit constraints of French companies from January 2000 to April 2009 to investigate how financial health, external finance and the extensive/intensive margin help explaining the decline in exports. Lower demand and the intensive margin for large firms are found to be the most important determinants. Credit constraints aggravate the trade situation. Another approach is to analyze the credit portfolio of banks. Paravisini, Rappoport, Schnabl, and Wolfenzon (2012) analyze matched micro data from Peru and compute the elasticity of exports. The shortage in credit supply is able to explain 15% of the decline in exports. Antras and Foley (2011) analyze transaction data from one exporting firm in the US into about 140 countries from 1996 to 2009. They have detailed information about the financing mode of each transaction and can evaluate how the financial crisis affected the choice of contracts. The use of letter of credits is rather low in the whole data set because they incorporate additional costs for the trading partners. Consequently, the authors conclude that the financial shock affect the mode of trade finance. However, the effect of banks on trade does not seem to be as strong as other researchers suggest.

### **3. Data Description**

To analyze bank-firm relationships in Germany, we use three different data sets, provided by the Deutsche Bundesbank. For reasons of confidentiality, the micro data are accessible only at the Bundesbank headquarter in Frankfurt, often in anonymized form. We begin by describing the data sources in detail.

Our main source of data is the Bundesbank's credit register, named MiMiK. Originally established in 1934, the register regularly collects information on individual lending relationships between borrowers and lenders in order to allow the central bank to monitor indebtedness. Banking institutions based in Germany are required to report their large exposures on a quarterly basis according to section 14 of the German Banking Act (*Kreditwesengesetz*),; reporting requirements were occasionally adjusted to take account of inflation (raising the regulatory reporting threshold) and structural changes in banking and financing techniques (e.g., adding credit derivatives to the definition of credit exposure). Schmieder (2006) provides a more detailed description of the database.

In its current version, the German credit register contains information on all loans in excess of 1.5 million euro granted by banks in Germany to firms worldwide. For each bank-firm relationship, the size of the total credit exposure (both on and off balance sheet) is provided, along with the name and address of the borrower as well as information on the lender. The frequency of the data is quarterly, with information provided at the end of the quarter. Our sample covers the period from 2005 to 2010.

The second source of information is the corporate balance sheets database of the Bundesbank, Ustan. The Bundesbank has collected, mainly for refinancing purposes, extensive data on individual firms. The data are often taken from financial statements, but may also have been obtained from a mandatory questionnaire, based on balance sheet and profit and loss accounts data. Most notably for our purposes, the database includes information on firms' domestic and export sales.

The corporate balance sheets data is on an annual basis. We merge the data with our information from the credit register by the corresponding year (such that annual firm data is matched with the loan data in each of the four quarters in a given year). Unfortunately, the firm identifiers differ between the two data sets. Therefore, we develop a propensity score matching algorithm, based on the name of the firm, its legal form and its location; Memmel, Schmieder and Stein (2007) use a similar approach. In the practical implementation of this matching procedure, we use a cut-off minimum score of 90%. In total, the matching quote between the two data sets is approximately 55%.

Finally, we use data from the Bundesbank's prudential information system on banks, BAKIS. The database contains information on a wide range of bank characteristics, mainly taken from financial statements and quantitative audit reports. Reports to the Bundesbank (as a German financial supervisory authority) are mandatory for banks, often in a monthly frequency. BAKIS data are on annual frequency, reaching back to 1993.

Table 1 provides an overview of the various combinations of matched data sets. In total, the Bundesbank's credit register contains information on more than 1 million bank-firm pairs for the 24 quarters from 2005 to 2010. For the large majority of the 17,000 firms and 2,000 banks in the data set, we also have complementary information on firm and bank characteristics; while the number of observations decreases by about a quarter in the matched data sets, the number of firms and banks is often considerably more stable. Most notably, the

subsamples based on the matched data sets do not differ significantly from the raw data. For instance, the pair-wise credit exposure consistently averages at about 8 million euro.

Reviewing our data in more detail, Figure 2 shows that financing conditions have indeed deteriorated in Germany after the fourth quarter in 2008. After a strong expansion in previous quarters, total credit has measurably declined in 2009; the number of loans continued to increase, but at a much smaller pace. An Appendix provides more information about the evolution of bank-firm credit relationships in our sample.

Moreover, it is reassuring to note that our firm-level data follows aggregate developments quite well. As shown in Figure 3, there is a (remarkably) close match between official statistical data on measures of economic activity and the corresponding variables in our matched micro data sets.

## **4. Empirical Analysis**

### **4.1 Reduced-Form Estimation**

In our empirical analysis of bank-firm relationships in Germany, we proceed in steps. To examine whether financing conditions have a measurable effect on firm activity, we begin our analysis by using the following first-differences model:

$$(1) \quad \Delta \ln(\text{Exports}_{ijt}) = \alpha + \beta \Delta \ln(\text{Loan}_{ijkt-1}) + \phi_j + \eta_i + \nu_k + \varepsilon_{ijkt}$$

where  $\text{Exports}_{ijt}$  are foreign sales of firm  $i$  in industry  $j$  at time  $t$ ,  $\text{Loan}_{ijkt-1}$  is the credit exposure of bank  $k$  to firm  $i$  in the previous period, and we include a full set of industry-time specific, firm-specific and bank-specific fixed effects.

Table 2 presents the results. As shown in column 1, our baseline estimates indicate that changes in export sales are basically unrelated to a firm's use of external finance; the estimated coefficient on the change in a firm's total stock of bank credit is statistically indifferent from zero and even takes a negative sign. Similarly weak results are obtained when we use the change in a firm's export share (instead of its sales) as dependent variable (column 2). In a next step, we explore the relevance of bank credit for other measures of firm activity.

The following two columns tabulate the analogues for domestic sales and total sales. For both measures, interestingly, we observe a strong positive association between the use of bank finance and firm sales; the point estimates of about 0.01 indicate that a reduction in the stock of bank credit by 10 percent is associated with a decline in sales by about 0.1 percent in the following year. Moreover, splitting the sample by a firm's export status has only moderate effects on the estimation results; total sales are, if anything, somewhat more dependent on external finance for non-exporters than for exporting firms. In the final three columns of Table 2, we report additional robustness checks on the relationship between credit and exports with mixed results. Our baseline results remain virtually unchanged when we additionally control for (unobserved) time-invariant firm characteristics, using firm-specific fixed effects. In contrast, the estimation results turn out to be stronger for the effect of credit use on exports when changes in the stock of credit at the individual bank-firm level (instead of a firm's total stock of credit) are analyzed.

#### 4.2 Instrumental Variable Analysis

While correlations between variables may be interesting, we are particularly interested in the direction of causality in the relationship. That is, did greater restrictions in the firms' access to external finance (credit shortage) lead to a decline in external trade? The key difficulty with the reported measure of credit exposure is that it represents an equilibrium outcome: An agreed credit line is the result of matched credit supply and credit demand between a lender and a borrower.

To deal with this issue, we use an instrumental variables approach, which allows to disentangle variation in credit demand from changes in credit supply. Following Paravisini, Rappoport, Schnabl, and Wolfenzon (2012), we hypothesize that banks that are strongly affected by the financial crisis have reduced their credit exposure relative to other banks. As a result, firms lending from such banks are likely to suffer from credit reductions.

The difficulty, then, is to identify banks that have been hit particularly hard by the crisis. For Peruvian banks, Paravisini, Rappoport, Schnabl, and Wolfenzon (2012) use the share of foreign funding as identification variable. Specifically, they argue that if a bank receives much funding from abroad (defined as funding above the mean value of foreign funding one year before the crisis occurred), it seems reasonable to assume that the bank has

been ‘affected’ by the crisis.<sup>7</sup> Another interesting approach has been proposed by Rose and Wieladek (2011). Based on a Google search, they classify approximately 150 banks as ‘affected’ by public interventions in the United Kingdom.

For our sample of German banks, we identify crisis-hit banks if they received government support (guarantees, recapitalization or resolution agencies) through the special financial market stabilization fund SoFFin. The fund was established on October 17, 2008, with the purpose to “stabilize the financial system in Germany”. An appendix lists the ten banks which have received public capital injections. We analyze a sample of these banks with and without their subsidiaries.

In our empirical implementation, we also experiment with other measures of bank health. For instance, we classify banks as ‘affected’ if they are covered by the European Banking Authority (EBA) stress test exercise. Especially large German banks have pursued risky business before the crisis. As shown in the appendix, there is indeed considerable overlap.

Another approach is to use balance sheet (or bank performance) measures such as the leverage ratio (often defined as equity ratio). Vazquez and Federico (2012) analyze Bankscope data and show that the probability of default increases with the leverage ratio for a set of European banks. We use the 25 percent quantile to classify a sample of ‘affected’ banks one year before the crisis emerged.

We also make use of the share of non-performing loans. Higher write-offs are associated with banks that are hit the hardest by the financial shock, especially before and after the crisis. The banks within the highest 25 percent quantile of non-performing loans one year before the crisis are defined as ‘affected’.

Table 3 examines the association between our measures of bank health and credit provision in more detail. The table reports the results of a differences-in-differences specification in which comprehensive sets of fixed effects control for the variation in bank lending across banks and over time and an interaction term captures the effect of the crisis on the lending behavior of the banks of interest. Estimation results are tabulated for two measures of bank credit. The first six columns present results for individual bank-firm pairs;

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<sup>7</sup> For a small open economy such as Peru, this method is plausible; firms mostly receive funding from one or two banks and shocks from outside can easily influence firm behavior.

the remaining six columns report the analogues for the much smaller (and therefore less reliable) sample of aggregate bank credit.

Three observations appear particularly noteworthy. First, there is convincing evidence of a reduction in credit supply for banks on the SoFFin and EBA lists during the crisis. Second, the reduction in credit supply applies particularly to the main bank; the effect is much weaker for subsidiaries. Third, there is no evidence of a change in lending behavior for banks identified by our (poor) performance measures.

Table 4 replicates our analysis for quarterly data (and a symmetric window of +/- four quarters around the bankruptcy of Lehman Brothers). Reassuringly, the results indicate a strong decline in credit provision for banks that required government support through SoFFin, an effect that applies particularly for the main bank. The results are less convincing for our other measures of bank health.

Table 5 presents the results of our instrumental variables estimation. The IV analysis confirms our previous findings; exporting activity of German firms is unaffected by changes in credit supply.

#### 4.3 Propensity Score Matching

As an alternative estimation approach, we employ propensity score matching to analyze whether firms which receive credit from ‘affected’ banks export less than similar firms which have a financing relationship with an ‘unaffected’ bank. Following Rosenbaum and Rubin (1983), we aim to identify an optimal counterfactual in non-experimental data such that both exporting firms are identical in several characteristics and only differ in the outcome variable (change in exports) and the treatment (whether the firm receives funds from ‘affected’ financial institutions).

In a first step, we estimate the probability of treatment using a probit estimator. To determine the score, we use the same time (third quarter of 2008)<sup>8</sup>, industry, firm size (approximated by the number of employees) and credit exposure. Then, we employ nearest

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<sup>8</sup> Exports, domestic and total sales are reported on an annual basis. Accordingly, the drop in operations can only be observed for 2008 because in 2009 the world economy recovered.

neighbor matching<sup>9</sup>: the absolute difference between the probabilities of one firm which is treated and another that is non-treated is minimized. As before, we use the SoFFin list as our baseline measure for ‘affected’ banks<sup>10</sup> in the following. The empirical implementation of this estimation procedure requires that the bank dimension vanishes from our bank-firm data set.<sup>11</sup> As a result, we now define firms (instead of banks) as ‘affected’.

In practice, we employ three different definitions for an ‘affected’ firm: at least one of the firm’s lending bank is on the SoFFin list, only firms with one bank-firm relationship (and this bank is on the SoFFin list) are analyzed, and the firm’s share of total lending from ‘affected’ banks is larger than 50%. After identifying the optimal counterfactual, we pool all industries and compare the annual change of exports, domestic and total sales between the control and treatment groups in the year of the crisis, 2008.

Table 6 tabulates the results. Interestingly, there is no observable difference in firm activity between the control group and the treatment group. As a result, exporting firms which receive credit from crisis-hit banks do not experience larger declines in exports than firms which have a relationship with a healthy bank. In sum, credit supply conditions do not seem to be the main driving force for the explanation of the ‘Great Trade Collapse’ for Germany.<sup>12</sup>

#### 4.4 Bank Behavior

We also explore bank lending behavior in more detail. The results in Table 7 indicate that banks affected by the crisis have reduced lending to non-exporters, while the stock of credit to exporters remained unchanged.

### 5. Conclusions

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<sup>9</sup> Becker and Ichino (2002) provide an overview about different approaches to estimate the average treatment effect.

<sup>10</sup> The experimentation with the other definitions provides similar insights. We employ dummy variables for leverage ratio and non-performing loans and define banks as ‘affected’ if the equity ratio is lower than the 25% percentile and if the non-performing loans are greater than the 75% percentile in 2007.

<sup>11</sup> The time panel structure is excluded by focusing exclusively on Q3/2008. In addition, we aggregate the credit exposure at firm-level.

<sup>12</sup> Applying different estimation methods (radius, kernel and stratification matching) leaves the results basically unchanged.

The sudden stand-still in world trade after the collapse of Lehman Brothers in September 2008 is often labeled the 'Great Trade Collapse'. Puzzled by this dramatic and unexpected decline in cross-border trade activity, a number of recent papers aim to explain this pattern, applying different data sources. Amiti and Weinstein (2011), for instance, identify a causal link between trade and financial conditions for Japanese firms; the deterioration in financial conditions of banks can partly explain the large drop in trade flows. Behrens, Corcos, and Mion (2010), in contrast, conclude that financial conditions are not the most important factor for explaining the trade pattern for Belgian firms; they argue that the fall in demand has had a much stronger impact. Bricongne, Fontagne, Gaulier, Taglioni and Vicard (2012) argue that lower demand and the intensive margin for large firms are the most important determinants. As a result, empirical findings appear generally mixed.

Based on three different micro data sets from the Deutsche Bundesbank, we identify various linkages between firms and banks in Germany. Exports turn out to be insensitive to variations in external finance. While German banks affected by the crisis have significantly reduced their credit supply, exporting firms seem to be particularly good borrowers, which have been offered alternative financing options.

#### References:

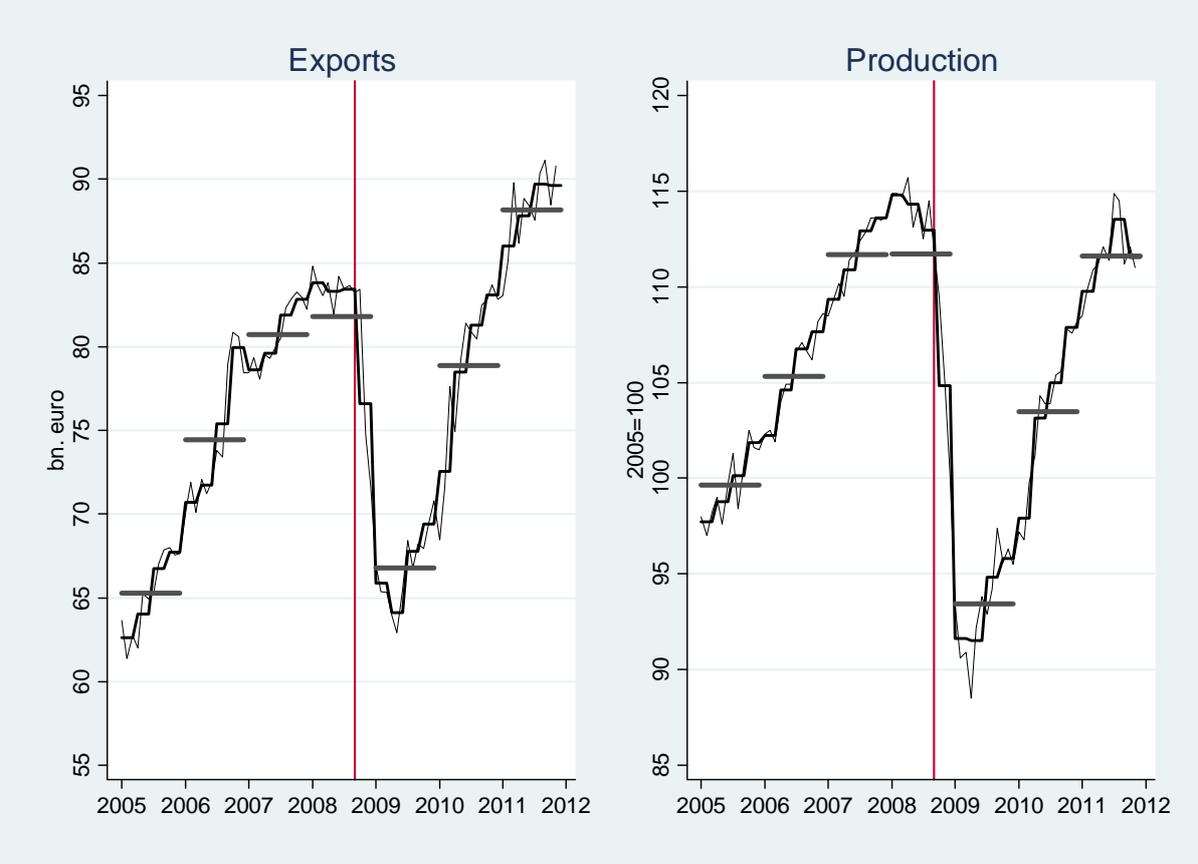
- Aghion, Philippe, Philippe Askenazy, Nicolas Berman, Gilbert Clette, and Laurent Eymard. 2012. "Credit Constraints and the Cyclicalities of R&D Investment: Evidence from France," Journal of the European Economic Association. 10 (October): 1001-1024.
- Ahn, JaeBin. 2011. "A Theory of Domestic and International Trade Finance," IMF Working Paper #11/262.
- Ahn, JaeBin, Mary Amiti, and David E. Weinstein. 2011. "Trade Finance and the Great Trade Collapse," American Economic Review. 101 (May): 298-302.
- Amiti, Mary and David E. Weinstein. 2011. "Exports and Financial Shocks," Quarterly Journal of Economics. 126 (November): 1841-1877.
- Antràs, Pol and C. Fritz Foley, 2011. "Poultry in Motion: A Study of International Trade Finance Practices," NBER Working Papers 17,091.
- Auboin, Marc. 2007. "Boosting Trade Finance in Developing Countries: What Link with the WTO?" WTO Staff Working Paper ERSD-2007-04.
- Auboin, Marc and Moritz Meier-Ewert. 2003. Improving the Availability of Trade Finance during Financial Crises. Geneva: WTO.

- Beck, Thorsten, Asli Demirgüç-Kunt, and Vojislav Maksimovic. 2008. "Financing Patterns around the World: Are Small Firms Different?" Journal of Financial Economics. 89 (September): 467-487.
- Behrens, Kristian, Gregory Corcos, and Giordano Mion. 2013. "Trade Crisis? What Trade Crisis?" Review of Economics and Statistics. 95 (May): 702-709.
- Bems, Rudolfs, Robert C. Johnson, and Kei-Mu Yi. 2013. "The Great Trade Collapse," Annual Review of Economics. 5: 375-400.
- Berger, Allen N., Nathan H. Miller, Mitchell A. Petersen, Raghuram G. Rajan, and Jeremy C. Stein. 2005. "Does Function Follow Organizational Form? Evidence from the Lending Practices of Large and Small Banks," Journal of Financial Economics. 76 (May): 237-269.
- Berman, Nicolas and Philippe Martin. 2010. "The Vulnerability of Sub-Saharan Africa to the Financial Crisis: The Case of Trade," EUI-RSCAS Working Paper 2010-15.
- Bernard, Andrew B., J. Bradford Jensen, Stephen J. Redding, and Peter K. Schott. 2007. "Firms in International Trade," Journal of Economic Perspectives. 21 (Summer): 105-130.
- Bricongne, Jean-Charles, Lionel Fontagné, Guillaume Gaulier, Daria Taglioni, and Vincent Vicard. 2012. "Firms and the Global Crisis: French Exports in the Turmoil," Journal of International Economics. 87 (May): 134-146.
- Chor, Davin, and Kalina Manova. 2012. "Off the Cliff and Back? Credit Conditions and International Trade During the Global Financial Crisis," Journal of International Economics. 87 (May): 117-133.
- Damijan, Joze and Crt Kostevc. 2011. "Firms' pattern of trade and access to finance," KU Leuven LICOS Discussion Paper 278.
- Freund, Caroline. 2009. "The Trade Response to Global Downturns : Historical Evidence," World Bank Policy Research Working Paper 5015.
- Goldbach, Stefan and Volker Nitsch. 2014. "Extra Credit: Bank Finance and Firm Export Status in Germany," The World Economy. (forthcoming).
- Iacovone, Leonardo and Veronika Zavacka. 2009. "Banking Crises and Exports : Lessons from the Past," World Bank Policy Research Working Paper 5016.
- Memmel, Christoph, Christian Schmieder, and Ingrid Stein. 2007. "Relationship Lending: Empirical Evidence for Germany," Deutsche Bundesbank Discussion Paper 14/2007.
- Novy, Dennis and Alan M. Taylor. 2013. "Trade and Uncertainty," University of Warwick and University of Virginia.
- Paravisini, Daniel, Veronica Rappoport, Philipp Schnabl, and Daniel Wolfenzon. 2012. "Dissecting the Effect of Credit Supply on Trade: Evidence from Matched Credit-Export Data," Working Paper 2010-022, Banco Central de Reserva del Perú.
- Rose, Andrew K and Tomasz Wieladek, 2011. "Financial Protectionism: the First Tests," NBER Working Paper 17,073.
- Schmidt-Eisenlohr, Tim. 2013. "Towards a Theory of Trade Finance," Journal of International Economics. 91 (September): 96-112.

Schmieder, Christian. 2006. "The Deutsche Bundesbank's Large Credit Database (BAKIS-M and MiMiK)," Schmollers Jahrbuch. 126: 653-663.

Vazquez, Francisco F. and Pablo Federico, 2012. "Bank Funding Structures and Risk: Evidence from the Global Financial Crisis," IMF Working Papers 12/29, International Monetary Fund.

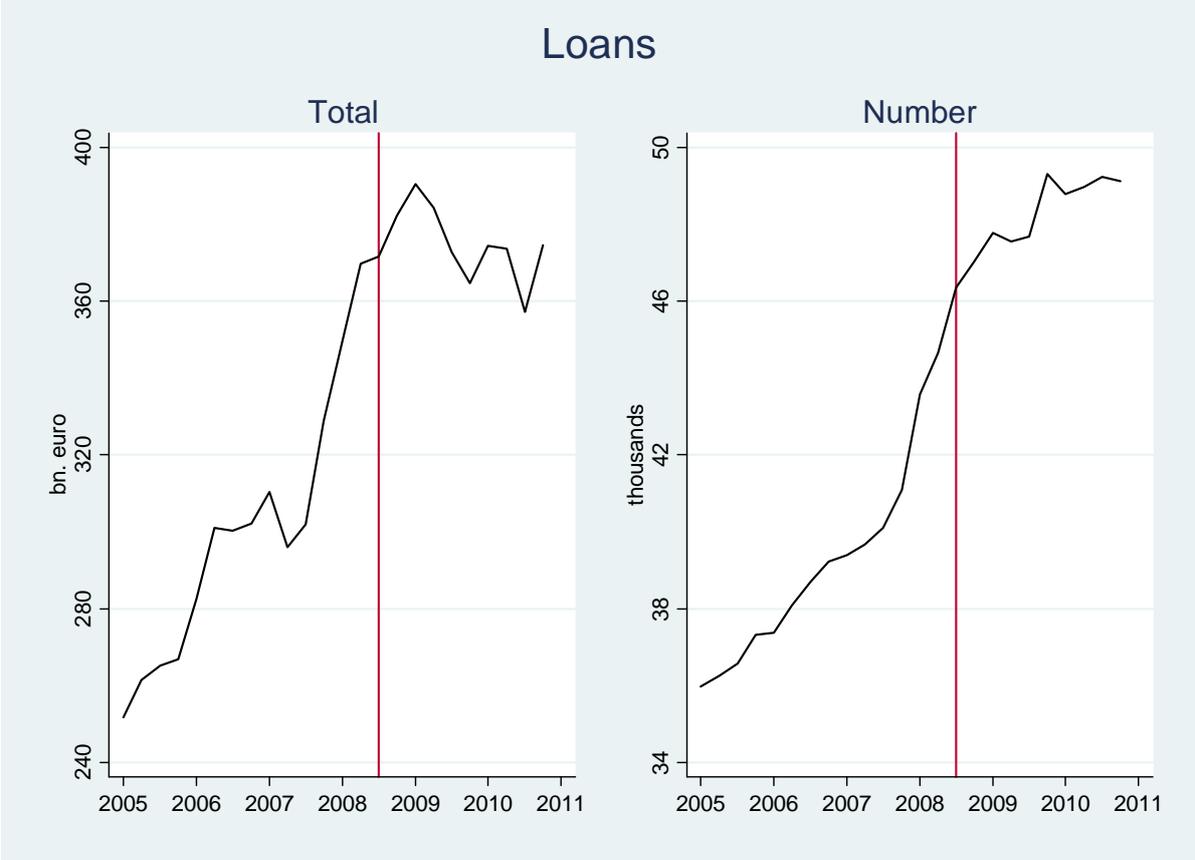
**Figure 1: Exports and Production in Germany, 2005-2011**



Notes: The graphs plot seasonally adjusted monthly data as well as quarterly and yearly averages.

Source: Deutsche Bundesbank

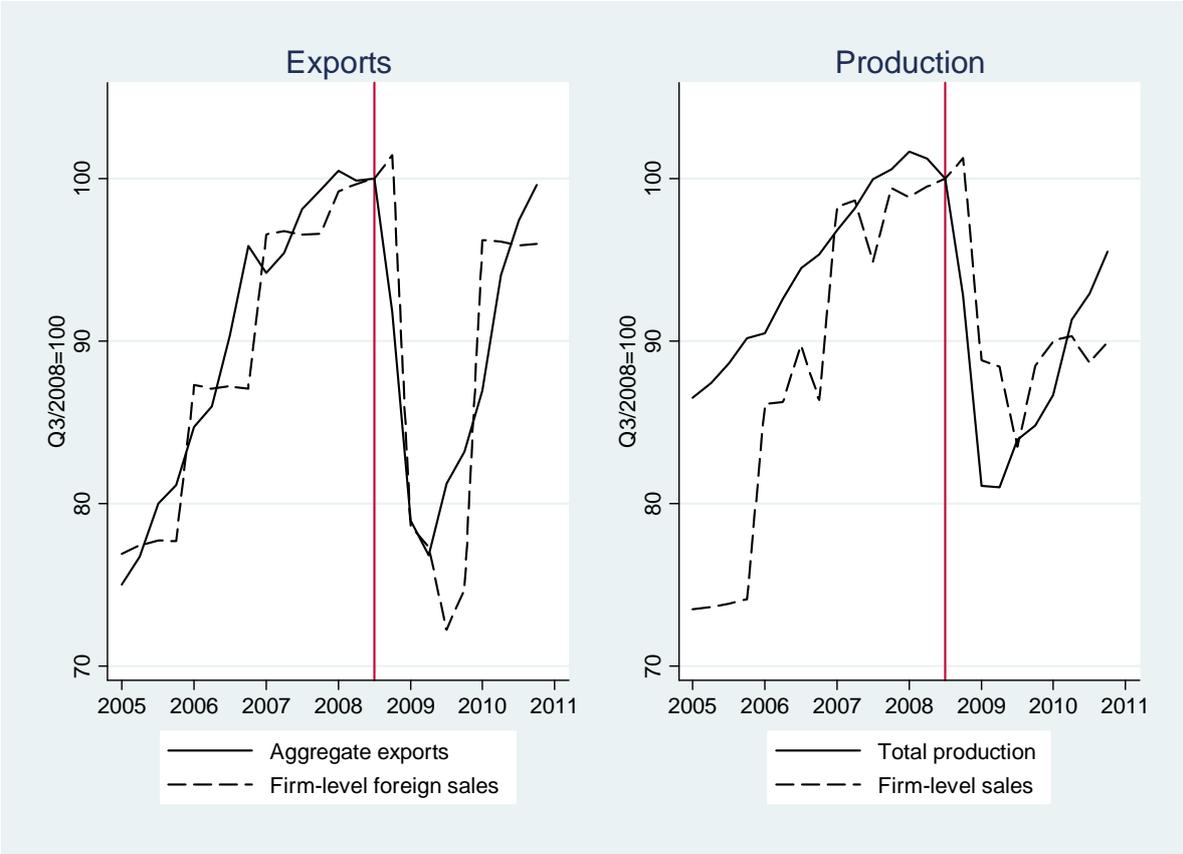
**Figure 2: Bank-Firm Credit Relationships in Germany, 2005-2010**



Notes: The quarterly data are taken from the Bundesbank’s credit register for loans of 1.5m euro or more.

Source: Deutsche Bundesbank

**Figure 3: Firm-Level and Aggregate Data**



Notes: The graphs are based on quarterly data from the Bundesbank’s credit register matched with the Bundesbank’s corporate balance sheet statistics.

Source: Deutsche Bundesbank

**Table 1: Information on Matched Data Sets, 2005-2010**

	<b>MiMiK</b>	<b>MiMiK – Ustan</b>	<b>MiMiK – BAKIS</b>	<b>MiMiK – Ustan – BAKIS</b>
<b>Loan-quarter pairs</b>	933,612	799,104	825,064	692,910
<b>Firms</b>	14,854	14,545	16,882	14,380
<b>of which: Exporters</b>		5,839		5,787
<b>Banks</b>	2,275	2,170	1,673	1,590
<b>Mean number of loans per bank</b>	17,058	14,588	18,551	15,613
<b>Mean share of largest borrower per bank</b>	0.131	0.124	0.148	0.141
<b>Mean loan value (1,000 €)</b>	8,144	8,147	8,425	8,695
<b>Median loan value (1,000 €)</b>	2,250	2,305	2,148	2,268
<b>Sales (bn. €)</b>		8,190		7,940
<b>of which: Exports (bn. €)</b>		2,160		2,100

Notes: The table describes samples based on matched data sets. All data have been obtained from the Deutsche Bundesbank. MiMiK is the credit register; Ustan is the corporate balance sheet statistics; BAKIS is the prudential information system on banks.

**Table 2: Credit Exposure and Exports**

<b>Dependent variable:</b>	$\Delta \text{Log Exports}_t$	$\Delta \text{Log Export Share}_t$	$\Delta \text{Log Domestic Sales}_t$	$\Delta \text{Log Total Sales}_t$	$\Delta \text{Log Total Sales}_t$ (Non-Exporter)	$\Delta \text{Log Total Sales}_t$ (Exporter)	$\Delta \text{Log Exports}_t$	$\Delta \text{Log Exports}_t$	$\Delta \text{Log Exports}_t$
$\Delta \text{Log Total Firm Credit}_{t-1}$	-0.040 (0.033)	-0.001 (0.001)	0.013** (0.004)	0.011** (0.004)	0.013** (0.005)	0.008* (0.004)	-0.045 (0.042)		
$\Delta \text{Log Firm Credit}_{t-1}$								0.030# (0.017)	0.029# (0.017)
<b>Industry-Time FE?</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Bank FE?</b>	No	No	No	No	No	No	No	No	Yes
<b>Firm FE?</b>	No	No	No	No	No	No	Yes	No	No
<b># Observations</b>	13,740	13,740	35,950	35,999	22,259	13,740	13,740	33,412	33,412
<b>R<sup>2</sup></b>	0.007	0.012	0.025	0.031	0.015	0.106	0.290	0.077	0.097

Notes: OLS estimation. Robust standard errors in parentheses. \*\*, \* and # denote significant at the 1%, 5% and 10% level, respectively.

**Table 3: Bank Health and Lending (Yearly Data; 2005-2010)**

<b>Dependent variable:</b>	<b><math>\Delta\text{Log Bank Credit}_t</math></b>						<b><math>\Delta\text{Log Total Bank Credit}_t</math></b>					
<b>SoFFin list <math>\times</math> Crisis</b>	-0.080** (0.025)						-0.151* (0.064)					
<b>SoFFin list (w/ subsidiaries) <math>\times</math> Crisis</b>		-0.022 (0.022)						0.034 (0.169)				
<b>EBA list <math>\times</math> Crisis</b>			-0.082** (0.021)						-0.107* (0.047)			
<b>EBA list (w/ subsidiaries) <math>\times</math> Crisis</b>				-0.063** (0.019)						0.017 (0.084)		
<b>Leverage ratio<sub>t-1</sub></b>					0.234 (0.174)						0.381 (0.427)	
<b>Non-performing loans<sub>t-1</sub></b>						0.000 (0.000)						0.000 (0.000)
<b>Time FE?</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Bank FE?</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Firm FE?</b>	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No
<b># Observations</b>	138,490	138,490	138,490	138,490	138,490	138,490	5,687	5,687	5,687	5,687	5,687	5,687
<b>R<sup>2</sup></b>	0.389	0.389	0.389	0.389	0.389	0.389	0.302	0.302	0.302	0.302	0.302	0.302

Notes: OLS estimation. Robust standard errors in parentheses. \*\*, \* and # denote significant at the 1%, 5% and 10% level, respectively.

**Table 4: Bank Health and Lending (Quarterly Data; Q3/2007-Q3/2009)**

<b>SoFFin list × Crisis</b>	-0.059** (0.016)					
<b>SoFFin list (w/ subsidiaries) × Crisis</b>		-0.045** (0.015)				
<b>EBA list × Crisis</b>			0.010 (0.014)			
<b>EBA list (w/ subsidiaries) × Crisis</b>				-0.010 (0.013)		
<b>Leverage ratio<sub>t-1</sub></b>					-0.406# (0.225)	
<b>Leverage ratio<sub>t-1</sub> × Crisis</b>					0.441# (0.260)	
<b>Non-performing loans<sub>t-1</sub></b>						0.003# (0.002)
<b>Non-performing loans<sub>t-1</sub> × Crisis</b>						-0.004* (0.002)
<b># Observations</b>	195,640	195,640	195,640	195,640	162,824	162,824
<b>R<sup>2</sup></b>	0.012	0.012	0.012	0.012	0.012	0.012

Notes: OLS estimation. Dependent variable is  $\Delta \text{Log Firm Credit}_i$ . Time (quarter) and bank fixed effects always included, but not reported. Robust standard errors in parentheses. \*\*, \* and # denote significant at the 1%, 5% and 10% level, respectively.

**Table 5: Credit Exposure and Exports (Instrumental Variables)**

Dependent variable:	$\Delta\text{Log Bank Credit}$				$\Delta\text{Log Export}$	
	Full sample		Exporters			
SoFFin list	-0.165** (0.021)		-0.075** (0.032)		-0.034 (0.753)	
SoFFin list (w/ subsidiaries)		-0.058** (0.019)		-0.015 (0.033)		-0.670 (3.832)
Time/Firm FE?	Yes	Yes	Yes	Yes	Yes	Yes
Observations	59,373	59,373	21,834	21,834	21,834	21,834
R <sup>2</sup>	0.180	0.179	0.180	0.179	0.424	0.424

**Table 6: Bank Health and Lending (Propensity Score Matching)**

<b>Dependent variable:</b>	<b><math>\Delta</math>Log Exports</b>	<b><math>\Delta</math> Log Domestic Sales</b>	<b><math>\Delta</math> Log Total Sales</b>	<b>Treatment Group</b>	<b>Control Group</b>
<b>At least one bank 'affected'</b>	0.086 (0.080)	-0.007 (0.023)	-0.017 (0.024)	1,933	1,596
<b>Firms with one firm-bank relationship</b>	-0.150 (0.132)	0.040 (0.038)	0.049 (0.039)	693	571
<b>Share of 'affected' banks &gt;50%</b>	-0.065 (0.090)	-0.030 (0.028)	-0.032 (0.030)	1,601	1,351

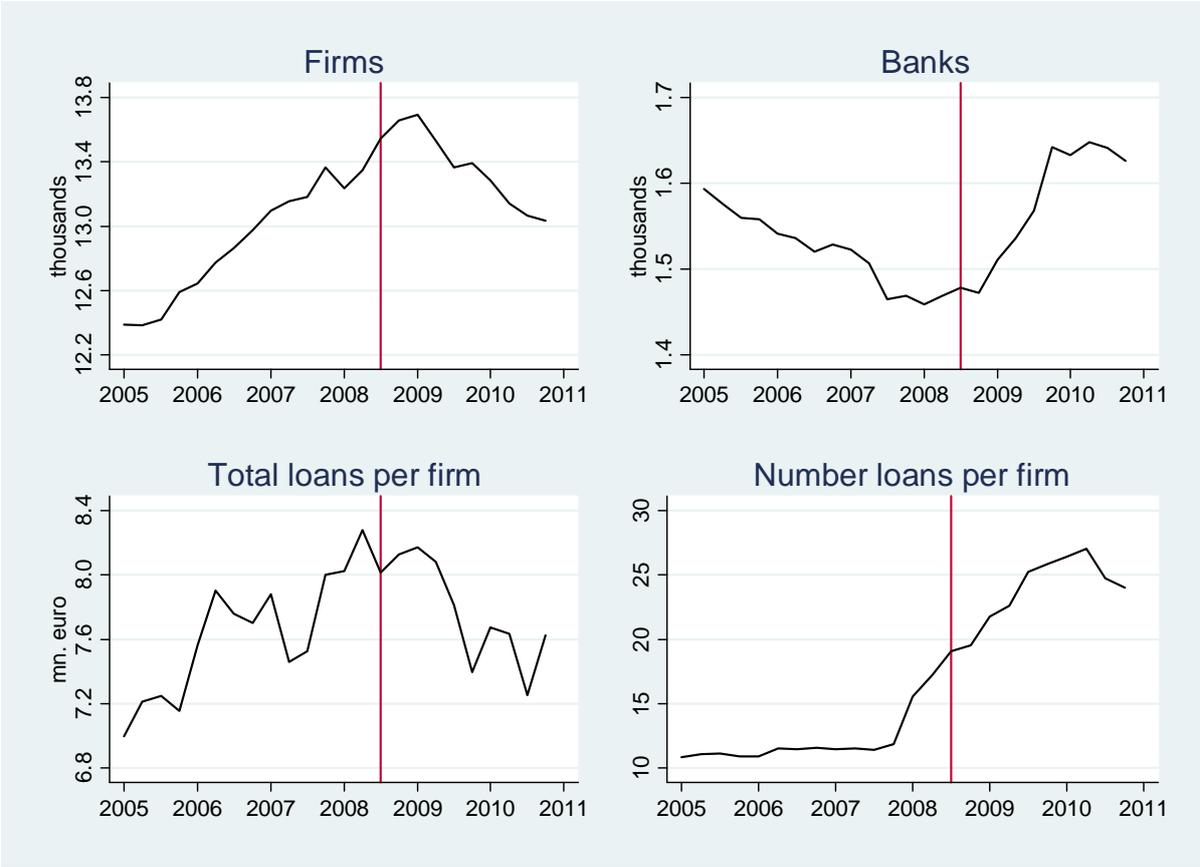
Notes: Propensity score matching (nearest neighbor). Robust standard errors in parentheses. \*\*, \* and # denote significant at the 1%, 5% and 10% level, respectively.

**Table 7: Bank Lending by Exporters and Non-Exporters**

Dependent variable:	$\Delta \text{Log Bank Credit}_t$					
	Exporter			Non-Exporter		
<b>SoFFin list <math>\times</math> Crisis</b>	-0.003 (0.021)	-0.014 (0.015)	-0.011 (0.028)	-0.071** (0.016)	-0.077** (0.011)	-0.073** (0.019)
<b>SoFFin list (w/ subsidiaries) <math>\times</math> Crisis</b>	0.003 (0.022)	0.011 (0.016)	0.006 (0.028)	-0.049** (0.013)	-0.027** (0.010)	-0.036* (0.016)
<b>EBA list <math>\times</math> Crisis</b>	-0.038* (0.019)	0.007 (0.013)	-0.036 (0.024)	-0.045** (0.014)	-0.029** (0.010)	-0.057** (0.018)
<b>EBA list (w/ subsidiaries) <math>\times</math> Crisis</b>	-0.019 (0.018)	0.003 (0.012)	-0.023 (0.023)	-0.035** (0.012)	-0.016# (0.008)	-0.039** (0.015)
<b>Leverage ratio<sub>t-1</sub></b>	0.064 (0.130)	-0.050 (0.157)	-0.112 (0.182)	-0.178 (0.145)	-0.175 (0.140)	-0.034 (0.153)
<b>Non-performing loans<sub>t-1</sub></b>	-1.83e-09* (8.76e-10)	-5.42e-10 (1.12e-09)	-3.61e-10 (1.29e-09)	9.84e-10 (6.66e-10)	1.51e-09# (8.54e-10)	1.60e-09# (9.33e-10)
<b>Time FE?</b>	Yes	Yes	Yes	Yes	Yes	Yes
<b>Bank FE?</b>	Yes	No	Yes	Yes	No	Yes
<b>Firm FE?</b>	No	Yes	Yes	No	Yes	Yes
<b># Observations</b>	48,285	48,285	48,285	81,321	81,321	138,490
<b>R<sup>2</sup></b>	0.019	0.107	0.350	0.018	0.138	0.390

Notes: OLS estimation. Robust standard errors in parentheses. \*\*, \* and # denote significant at the 1%, 5% and 10% level, respectively.

**Appendix:  
More Details on Bank-Firm Credit Relationships in Germany, 2005-2010**



Notes: The graphs are based on quarterly data from various matched data sources.

Source: Deutsche Bundesbank

## **Appendix:**

### **Recapitalized German Banks Using the Financial Markets Stabilization Fund (SoFFin)**

Aareal Bank  
BayernLB  
Commerzbank AG  
Corealcredit Bank AG  
Düsseldorfer Hypothekenbank  
HSH Nordbank  
Hypo Real Estate  
IKB Deutsche Industriebank  
Volkswagen Bank  
WestLB

### **German Banks Covered by the European Banking Authority (EBA) Stress Test Exercise**

BayernLB  
Commerzbank AG  
Dekabank  
Deutsche Bank AG  
DZ Bank AG  
Helaba  
HSH Nordbank  
Hypo Real Estate  
Landesbank Berlin  
LBBW  
NordLB  
WestLB  
WGZ Bank

Notes: Banks are listed in alphabetical order.