

The Effect of the Financial Crisis on European Exports – The Trade Finance Transmission Channel

Master Thesis

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Abstract

A striking characteristic of the recent financial crisis was the unprecedented decline in international trade. This paper studies potential effects of trade finance conditions on exports using a rich dataset on monthly exports of the major European economies on a sector level. Furthermore, time varying indicators of the financial vulnerability of each sector in every country are included. This paper is the first to distinguish the effects of credit conditions between different exporting countries as well as between different export destinations. The results suggest that in line with prior literature, the financial crisis indeed had a significant negative impact on exports. The analyzed exporting countries were similarly but not equally affected by the crisis. Export destinations were found to be important determinants of the impact of the crisis on exports. For policy makers it follows that although the crisis globally affected international trade, heterogeneous country and sector characteristics should also be considered.

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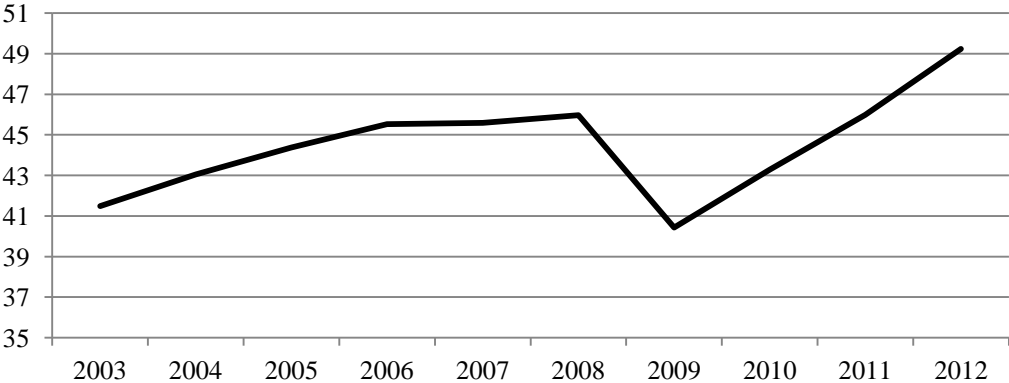
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1 Introduction

The global financial crisis of 2008-2009 was without doubt one of the worst economic crises in the last century. Stock markets all over the world experienced the sharpest fall since the Great Depression in the early 1930s. The timing of the financial crisis as well as its magnitude came as a surprise for many economists and politicians. Even in the wealthiest nations, banks had to be bailed out by their governments and whole financial sectors had to be backed up with rescue packages. It became apparent that global and national financial systems were not as stable as many had thought.

Even though this global crisis started off as a financial crisis, it quickly expanded into the real economy. As a consequence, world GDP declined from 2008 to 2009 by about 5%.¹ What is very striking though is the extent to which global trade suffered more than the overall global production during the same time period, as global exports declined by around 16%.² Figure 1 underlines this finding showing that the share of world exports in world GDP declined significantly from 2008 to 2009. Although Freund (2009) points out that trade is generally more elastic in times of economic crises than GDP, the magnitude of the decline in trade during the financial crisis was historical. Several economists estimate that the trade decline in the last months of 2008 and first months of 2009 even amounted to up to 30% in many open economies (Chor and Manova 2012, Bricongne et al. 2012).

Figure 1. World exports as % of world GDP



Source: World Bank, own calculations

The crucial question is what caused exports to decline so extremely during the financial crisis. In the last few years, a lot of research was conducted to identify potential transmission channels. Generally, the spill-over effects from the financial crisis into the real economy can be categorized in two main channels: the consumer side (demand side) and the producer side

¹ Source: World Bank data

² Source: World Bank data

(supply side). On the consumer side, the economic outlook worsened as expectations about the future economy darkened and thus led to a reduction in demand, especially in the demand for tradables. On the producer side, the collapse in financial markets caused a credit crunch which in turn worsened credit conditions for exporting firms and forced them to cut down their exports. Both main channels will be analyzed in the next section with respect to the overall findings of recent literature.

This paper will focus on the producer side, namely examining how and to which extent credit conditions had an impact on exports in Europe. Concretely, the trade finance transmission channel will be analyzed. The external financing of exports is crucial for international trade as 80% to 90% of world trade is relying on some kind of trade financing (Auboin, 2009). Deteriorations of credit conditions in the trade finance market are assumed to have negatively impacted export volumes since the financing for exports became more expensive and more scarce during the crisis, as will be outlined in the next section. The examination of the crisis transmission through the producer side is especially important taking into account that this topic has been largely ignored by the literature before the recent crisis.

The aim of this analysis is to show how European exports were affected by the distress in financial markets during the financial crisis that caused both the price and the availability of trade finance for exporters to deteriorate. This paper will further examine whether different exporting countries in Europe and whether the exports to different export destinations were equally affected by the crisis. In doing so, this paper will take into account the financial vulnerability of different sectors since sectors are not equally dependent trade finance.

The European Union is the greatest exporter in the world as it accounts for 15% of world exports³ and is thus quantitatively significant for international trade. The biggest exporters of Europe are, with the exception of the United Kingdom, all members of the eurozone. For the analysis, the exports of the largest economies in the eurozone, Germany, France, Italy, Spain and the Netherlands, are taken into account. Differentiating the exports according to the exporting country allows further examining whether the major European exporters were equally affected by the financial crisis. Moreover, the exports are also distinguished by their

³ Source: Eurostat

export destination. The exports to five different export destinations⁴ will be studied in order to evaluate if the export destination mattered for the impact of the financial crisis.

In line with previous literature, different sector characteristics of the economies are included in the estimation. Concretely, the sensitivity of different sectors to shocks in financial markets is taken into consideration. This is important as sectors reacted differently to the financial constraints during the crisis.

The results of this paper contribute to the literature in several ways. The overall results confirm findings of the existing literature that external financing conditions had a negative impact on exports (Chor and Manova 2012, Amiti and Weinstein 2011, Iacovone and Zavacka 2009). Hence, the trade finance market constitutes a significant contagion channel of the financial crisis via the export sector into the real economy. Furthermore, this paper is the first to distinguish between different exporting countries and export destinations in its analysis. The results suggest that the exporting countries were similarly but not equally affected by the crisis as in some countries the crisis impact was more pronounced than in others. Also the export destination is found to be a significant determinant of the effects on exports as geographical distance and perceived risk of the export destination can be important for export financing.

Contrary to the existing literature, this paper does not use time and country invariant financial vulnerability indicators for the different economic sectors. Instead, for every exporting country the indicators are computed individually and are allowed to change over time. The different estimated effects of the financial vulnerability measures in the countries imply that indeed sector characteristics concerning the sensitivity to financing conditions should not be assumed to be the same in different countries.

The remainder of the paper is organized as follows. Section 2 provides a short overview of the findings of the literature for consumer side effects on exports. It further sheds light on the producer side, describing the mechanisms of trade finance and how they were affected during the financial crisis. Thirdly, a summary of academic findings is provided. The methodology employed in this paper is explained in Section 3 while Section 4 discusses the data used for the estimations. In the following, Section 5 presents the empirical results. The policy implications are discussed in Section 6 and Section 7 concludes.

⁴ The most important trading partners of the eurozone: United States, China, Russia, United Kingdom and Switzerland

2 Related Literature on Financial Crises and Exports

2.1. Consumer Side Effects on Exports

The fact that global demand for goods is declining in times of global economic crises is not very surprising. The decrease in demand can usually be attributed to three potential causes. Firstly, it is very straight forward that in times of economic crises, production is lower and accordingly also income. Less income is equivalent to less purchasing power and hence causes a lower demand. Naturally this only holds assuming that the elasticity of consumption which drives demand are constant which implies a similar percentage change in income as in demand. However, especially in times of crises, expectations play a major role in the decision making for consumption and investment. This leads to the second cause of lower demand as consumers and investors naturally have negative expectations about the future economic development during crises periods, at least concerning the short-run. Accordingly, more income is saved to overcome the crisis and less income is spent.

A third cause for a drop in global demand could also arise from economic trade policy, namely protectionism. During the Great Depression in the early 1930s, protectionist measures played an important role in the global trade collapse as for instance the infamous Smoot-Hawley Tariff Act in 1930. However, such trade frictions played only a minor role in the recent crisis. Baldwin and Evenett (2009) state that new trade barriers did not cause or significantly amplify the trade collapse. Eaton et al. (2011) find that even though trade frictions increased for some countries such as China and Japan, the overall effects of trade frictions did not influence global trade since other countries reduced trade frictions in the same period. The authors use a general equilibrium model to conduct a multi-country analysis of the recent trade collapse. Their key finding is that a great part of the decrease in international trade was due to a lower demand for tradables. Primarily the demand for durable manufactured goods explains nearly two thirds of the drop in demand. As well as for trade frictions, they also could not detect any major effect of a country's productivity nor their deficit on trade.

Behrens et al. (2011) reach similar conclusions using a very different approach. They examine the case of Belgium as an example for the great trade collapse on a micro-level base by analyzing firms' exports and imports and balance sheet data. They conclude from their analysis that slightly more than half of the fall in Belgian exports during the crisis can be attributed to demand shocks. In line with Eaton et al. (2011) durable and capital goods were more strongly affected by the crisis than exports from other sectors. However, also financial

variables such as access to credit play a role given that they account for around a third of the trade decline. Interestingly, they also state that nearly the entire decline in trade happened at the intensive margin which they define as price adjustments and output scaling. The extensive margin played no major role which implies that the number of exporting firms or products did not drop much. Lastly, they do not find evidence that exporting firms were more heavily hit by deterioration in credit conditions than domestic firms and hence the greater decrease in trade than GDP should not be attributable to financial variables. Conversely, this particular finding stands in sharp contrast to results of other literature (see for instance Amiti and Weinstein 2011) that primarily dealt with the effect of financial conditions on trade which will be described in the next section.

A paper by Alessandria et al. (2010) finds that inventory adjustments contribute to the sharp decline in international trade. They document a strongly countercyclical behavior of the inventory-to-sales ratio which causes a stark drop in economic activity, especially for exports and hence international trade. The resulting gap between exports and sales was partly compensated by increasing inventory levels as exports declined more than production.

Bems et al. (2010) also address the issue of demand patterns during the crisis by taking into account vertical linkages and specializations. These vertically integrated international production chains can play an important role in explaining why countries were affected by the global trade decline although their financial systems had only little exposure to the international financial markets. International goods markets are nowadays more integrated than ever and intermediate goods are often produced in different countries other than the final good. If the demand for the final good decreases, consequently the demand for the intermediate good will decrease as well which thus creates a demand spill-over channel. For their analysis the authors use a global bilateral input-output framework. They find that in their model vertical linkages are quantitatively significant in explaining the simultaneous decline in world trade.

A similar finding with respect to the effect of vertical linkages is obtained by Levchenko et al. (2010). They use sector data at the 6-digit NAICS level for the United States and its trading partners. They also confirm that the trade with basically all trading partners worldwide fell by great magnitudes. Most affected by the trade collapse were durable industrial as well as capital goods which is line with the findings of Behrens et al. (2011). Also automobiles trade was found to have suffered drastically. Another main finding is that compositional effects played an important role. This means that sectors that experienced a stronger decline in their domestic output also faced a stronger decline in their exports. This supports the view of

Behrens et al. (2011) that domestic production and exports were not affected differently. Even more, they also test for the effect of trade credit on exports, however a significant effect of trade credit on exports is not found as sectors dependent on more trade credit did not seem to have faced greater export losses than less dependent sectors. These findings stand in sharp contrast to the results of Chor and Manova (2012).

It becomes apparent that there is an ongoing debate in literature about how significant and with which magnitudes financial variables such as trade credit played a role in the export decline in the crisis.⁵ The next section of this paper will shed more light on this debate as the supply side channel will be analyzed. Regardless of somewhat different findings between literature on the supply side and literature on the demand side, there is no doubt that demand side effects are an important factor in explaining the fall in global trade during the crisis. Demand effects always played a role in economic crises since it is a relatively natural reaction that demand decreases in times of output and income reductions. However, for a more accurate understanding of the trade decline in 2008-2009, it is important to investigate how much of the decline was due to consumer side effects and how much to producer side effects. Given the fact that credit conditions, or more generally the spill-overs from the financial sector to the export sector, were largely ignored in literature before the recent crisis, it is crucial to study this supply side contagion channel more in depth to which this thesis will contribute. The next section will illustrate trade finance conditions during the financial crisis and give an overview of the findings of recent literature.

2.2. Producer Side Effects on Exports

Before summarizing the findings of prior literature and other insights that have been gained about producer side effects since the financial crisis, it is important to first give an overview about what trade finance actually means. There are several different types of trade finance and trade credit that can be distinguished. This will be done in the first part of this section. Afterwards, it will be outlined why trade finance mattered during the crisis and the transmission channel of the crisis from financial markets to trade markets will be outlined.⁶ The last part of this section will then summarize the findings of the overall literature.

⁵ Baldwin (2009) provides a large number of empirical studies shedding light on the trade decline from many different angles and employing different techniques and data sets

⁶ Berman and Héricourt (2010) point out that the availability of trade finance not only matters in times of financial crises but also generally is an important requirement for exporters that can even decide if firms become

2.2.1. What is Trade Finance?

For exporters, any sale of goods that is not yet paid by the importer constitutes a risk as well as a cost since the exporter himself has to finance the time gap between the shipment of its goods and the payment. For the importer, any good that is already paid but not yet received also implies a risk as well as a cost for the same reasons. Given that most exports are transported by ship and the shipping transit is very time-consuming, this implies significant costs for international trade. Djankov et al. (2006) estimate that the average amount of time that is needed between the date when a good is produced to the date when the good is finally loaded on a ship is 21 days. Furthermore, the average time between the arrival of the ship at its destination and the reception of the good by the importer is 23 days.⁷ Hummels and Schaur (2012) find that the average shipping time of goods from Europe to the United States is around 20 days and to Japan even 30 days. Altogether these findings show that goods that are shipped internationally often spend up to two months to get from the producer to the buyer. This implies quantitatively significant working capital costs for world trade. The long time period implies a risk since during the shipping time, the business partner could default or the political and economic situation in the country of destination can change and thus also potentially impact the transportation. The fact that business partners are located in different countries additionally creates higher information asymmetries and along with that potential moral hazard problems. Consequently, many importing and exporting firms make use of external financing for their trading activities. Trade finance helps to reduce both the cost and the risk of the goods transportation.

Commonly two main types of financing for firms are distinguished: long-term and short-term financing. Long-term financing is usually needed for the production of goods or other investments while short-term financing bridges the time gap between the shipment of a good by the exporter and the reception of a good by the importer. The short-term credits for companies through trade finance normally have a maturity of up to 180 days but can be extended to 360 days (Auboin and Meier-Ewert, 2003).

Short-term credit trade financing is crucial for international trade since it makes sure that the movement of goods is backed up with sufficient fluidity and security for the participating trade partners. The availability of financing during the goods transportation period allows

exporters in the first place. However, this article will focus on the effects of trade finance on exports during financial crises, particularly during the recent financial crisis.

⁷ In developed countries the whole process of getting the goods ready to be shipped and getting the goods from the ship to its final destination is about a week faster taking around 13 days.

trading companies not having to use their own cash flows for the transportation financing as instead they can finance for instance their production. It is hard to imagine world trade without any kind of trade finance since 80% to 90% of all world trade is relying on some kind of trade financing, including insurance and guarantees (Auboin, 2009). The total size of the trade finance market is estimated to have a volume of \$ 6-7 trillion p.a. (Auboin and Engemann 2013). The different types of trade finance instruments can be categorized in two groups.

First, financial institutions, mostly banks, provide financing for trade (indirect finance). One of the most important if not the most important trade financing instruments is the so called letter of credit. (ICC 2008). The letter of credit (LC) is a document that is issued by a financial institution, usually a bank, which assures payment under the condition that certain criteria are fulfilled, such as the delivery of goods. In the trading process, the title of the goods is assigned from the exporter to the importer's bank and in return this bank will guarantee payment of the exporter. After the goods have arrived at their destination, the title of the goods is transferred from the bank to the importer and the importer vice versa pays the bank. The LC hence functions as a guarantee of payment for the exporter. Accordingly, the issuing bank works as a financial intermediary between the trading partners. Often there is also an advising bank involved in this process. This bank usually offers working capital loans to the exporter, in exchange for the guarantee of payment from the issuing bank, so that the exporter can cover his production and transportation costs. The letter of credit is not only a protection for the exporter but also for the importer since a payment obligation only arises if the goods are received as stated in the contract. Accordingly, letters of credit are among the most secure instruments available for trading companies (Korinek et al. 2010).

The role of the bank as an intermediary is crucial as it provides not only a guarantee of payment but also makes sure that each party involved receives its service right after they complete their part of the contract. The bank hence assumes the risk of the transaction and provides working capital loans.

Alternatively, banks can also provide other forms of credits to only the exporter or only the importer so that the firms have enough working capital available to cover the time gap of the goods transportation. In case an advance payment is given to an exporter, this is referred to as pre and post-shipping financing. If an importer is given a loan to finance its acquisition of

goods, this is called a buyer's credit. There are of course also other types of trade financing but they work according to the same principles.⁸

Second, firms can also provide credit to their trading partners without any banks being involved (direct finance). Since there are no further institutions involved apart from the trading partners, inter-firm credits are more risky for the firm that offers the loan. In case of cash-in-advance payment agreements, the exporter receives the payment from the buyer before he obtains ownership of the goods. This eliminates the risk for the exporter but implies a greater risk for the importer. In turn, in case of an open account transaction, the seller ships his goods before he receives payment. Usually, the importer is given between 30 to 90 days to transfer the payment. That way the importer benefits since he is practically given a credit whereas the exporters is facing the risk. As Chauffour and Malouche (2011) point out, open account arrangements are more common than cash-in-advance terms which could be explained by the fact that export markets are often highly competitive which in turn can put the buyer into a better position for trade credit negotiations than the seller.

As Engemann et al. (2011) state, trade credit is often used instead of bank trade financing which seems rather surprising as trade credits are usually more expensive than bank intermediated trade finance. One reason given by the authors for firms to use trade credit is simply that they cannot obtain a bank credit and thus have to rely on firm credit. Further reasons among others pointed out by Petersen and Rajan (1997) are that credit supplying firms might be able to more accurately evaluate and control the credit risk of their buyers. Additionally, trade credit can reduce transaction costs or indicate a quality signal for other potential lenders or buyers. Since international trade involves high uncertainties faced by firms and credit supplying banks, banks might find information asymmetries very high which can result in prohibitively high costs for bank credit. In that case, a supplier credit can work as a signal for the bank indicating that the company is in sound shape and thus reduce perceived information asymmetries. Consequently, trade credit can function as a complement to bank trade finance. For firms that are not credit constraint and can obtain more affordable bank credit, trade credit might rather be a substitute to a bank credit (Engemann et al. 2011).

It is important to emphasize that inter-firm loans require a greater amount of mutual trust and long practices since no securities or guarantees are involved. This characteristic is important in times of economic distress, since an economic crisis usually brings along dampened

⁸ See for instance Chauffour and Farole (2009) or Auboin and Meier-Ewert (2003) for a more detailed discussion.

expectations and uncertainty regarding the economic situation which can also lead to firms questioning the solvency of their business partners. As a result, the lack of securities might cause firms to become more reluctant to provide trade credit.

In several papers and surveys, the terms trade credit and trade finance are used interchangeably. Sometimes trade credit is also referred to as a special form of trade finance. In this paper however, for the sake of clarity, trade finance is referred to the bank intermediated export financing (indirect finance) while trade credit is defined as the inter-firm type of financing (direct finance).

Additionally to trade finance and trade credit, export credit insurance plays an important role in international trade. Often trade insurance is provided by export credit agencies (ECA). ECAs used to be mainly public institutions either being government or multilateral agencies.⁹ However, as Korinek et al. (2010) state, governments have reduced their engagement in the trade insurance market over the last decade. Due to the fact that this market was regarded as profitable for private insurance companies, the need for public intervention seemed to be minor. Hence private trade insurance companies were becoming more and more important and numerous. Public ECAs and private insurance companies partly offer similar services as a bank intermediated letter of credit since they insure the payment of the trade. Yet, an insurance is not only providing a guarantee for the transaction process of the contract but can also insure the trading partners from any other default in the trading process, such as, for instance, a failure of the intermediating banks to meet their obligations. Especially concerning multi-year contracts, insurance is important to cover a potential default of the trading partner over a longer period of time and not just a one-time transaction. This is essential since trading partners are dependent on the payment (or in case of the importer of the delivery of the goods) for their overall business activities over a longer period of time. Therefore, trade insurance can be an important additional tool to trade credit to cover default risk as well as political risks such as transfer restrictions, political violence and confiscation of goods or expropriation (Auboin and Meier-Ewert 2003).

⁹ There are multilateral development banks that provide credit and insurance such as the Inter-American Development Bank (IADB), sub-regional banks such as the German Kreditanstalt für Wiederaufbau (KfW) and official export credit agencies on a country level that have been given a mandate from the government to support exports by providing credit, and insurance/guarantees. In Germany for instance, the Euler Hermes Group is the main provider of these services with the mandate of the German government.

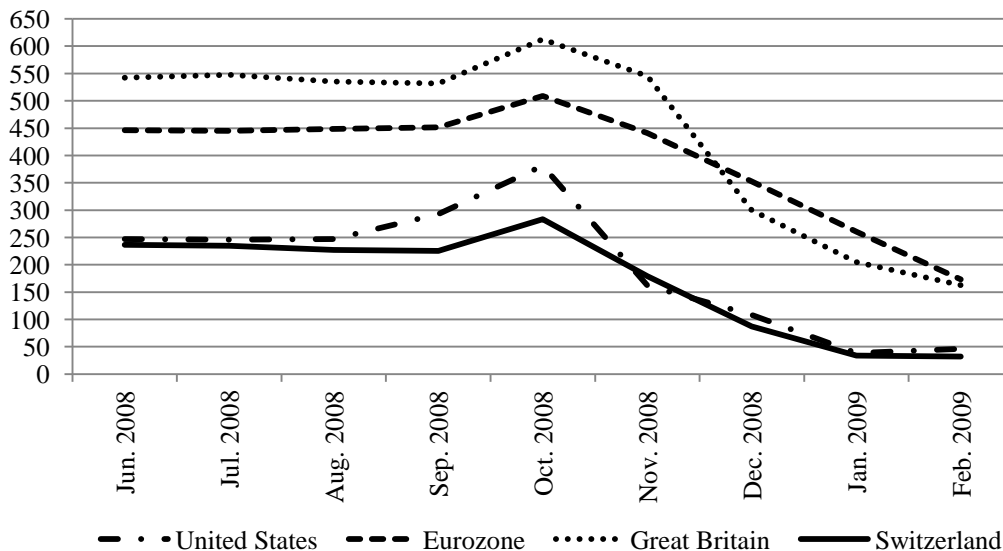
2.2.2. The Financial Crisis

2.2.2.1. Lending Conditions in the Financial Crisis

In order to understand what happened in the trade finance market during the crisis, it is necessary to evaluate trade finance in light of the developments of the global financial market. Although problems in the financial markets were already obvious during 2008, the bankruptcy of Lehman Brothers in September of the same year triggered unprecedented distress in financial markets which was accompanied with historical stock market crashes all over the world. The financial crisis was characterized by a great level of synchronization around the world. In comparison to previous crisis such as the Asian crisis in the late 1990s, basically no region in the world was unaffected by the crisis.

The bankruptcy of Lehman Brothers demonstrated that even the seemingly successful and large banks were not safe anymore and that governments might not necessarily step in to bail-out financial institutions. The assumed paradigm “too big to fail” was suddenly put into question. As a consequence, banks did not trust each other anymore which caused interbank lending rates to rise sharply (see Figure 2).

Figure 2. Interbank lending rates (in Bps)

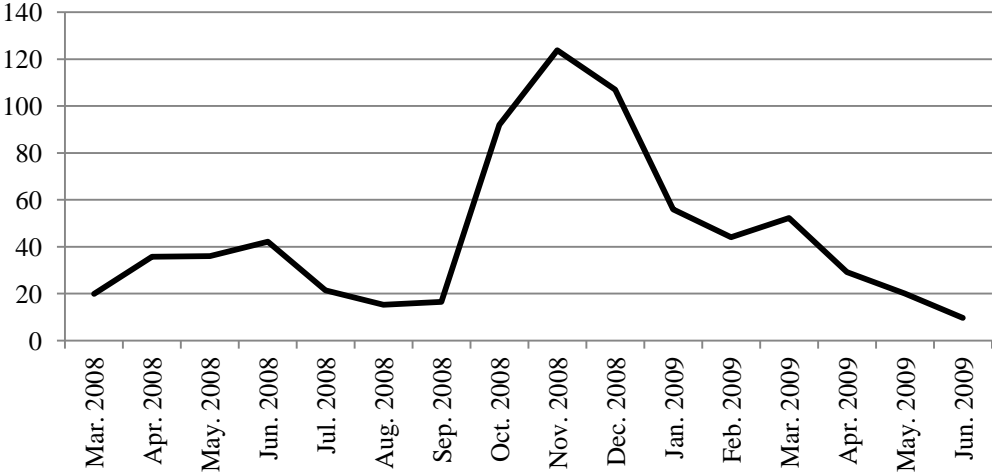


Source: Thompson Reuters

The uncertainty in financial markets became even more apparent when looking at the spread between the Euribor and the Eurepo, in case of the eurozone. The Euribor is the overall interbank lending rate whereas the Eurepo represents the interest rate for interbank lending in exchange for collateral. Therefore, the spread indicates the level of perceived risk in the financial sector by banks as it represents the demand for collateral relative to overall lending.

As Figure 3 illustrates, the collapse of Lehman Brothers caused a tremendous increase in this spread from around 20 basis points in September 2008 to around 120 basis points in November 2008.

Figure 3. Spread Euribor-Eurepo (in Bps)



Source: Thompson Reuters

The resulting credit crunch in financial markets can be decomposed into two effects: price effect and volume effect (Korinek et al. 2010). The price effect was characterized by the rising costs of credit in financial markets, due to the extreme increase in the perceived credit risk. The same risk increase also had a volume effect as banks reacted to higher credit costs cutting down their exposure by reducing the amount of credit they supplied. However, monetary policy by central banks responded very quickly and helped to bring down lending rates in financial markets around mid-year in 2009. Central banks lowered the interest rates at which commercial banks could borrow from the central bank, provided liquidity to the financial sector by extending the duration of refinancing operations and by accepting lower standards for collateral. Moreover, central banks carried out so-called unconventional measures such as “lender of last resort” and “quantitative easing” to prevent financial institutions from collapsing (Gros et al. 2012, Nakaso 2013).¹⁰

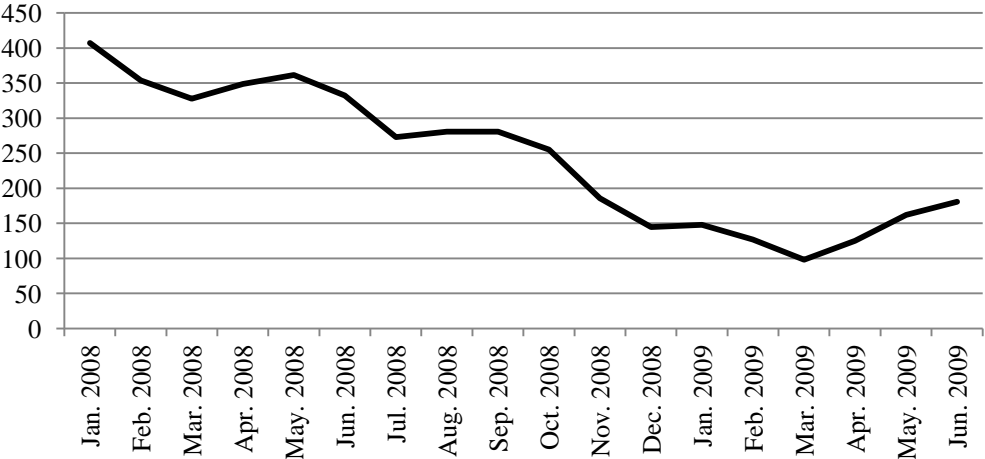
For the case of the euro area, the Euro Area Bank Lending Survey by the ECB, which is conducted every quarter, confirms price and volume effects for European banks. The surveys from October 2008, January 2009 and April 2009 indicate that the greatest impact of the financial crisis on credit conditions was experienced in the last two quarters of 2008 and the

¹⁰ Among other actions, the Bank of England privileged the purchase of medium and long-term government bonds with GBP 200 billion, the FED purchased commercial papers and other private assets for around USD 1000 billion and the ECB expanded credit to banks for about EUR 300 billion.

first quarter of 2009. For the second quarter of 2009, credit markets were still under distress but fewer banks reported problems due to the tightening of credit standards. The main issues reported were funding cost and balance sheet constraints, especially banks' access to market financing. As a result, banks increased margins on credits to enterprises as well as credit conditions. In the last two quarters of 2008, between 60% to 70% percent of the banks reported higher margins on average loans (compared to around 40% in the last quarter of 2007) and nearly 80% of banks reported higher margins on riskier loans (compared to around 60% in the last quarter of 2007). The increases in credit conditions were even more pronounced. Around 45% of banks reported effects on the size of loans and credit lines (compared to 10% in Q4 2007), nearly 50% of banks reported tighter collateral requirements (compared to around 25% in Q4 2007) and maturity was stated to have been affected by over 30% of banks (compared to below 20% in Q4 2007). It was further reported that lending to firms was more affected than lending to households. However, the demand for loans from enterprises also decreased significantly.

In sum, it can be stated that banks were facing severe problems in the financial crisis, both on the active and passive side of their balance sheets. As a result to the tighter credit constraints, asset devaluations and exposure reductions as well as the overall uncertainty in the financial

Figure 4. EURO STOXX Banks Index (in €)



Source: Thomson Reuters

market, banks were facing a significant decrease in their market value as banks stocks were falling. The EURO STOXX banks index, for instance, which is composed out of 29 eurozone banks stocks dropped its value by four times throughout 2008 until the second quarter in 2009 (Figure 4). This all emphasizes that banks were experiencing extreme times during the crisis.

The crucial question is how the trade finance market in particular was affected by this turmoil in financial markets which will be outlined next.

2.2.2.2. Trade Finance in the Financial Crisis

Although the trade financing market is usually considered a relatively sound market as it is backed up by collateral and long-standing practices and procedures (Auboin 2009), it was still affected by the overall squeeze in credit markets. Auboin (2009) further states that, according to private Wall Street banks, a market gap of around \$25 billion in November 2008 in the trade finance market was estimated. Especially large banks are said to have stated that they were unable to keep up their trade financing activities due to the overall credit crunch. This observation is supported by Asmundson et al. (2011) who point out that credit availability concerns were relatively more emphasized in large banks and correspondingly, larger institutions were facing a greater need for deleveraging.

The volume effect of the crisis on trade finance has been considerable as the IMF-BAFT Trade Finance Survey (2009) shows. The very fact that the value of issued letters of credit dropped by 11% from October 2008 to January 2009, after already having declined by 7% from October 2007 to October 2008, is a clear sign that short-term trade financing was indeed directly affected by the financial crisis. Other trade financing product, such as export credit insurances and short-term export working capital lines, were also negatively affected as they decreased by 4% and 3% respectively in value. Furthermore, the survey finds that the decline in trade financing for large corporations was the strongest as the value of overall trade finance business with this sector dropped by 13% between October 2008 and January 2009. This is even more remarkable taking into account that from October 2007 to October 2008 the value of trade finance still increased by 9%. Consequently, it seems as if large corporations were experiencing the impact of the crisis the most. Ivashina and Scharfstein (2010) even show that during the peak of the crisis, new loans to large corporations decreased by as much as 36% compared to prior months.

Due to the lack of data availability, the price effect on trade finance cannot be estimated accurately. Nevertheless, a survey by the International Chamber of Commerce in November 2008 states that pricing in the trade finance market has “shot through the roof”. According to anecdotal evidence, trade finance deals were priced 300-400 basis points over interbank lending rates which is about two to three times higher than usual (ICC 2008).

In line with the volume and price effect on trade finance, banks adopted stricter risk management practices in response to their increased refinancing costs and risk exposure. Therefore, banks started to differentiate more between their individual clients and their respective business sectors and countries of origin. This might among other factors contribute to explain the finding in the literature that different sectors were unequally affected by the financial crisis. A more detailed analysis of this fact will be provided in the next part of this section. Additionally, banks limited their risk by expanding their insurance, shortening credit maturities and asking for higher deposits or collateral from exporting firms (Asmundson et al. 2011).

It should also be noted that several authors argue that trade finance only played a rather modest role. Chauffour and Malouche (2011) and Mora and Powers (2011) for instance point out that according to the IMF-BAFT trade finance survey (2009), the most important reason stated by banks for the decline in trade transactions was the fall in demand for trade activities from their customers. The second most important reason stated was trade finance (less credit availability at their own institutions or at counterparty banks). This is confirming the important demand side effects on trade during the crisis that was outlined earlier in this paper. Nevertheless, trade finance still plays an essential role. This becomes more apparent when looking at the IMF-BAFT trade finance survey of 2010 in which the same issue was evaluated again. In the second quarter of 2010, the importance of trade finance for explaining less trade transactions is now only half as pronounced as in March 2009 whereas a demand fall even increased its importance. Consequently, trade finance was responding relatively more heavily in the peak of the crisis period at the end of 2008 than demand. Therefore, it does not seem to be a coincidence that world trade declined the most in around the same time period.

Furthermore, Asmundson et al. (2011) claim that bank-intermediated trade finance might actually not have been impacted so heavily by the crisis, as the share of trade with bank-intermediated trade finance over total world trade even increased during the crisis. The authors argue that despite the higher pricing margins, the demand for trade finance increased in the crisis as exporters were becoming more risk averse and thus relying more on secure bank intermediation. However surprising this development may seem at first sight, it is only logical when taking a closer look. As exporting firms became more risk averse due to the crisis situation, they could have decided to either export less or to get more secure financing. The firms that were still exporting are those that could still afford the increased margins for bank intermediated finance whereas the firms that could not afford trade finance anymore

reduced their exports. Therefore, relative to overall exports, the amount of trade financed exports increased. Contrary to the statement of Asmundson et al. (2011), this does not indicate that trade finance was only slightly impacted by the financial crisis but it underlines the importance of trade finance for exporting firms during financial crises.

Contessi and de Nicola (2012) summarize the partly ambiguous findings and interpretations concerning trade finance. They state that although there is a consensus among economists that demand side effects played a large role, they still cannot account for the overall trade decline. In turn, supply side effects via trade finance can also only explain a part of the export reduction as the drop in goods exports was significantly larger than the drop in trade finance in all parts of the world (except in developing Asia).

A potentially aggravating effect on trade finance activities was the already mentioned low level of transparency in the trade finance market. Since market participants had no clear view on the financial conditions of other market participants, they could have become even more cautious regarding potential business partners. The reason for the absence of data on the trade finance market is that trade finance is typically based on individual relationships between banks and their clients. Usually trade finance contracts include guarantees and collateral which is proprietary information about banks and their clients and thus not made available for the public. Similarly, open account and cash-in-advance transactions are based on individual customer relationships and are hence also confidential. As a result, the only information accessible consists in the surveys on trade finance conducted by the IMF and BAFT-IFSA as well as surveys by the ICC banking commission. By definition, these reports cannot provide accurate evaluations of the trade finance situation in general and especially during the financial crisis. This also makes it harder for the empirical literature that will be outlined in the next part to isolate the effect of trade finance crisis transmission channel on exports.

2.2.3. Academic Literature on Trade Finance

Since there is no accurate data available for trade finance, it is not possible to directly measure the effect of trade finance on exports empirically. Consequently, there are numerous approaches to estimate the effect of the financial crisis on exports via the trade finance channel. In the following, different estimations and results from the literature will be summarized and compared to other findings.

As pointed out at the beginning, world trade declined much more than world GDP in the financial crisis. A popular explanation for this fact in the literature is that exporters have a greater need for external financing than domestic producers due to higher costs and risks¹¹ that are attached to the international transfer of goods, as pointed out for instance by Amiti and Weinstein (2011). They confirm this hypothesis with their finding that firms who export by ship and thus incur the highest costs and risks and are accordingly most dependent on trade finance, are more severely affected by the financial crisis than firms who export by plane or even firms that only sell their products domestically. The authors examine the case of Japan using a unique data set that matches Japanese firms with their credit supplying banks. It is estimated what effect the financial health of banks, approximated with their market to book value, has on the exports of their clients during financial crises. That way, this paper was one of the first papers to model a causal link between the financial sector and the trade sector. The authors find that financial shocks such as the recent financial crisis can make up for at least 20% of the overall decline in exports of Japan.

Bricongne et al. (2012) also use firm level data for the case of France that is differentiated at an 8-digit level which allows controlling for product and export destination. They analyze their firm database for so called payment incidents to check for the effects of financial constraints. These are defined as the incidents in which a firm does not manage to pay its creditors. According to the authors, payment incidents can be interpreted as an indicator of credit constraints as the failure to pay back loans will have a negative effect on both the probability of getting a new loan and the amount of a new credit. However, the authors do not explicitly take into account any financial variables so that their estimation strategy for financial factors remains slightly vague. As the authors themselves state, they cannot rule out adverse causality where a demand shock might actually cause an incident of payment to the creditors of the exporter. Their overall findings are that a major part of the trade collapse can be attributed to the demand shock and is therefore in line with the literature presented in the previous section. In accordance with Behrens et al. (2011) they attribute most of the trade decline to changes in the intensive margin. They also find that credit constraint firms experienced a significant decrease in their exports. However, the share of these financially constrained firms is stated to be rather small so that the overall effect of financial constraints seems to be modest.

¹¹ As explained above, international goods transfers are time consuming and therefore require high working capital amounts. This longer transportation period also increases the attached risk that is further enhanced by the higher information asymmetry.

Another strand of literature estimated the financial effects on trade not for a single country but from a more global perspective. Chor and Manova (2012) examine imports into the United States from 31 countries around the world. As an indicator of financial distress they take the interbank lending rates in the exporting countries as they represent the overall credit conditions in a country. Furthermore, they also control for sector characteristics such as the dependence on external finance, access to trade credit or the amount of collateralizable assets as a guarantee for loans. The results indicate that tighter credit conditions in a country negatively affect exports as firms were provided with less and/or more expensive trade financing. This effect was most pronounced for sectors that are particularly dependent on trade finance and hence most vulnerable to financial shocks; sectors with a high dependence on trade financing as well as sectors with limited access to trade credit or collateralizable assets were more severely affected.

Iacovone and Zavacka (2009) do not specifically focus their research on the recent financial crisis but on 23 banking crises in the 1980s and 1990s. The authors control for both demand and supply side effects of financial crises on exports. In accordance with Chor and Manova (2012) they take into account the same sector specific characteristics and find similar results. The health of a financial system matters for export growth and particularly firms that are dependent on external financing are affected by financial crises. Iacovone and Zavacka (2009) emphasize though that this does not necessarily hold for firms that are less dependent on bank finance. Trade credit on the other hand is not found to be negatively affected by financial crises. The level of asset tangibility is also found to be significant as higher asset tangibility mitigates the impact of financial crisis. Demand shocks are also playing an important role, especially for durable goods which is in line with other literature on demand side effects. Importantly, demand shocks are found to be additional to financial crisis which could explain the unprecedented trade decline in the recent financial crisis.

Another important issue when talking about trade finance that was mentioned in the previous part is credit insurance. As already pointed out, credit insurance plays an important role in the trade financing process, especially in times of great uncertainty during crises. A paper by van der Veer (2010) takes a closer look at this topic and examines how the reduction in private credit insurance due to the crisis affected international trade. The author estimates that credit insurance can account for about 5% to 9% of the decline in world trade whereas in Europe, credit insurance even accounts for 10% to 20% of the drop in exports.

As trade finance received only little attention in the academic literature, only very recently more papers were presented that incorporate trade finance into theoretical models and thus to combine international finance and international trade. Ahn (2011) develops a model that shows how differently international trade finance reacts compared to domestic trade finance. The main determinant in the model is the greater risk that is attached to international trade finance loans due to a higher uncertainty about firms' performance during crises. Consequently, trade finance becomes more costly to cover for higher information asymmetry. Another theoretical approach was made by Schmidt-Eisenlohr (2012) who focuses on the time gap that arises from the longer transportation in international trade and on different potential payment contracts. He determines that financial conditions have a large effect on bilateral trade flows and particularly emphasizes that the financial conditions and costs are crucial for trade not only in the exporting country but also in the importing country.

When it comes to effects of the financial crisis on the real economy in general Tong et al. (2012) find that the decline in international trade negatively impacted the real economy as a whole which only underlines the already mentioned importance of the trade collapse for the world economy. Financial factors played only a minor role which again is in line with other findings since GDP did not decrease as much as trade during the financial crisis.

3 Methodology

3.1. Empirical Strategy

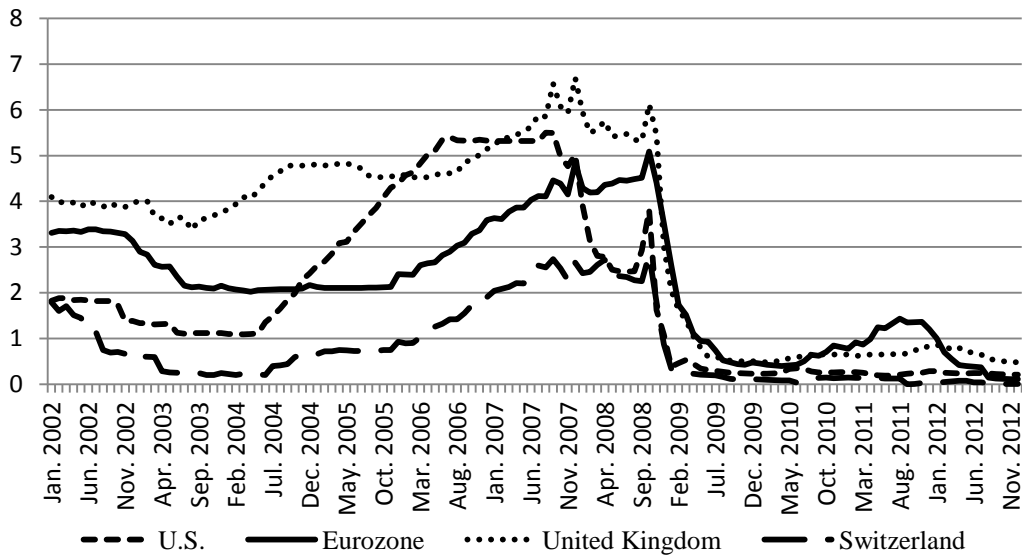
The primary goal of this paper is to identify a causal relationship between the financial crisis and international trade via producer side effects, strictly speaking via trade finance, in line with the literature presented in the previous section. As outlined above, there is strong empirical and theoretical evidence that the financial crisis spilled over into the export market through the trade finance channel. Unfortunately, there is not much data on trade finance available due to already mentioned reasons. Therefore, alternative measurements that capture the conditions in credit markets and the usage of trade finance by firms have to be implemented.

3.1.1. Credit Conditions

Since trade finance reacts to changes in the costs and availability of financing by banks and financial institutions in general, a variable that represents the credit market conditions for banks would be optimal. A rather broad but representative measure for financing costs in the financial sector is the interbank lending rate. This rate represents the interest rate at which banks lend each other money. As the interbank rate goes up in times of crises due to a liquidity gap and greater uncertainty, these higher costs incurred by banks will in the main be passed down to its debtors. This is for instance outlined by Brunnermeier (2009) who states that increases in the interbank rate go hand in hand with a decrease in the possibility of firms to obtain external capital as banks tighten credit conditions. In line with this reasoning, Chor and Manova (2012) use the interbank lending rate in their empirical framework. A similar empirical framework is followed by this paper, as will be outlined below.

Although generally the interbank lending rate might be a good indicator for trade finance conditions, in the recent financial crisis this is not the case. As already stated above, central banks around the world strongly intervened in financial markets in order to prevent a collapse of the banking sector. Cutting down the interest rate at which banks could borrow from central banks, extending the duration of refinancing operations for financial institutions, lowering the standards for assets accepted as collateral and introducing new direct market interventions such as the “quantitative easing” program all contributed to a tremendous drop in the interbank rates. The interbank lending rates fell below one percent around the end of 2008 from their highs of above four percent in case of the Euribor and above five percent in case of the US Libor (Figure 5). Of course, these interventions, as effective as they were to bring down interbank rates, did not end the financial crisis and the distress in financial markets. As pointed out in the section above, the financial sector started to calm down not before mid 2009. Therefore, this huge decrease in interbank lending rates at the very beginning of 2009 does not represent improved lending conditions in the financial sector but only an artificial effect due to central bank actions. As the surveys in the prior section suggest, banks did not pass on these lower interest rates for credit to their customers as trade finance conditions were still tight in the first two quarters of 2009. The interbank lending rate thus seems inappropriate to be used as an indicator for trade finance in the financial crisis.

Figure 5. Interbank Lending Rates (1 month) in %



Source: Thompson Reuters

Consequently, this paper will employ the spread between Euribor and Eurepo as a measurement for the overall lending condition in financial markets. The spread indicates the level of perceived risk in the financial sector by banks representing the demand for collateral relative to overall lending. Accordingly, the spread is a suitable measurement for the tightness in the credit market. A high level of the spread suggests that uncertainty and risk perception between banks is high which is the case in financial crises. It also implies that lending without collateral has become relatively more expensive and hence the spread indirectly takes into account the cost of credit. If banks already ask for more collateral in return for credits from other banks, it is likely that they will also be more strict and demanding when it comes to credits for firms in the real economy which is in line with evidence. The spread has furthermore the advantage not to be influenced by potential demand side effect that can drive the interest rates. In the years prior to the crisis, interbank rates were increasing although financial markets were still doing well which means this increase in interbank rates does actually not represent tighter credit conditions. Since the Euribor and the Eurepo are equally affected by an increased demand for credit, the spread stays unaffected and thus only represents supply side effects for bank lending which is what this paper wants to examine.

3.1.2. Sector Characteristics – Financial Vulnerability

There is a common understanding in literature that sectors within an economy have different characteristics. Among other differences such as sector specific technology levels, sectors

differ with respect to their need for external financing which can be due to different production and exporting costs. If some sectors need more external financing, they are consequently also more dependent on that financing. This leads to the assumption that those more dependent sectors should be more severely affected by financial crises as they negatively impact costs and availability for external financing. The greater vulnerability of some sectors to financial crises has been tested and confirmed by multiple authors (Dell'Araccia et al. 2007, Manova 2008, Iacovone and Zavacka 2009, Chor and Manova 2012, Rajan and Zingales 1998). This strand of literature differentiates sectors by some or all of the following three indicator ratios that will also be employed in this paper.

First, direct external finance dependence is analyzed which is derived from different capital expenditures in industries. This was first proposed by Rajan and Zingales (1998) who computed a variable indicating the share of capital expenditures that was not financed by internal cash flows from operations. In this paper, a similar measurement is used.¹² External finance dependence is calculated as the part of capital expenditures that is not financed by operational income divided by operational income. The greater the dependence on external capital, the stronger a sector is assumed to be affected by the financial crisis.

Second, the access to trade credit of firms is taken into account since it can work as a substitute to trade finance as outlined above. The common level of trade credit varies among sectors and thus affects sectors' crisis reactions. It is calculated as the ratio of accounts payable over total assets. It is assumed that the access to trade credit could potentially reduce the dependence on bank financing (Fisman and Love 2003).

Third, the availability of collateralizable assets can have an effect on the willingness of external finance suppliers to provide loans, especially in times of crises. It is expected that firms with more tangible assets should find it easier to obtain external finance (Braun 2003). This ratio is constructed as the share of property, plant and equipment over total assets.

Additionally to these three already established variables in literature, this paper also uses two further sector specific measurements that could have an effect on the firms' possibility to obtain external credit. The first is the liquidity ratio of a firm which is computed as the ratio of current assets over current liabilities. A higher level of liquidity implies that a firm can more easily pay its liabilities using its own cash or quick assets which can make it easier for the firm to repay potential loans and thus might increase the likelihood of the firm to receive

¹² Contrary to the existing literature, instead of cash flows the operational net income is used. Since the calculation of cash-flows are subject to country specific regulations and contain incidental income changes such as mergers and restructurings, operational (net) income is better portraying the actual everyday business activities and revenues.

external credits. Moreover, a higher liquidity ratio of a firm might help to compensate short-term credit shortages in financial crisis by using its own quick assets instead.

The second additional measurement is the debt ratio which is calculated as total liabilities over total assets. The debt ratio indicates to which extent firms finance their assets with external finance. A high debt ratio implies that firms make use of more external capital and might face greater problems to repay their debt in times of economic crises. Thus potential lenders might be more reluctant to provide credit.

All these indicators are expected to have an impact on firms’ abilities to obtain credits from other firms or banks and to meet their required financing for their production and export activities. The expected effect of these indicators on exports are summarized in table 1.

Table 1. Overview of expected effects of financial vulnerability indicators on exports

financial vulnerability variable	expected effect on exports
external finance dependence	negative
trade credit availability	positive
asset tangibility	positive
liquidity ratio	positive
debt ratio	negative

The existing literature uses these measurements as fixed, time-invariant variables. In this paper however, the ratios are time varying as they are calculated on a yearly basis for each sector in each country. Monthly ratios would be optimal in order to estimate their effect on (monthly) export data more precisely but due to data availability constraints, yearly ratios are used. Using time dependent ratios allows for more accurate estimations since changes and developments in the sectors are taken into account. It also allows analyzing if these values are changing at all. One could for instance assume that especially during financial crises, some ratios might be affected as well. Furthermore, existing papers that examine several countries assume these financial vulnerability ratios to be the same in every country. Chor and Manova (2012) for example state that sector characteristics including their external financing demand are comparable across countries. Therefore, they compute the ratios using United States data only but applying them for every country in their sample. However, as Hackethal and Schmidt (1999) demonstrate, external financing patterns are not necessarily the same between countries, not even among developed countries. Accordingly, in this paper the variables are

computed separately for every country in the data. An analysis of the differences between countries will be provided in the next part of this section.

3.1.3. European Exports

The focus of this paper is on European exports. This has several reasons and advantages. First of all, the European Union as a whole is the biggest exporter and one of the most open economic areas in the world.¹³ What happens to European exports thus has a significant impact on total world trade. In this paper however, it is not the European Union but the eurozone which is analyzed. Most of the exports of the Union are actually exports from the euro area since the biggest export nations such as Germany, France, the Netherlands, Italy, Belgium and Spain belong to the euro area as well, except the United Kingdom. Focusing on eurozone countries instead of Union countries further brings along the advantage that currency effects do not play a role in exports since all countries in the sample have the same currency and thus face the same exchange rates. This eliminates all potential currency based export biases when examining the distinct countries in the sample.

The exporting countries that will be analyzed in this paper are both among the biggest exporting nations and the biggest economies in the eurozone: Germany, France, Italy, the Netherlands and Spain. This matters for two reasons. First, together these countries account for around 75% of the overall exports of the euro area and for around 60% of the exports of the European Union.¹⁴ Therefore, these countries drive European exports and what affects their exports will have a crucial impact on European exports as a whole. Second, only the biggest exporting nations have enough export volume to allow for an analysis on a sector level. Smaller exporting countries do usually not export significant amounts in every sector. This would cause a much more unbalanced data set and could potentially bias the results when estimating sector effects. The exports of the mentioned five countries will be examined both jointly and individually. Analyzing the countries individually might provide some insight in differences between countries when it comes to their export patterns and how they were affected by the financial crisis.

This paper does not only distinguish between different exporting countries but also between different export destinations. As export destinations the United States (US), China, Russia, the United Kingdom (UK) and Switzerland were chosen. These countries are the largest trading

¹³ The export share of EU in world trade is above 15% in 2011, the share of China is above 13% and the share of the US is above 10% (Eurostat)

¹⁴ Source: Eurostat

partners of the eurozone and they account for above 40% of eurozone exports¹⁵. The choice of these countries also allows testing for different effects on exports regarding the geographical distance between exporting and importing country. As explained above, the transportation costs and time matter for trade finance. The longer the transportation time period, the more costly the export and the more working capital loans are needed. This is generally confirmed by Schmidt-Eisenlohr (2011) who finds that countries trade less with each other if the costs for trade finance are greater. Amiti and Weinstein (2011) particularly support this finding for the case of Japanese exports. Therefore, one could assume that exports to the US, China and to a lesser extent Russia were more affected by the financial crisis as these exports could be more dependent on trade finance due to the longer transportation distances. The exports to the UK and Switzerland on the other hand should not be as dependent on trade finance as they do not involve long transportation time gaps due to their geographical proximity. Moreover, the perceived risk of a trade finance credit might also depend on the export destination. Countries such as Russia and also China imply a greater risk as in these countries, laws and regulations are more different to those in western countries and authorities have more power to interfere in business activities.

Following the existing literature, for several reasons all analyzed sectors are industrial and manufacturing sectors. First of all, several authors find that during the financial crisis, durable goods were most severely affected as stated above (Eaton et al. 2011, Behrens et al. 2011, Levchenko et al. 2010). Chor and Manova (2012) point out that manufacturing exports closely mirror total exports. Given that basically all exporting countries in their sample are industrialized countries which means that the bulk of exports can be attributed to industrial products, this finding is not very surprising. This also holds for the exporting countries examined in this paper as the major part of exports, above 80%¹⁶, belongs to the manufacturing sector as well. Some primary sectors such as agriculture are furthermore indirectly accounted for as sectors that manufacture goods of these industries such as the sector for food and kindred products are in the data sample. Service exports do not have to be analyzed in this set up as they do not depend on trade finance since no working capital for transportation is required.

¹⁵ Source: Eurostat

¹⁶ Source: Eurostat

3.2. Estimation Technique

The estimation technique in this paper is generally following Chor and Manova (2012) but contains several additional extensions. In order to estimate the effect of the financial crisis on exports, the analysis will be divided in two steps. In the first step, only the spread between Euribor and Eurepo will be considered as the explanatory variable for both the overall time period and the financial crisis according to the following specification:

$$y_{ikt} = \beta_0 + \beta_1 * spread_{it} + \beta_2 * spread_{it} * D_{crisis} + D_{it} + D_{kt} + \varepsilon_{ikt} \quad (1)$$

where y_{ikt} is the value of monthly exports from country i in sector k at time t , $spread_{it}$ stands for the spread between Euribor and Eurepo in country i at time t .¹⁷ D_{crisis} is a binary variable that equals 1 during the time period of the financial crisis. The financial crisis period is defined from March 2008 to July 2009. In March 2008, the crisis reached a first peak with the collapse of the investment bank Bear Stearns and around mid-2009 trade flows as well as the situation in financial markets started to recover again. Furthermore, the recession indicator from the Federal Reserve Bank of St. Louis dates the crisis for the same time horizon for the euro area. In order to take into account the different country and sector characteristics of the data sample, an extensive set of fixed effects is included. D_{it} controls for country fixed effects over time, whereas D_{kt} controls for sector fixed effects over time. That way, among other things, seasonality in the export data and the impact of shocks to aggregate production are controlled for which significantly reduces potential omitted variable concerns. Only explanatory variables that vary simultaneously by country, sector and month will be estimated and thus the effect of the financial markets on exports will be isolated.

The tested overall time period ranges from January 2002 until December 2012. This time period serves as a control time period for the effects of financial markets on exports. The results for the overall time period are expected to be different from the crisis period results as financial markets are mostly in sound shape before and after the crisis. The overall period starts in 2002 since before that the Euro was not yet introduced implying different currencies and different interbank lending rates which would bias the overall results. In order to control for potential heteroskedasticity problems, White standard errors will be used for the estimation.

¹⁷ Since the spread is the same for all eurozone countries, the index i is not necessary but included for the sake of clarity.

In the second step the financial vulnerability indicators for every sector will be added as interaction terms:

$$y_{ikt} = \beta_0 + \beta_1 * spread_{it} * finvul_k + \beta_2 * spread_{it} * finvul_k * D_{crisis} + D_{it} + D_{ik} + \varepsilon_{ikt} \tag{2}$$

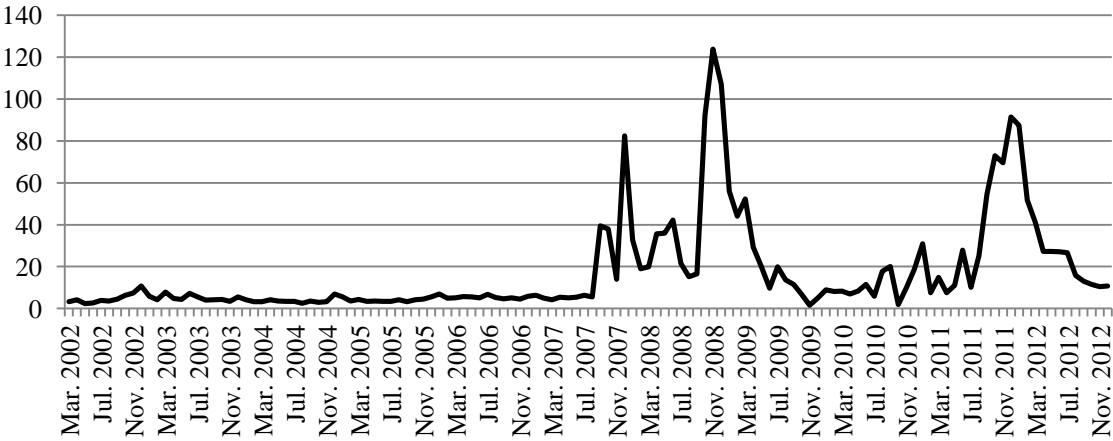
where $finvul_k$ stands for the financial vulnerability indicators. In order to test for the different sector characteristics, the estimation will be computed for each financial vulnerability indicator. The advantage of estimating the interaction terms is that this way, credit conditions in the financial market will directly be interacted with different measurements of firms' sensibility to tighter credit conditions. The result does hence not only take into account the overall deterioration in lending conditions but also sector specific characteristics that determine the impact of these effects on each industry.

4 Data and Descriptive Statistics

4.1. Financial Data

Data for the Euribor and the Eurepo is obtained from Thompson Reuters Datastream. The Euribor-Eurepo spread is generated by subtracting the Eurepo rates from the Euribor rates.

Figure 6. Spread Euribor-Eurepo (in Bps)



Source: Thompson Reuters

The spread in Figure 6 clearly indicates the distress in financial markets during the financial crisis starting in the second half of 2007 and reaching its peak after the Lehman Brothers collapse in the end of 2008. Around mid-2009, interbank lending markets calmed down again

until mid-2011 when debt problems in some European countries were becoming an issue which reached its peak with a potential exit of Greece of the eurozone.

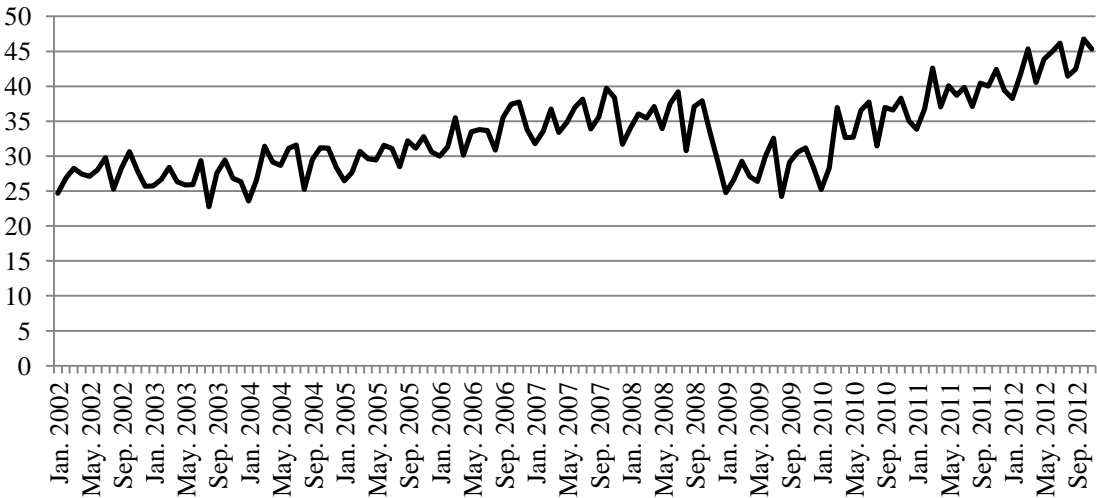
4.2. Export Data

Monthly export data of the eurozone is taken from the Eurostat database. The obtained data is differentiated by the exporting country, the exporting sector of the respective country and the country of destination. For exporting countries, data is obtained for Germany, France, Italy, Spain and the Netherlands. As export destinations, the US, China, Russia, UK and Switzerland are chosen. For each exporting country, the data is subdivided into 19 sectors, see table 1 in the Appendix. This ample variety of export data allows for a differentiated and accurate analysis of export patterns during the crisis.

The sectors in Eurostat are structured according to the SITC (Standard International Trade Classification) codes. In order to be matched with the data for financial vulnerability which is obtained in SIC (Standard Industrial Classification) codes, the SITC sectors are manually converted to SIC as well. Table 1 in the Appendix shows how SITC sector were converted to SIC sectors. The tobacco sector (SIC 21) was dropped due to too little data.

The aggregate exports of all countries clearly show a drop in export activity during the financial crisis (Figure 7). Exports declined around mid-2008 and started recovering in the second half of 2009. The magnitude of the export decline is quantitatively significant as exports decreased from nearly €40 billion to €25-30 billion in the crisis period.

Figure 7. Total aggregate exports (in billion €)

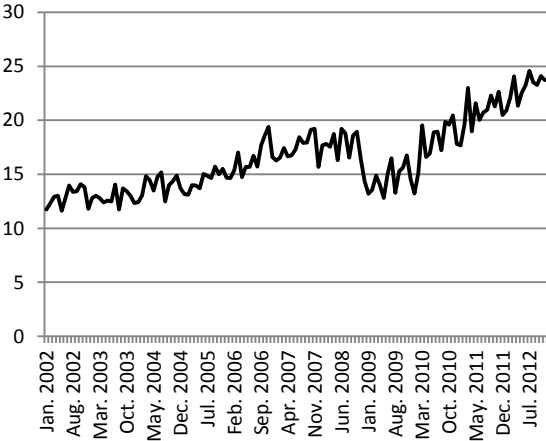


Source: Eurostat

When differentiating exports according to the exporting countries (Figures 8-12), the findings are very similar. In all countries exports started to drop in the third quarter of 2008 but the recovery somewhat occurred at a different speed. In Germany, for instance, the recovery was the fastest reaching pre-crisis levels already in the beginning of 2010. In the Netherlands, the recovery was only slightly slower whereas in Spain and Italy the recovery adjustment took a few months longer. In France, the drop in exports was relatively the least pronounced but the recovery process seems to have taken the longest of all countries to reach its pre-crisis levels. When looking at the overall exports (Figure 7) of the dataset, it is important to take into consideration that German exports account for around 50% of total exports. Not very surprisingly, Figure 7 and Figure 8 show quite similar graphs.

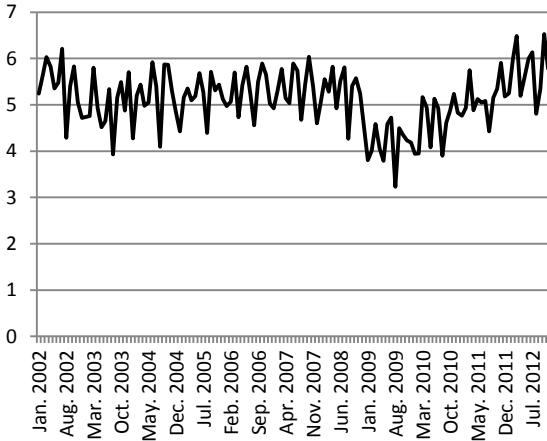
Looking at the different export destinations it becomes apparent that the export destination matters considerably (Figures 13-17). Aggregate exports to the United States and Russia declined the most followed by exports to the UK. The decline in exports to Switzerland was less pronounced and exports to China were the least affected and recovered very quickly reaching pre-crisis levels already in the second half of 2009. Exports to the US and Switzerland rebounded around the first quarter of 2010, whereas in exports to the UK and Russia needed until the beginning of 2011 to reach their prior levels.

Figure 8. Aggregate exports of Germany



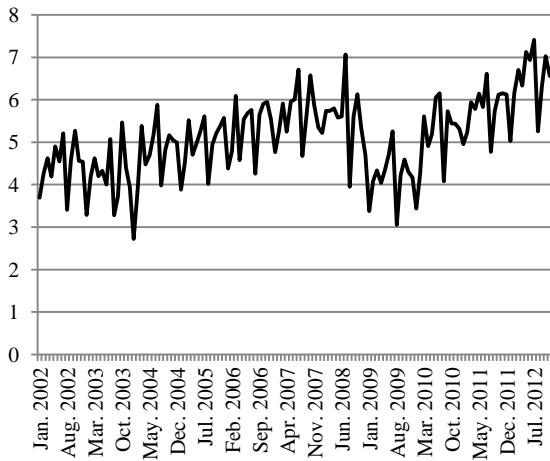
Source: Eurostat

Figure 9. Aggregate exports of France



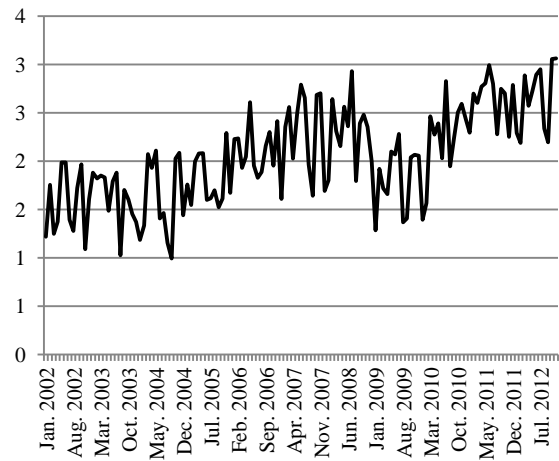
Source: Eurostat

Figure 10. Aggregate exports of Italy



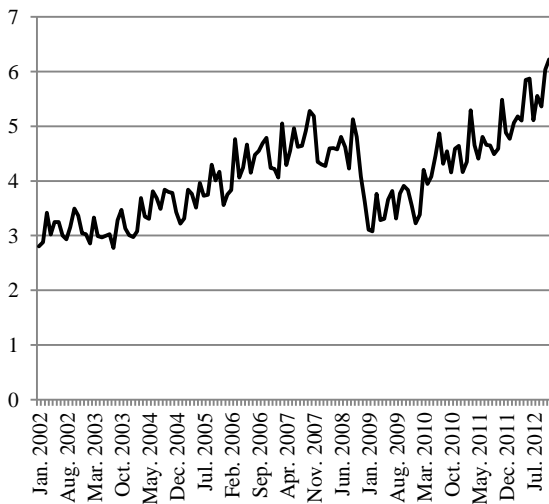
Source: Eurostat

Figure 11. Aggregate exports of Spain



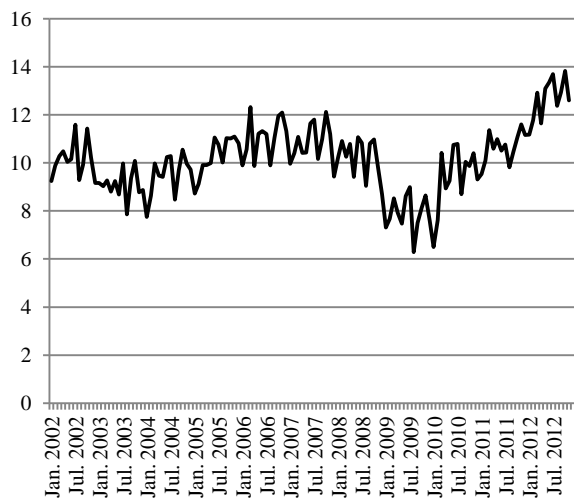
Source: Eurostat

Figure 12. Aggregate exports of Netherlands



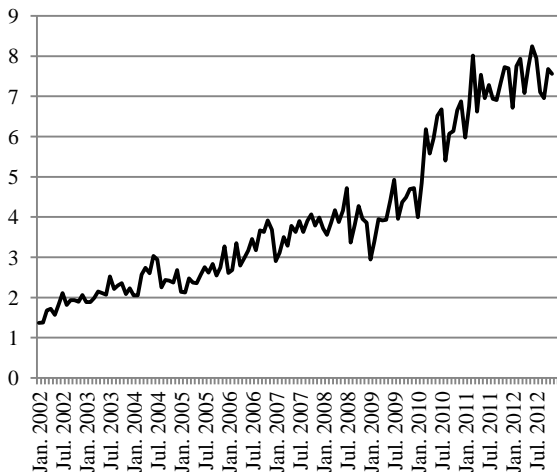
Source: Eurostat

Figure 13. Aggregate exports to U.S.



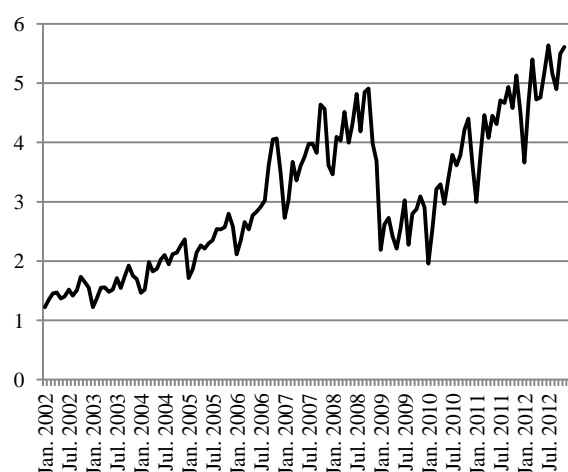
Source: Eurostat

Figure 14. Aggregate exports to China



Source: Eurostat

Figure 15. Aggregate exports to Russia



Source: Eurostat

Figure 16. Aggregate exports to Switzerland

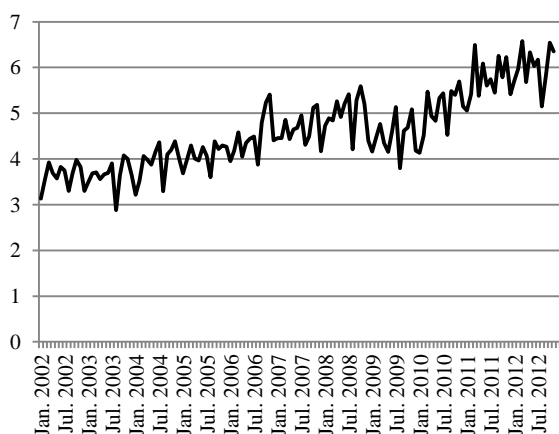
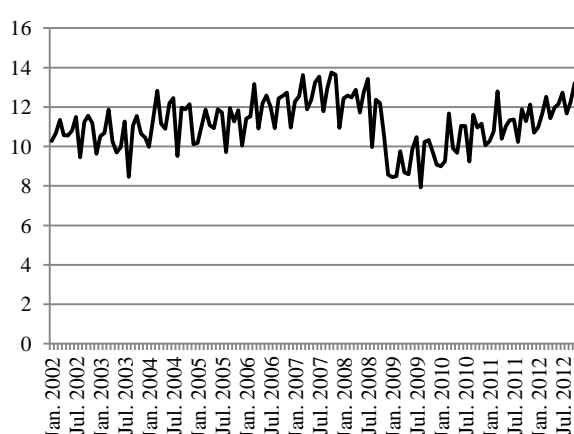


Figure 17. Aggregate exports to UK



The aggregated exports for every sector over all countries (figures 1-19 in the Appendix) underline the importance of an analysis on a sector level as sectors reacted very differently to the financial crisis. Some sectors faced sharp declines in their exports while other sectors seem to have been affected by the crisis only moderately (see table 2). In sum, most aggregate sectors experienced a significant decline in their exports during the crisis.

Table 2. Export decline from June 2008 to December 2008

SIC	Industries with strongest export decline	
29	Petroleum Refining and Related Products	-57.9%
24	Lumber and Wood Products*	-43.6%
283	Plastic Materials	-43.2%
37	Transportation Equipment	-36.0%
30	Rubber and Plastics Manufactures	-34.8%
SIC	Industries with smallest export decline	
31	Leather And Leather Products	-7.8%
20	Food And Kindred Products	-5.9%
38	Scientific and Controlling Instruments	-3.5%
25	Furniture and Fixtures	-3.4%
39	Miscellaneous Manufacturing Products	-2.9%

**the decline in this sector is partly explained by strong seasonal effects*

4.3. Financial Vulnerability Data

The data for financial vulnerability is taken for each exporting country from the Compustat Global database on a 4-digit SIC level. The 4-digit level data is aggregated to 2-digit level data¹⁸ and then averaged for every sector in every country in every year. With the obtained averages the variables external finance dependence, asset tangibility, trade credit availability, liquidity ratio and debt ratio are computed for each sector-country-year unit. Due to data limitations, monthly averages are not feasible so that yearly averages were computed. Summary statistics for these variables are provided in table 2 in the Appendix. Figures 20-24 in the Appendix further show the aggregated evolution for each variable over the years in the dataset. Two things become apparent. First, the variables are not the same for all the countries in the dataset and hence the assumption of the existing literature of equal sector characteristics across countries is questionable. Second, although these variables are aggregated over all sectors for each country, there is no clear overall crisis effect as the values for the years 2008 and 2009 are not systemically different from the other years.

5 Results

In this section the results of the estimations will be presented. The section is structured in three parts. In the first part, the results for the overall dataset will be described. The second and third part will present the results of financial crisis effects on exports differentiated by export destination and by exporting country, respectively.

5.1. Overall Results

The results for estimation (1) are presented in table 3. As expected, the spread between Euribor and Eurepo has a negative effect on exports during the financial crisis (column 1). The result for the crisis period is significantly different from the result of the overall time period which is also in line with expectations. The positive sign of the coefficient of the overall period might somewhat be explained by increases in the spread in 2007 and 2011/2012 while overall exports were also increasing in the same time period. The results of column 2 underline this assumption as the spread for the overall period is now close to zero and insignificant whereas the spread for non-crisis period is positive. In column 3 the

¹⁸ The sectors drugs (SIC 282) and plastic materials (SIC 283) are an exception as they are listed on 3-digit level.

possibility that firms need to borrow in advance to finance their exports is accounted for as the independent variables are lagged by one month. The results of this specification are very similar to those of column 1 and hence support the findings.

Table 3. Overall results – Financial Markets

dependent variable: exports	(1)	(2)	(3) lag spread
constant	328.20*** (13.86)	328.20*** (13.87)	344.53*** (15.18)
spread	1.76*** (0.40)	0.16 (0.29)	1.35** (0.53)
spread*crisis	-1.60*** (0.42)		-1.76*** (0.48)
spread*(1-crisis)		1.60*** (0.42)	
country, sector, month fixed effects	yes	yes	yes
White std errors	yes	yes	yes
Durbin-Watson test	0.814	0.850	0.814
R-Squared (adjusted)	0.944	0.944	0.946
Observations	12350	12350	11210

*Note: ***, ** and * denote significant at the 1%, 5% and 10% levels, respectively. The standard errors are in parentheses. The financial crisis period is defined as March 2008 - July 2009.*

In order to get a better understanding of the effect of the financial vulnerability terms themselves on exports, they are tested individually (table 4). The debt ratio is found to have a negative effect on exports. This is in line with the hypothesis that a higher debt ratio of a firm makes the firm less attractive for potential creditors and therefore the firm might find it harder to obtain external finance. Another simple reason is that a high debt ratio might also indicate economic problems of a firm not generating enough revenue which would of course also negatively affect their exports. The liquidity ratio has a negative effect on exports for the overall period and a positive effect for the crisis period. The reason for these two different signs of coefficients might be explained by the circumstances a crisis brings along. In times of a crisis, a high liquidity ratio suggests that a firm can more easily pay back its liabilities using its quick assets and might also be able to more easily compensate a short-term lack of credit. This could firstly make it easier for a firm to obtain trade financing since a credit to that firm might be perceived as less risky by lenders. Secondly, the potential compensation of the credit

crunch by the firm also has a positive effect on its exports. During non-crisis times though, these issues matter less as credit is not as scarce. Additionally, more liabilities, which would indicate a lower liquidity ratio, could be beneficial for exports as exports could be increased with more external funds available for financing. Trade credit is found to have a positive effect on exports that becomes even greater during the crisis. Although the coefficients are not significant in this estimation, this is still in line with the hypothesis that trade credit as an alternative to bank trade finance can help firms to finance their exports. This is especially important during financial crises when bank trade finance becomes more difficult to obtain. External finance dependence has a small positive, yet insignificant effect for the overall period but a very significant negative effect in the crisis. This supports the assumption that a greater dependence on external finance matters in times of scarcity of external financing options. In normal times, the greater dependence does not have to have an effect as external finance is not scarce. Asset tangibility has a significant positive effect in the crisis which confirms the hypothesis that more tangible assets as potential collateral for a credit could have a beneficial effect on the possibility for a firm to receive trade finance. For the overall time period, the effect is negative though which might be puzzling at first sight. However, a recent study by the OECD states that intangible assets can have a positive impact on a firm's growth and thus also on exports which might contribute in explaining the negative coefficient of tangible assets (OECD 2011). Moreover, the positive effect of more tangible assets on exports that dominates during the crisis is not as strong in normal times as collateral is not as important for trade finance providers. Although the results are somewhat imprecise as several coefficients are not significant, they still generally support the assumptions on their effects on exports derived from economic theory.

Table 4. Effect of Financial Vulnerability Factors on Exports

dependent variable	(1)	(2)
exports	overall	crisis
constant	626.27*** (67.89)	371.49*** (17.72)
asset tang	-412.00*** (62.53)	57.13* (36.68)
exfin dep	1.08 (1.04)	-2.26*** (0.92)
trade cre	18.14 (104.45)	107.98 (266.21)
liqui rat	-9.18* (5.70)	1.55 (1.48)
debt rat	-220.05*** (55.13)	-72.01 (112.8)
country, sector, month fixed effects	yes	yes
White std errors	yes	yes
Durbin-Watson test	0.793	0.756
R-Squared (adjusted)	0.944	0.943
Observations	11496	11496

*Note: ***, ** and * denote significant at the 1%, 5% and 11% levels, respectively. The standard errors are in parentheses. The financial crisis period is defined as March 2008 - July 2009.*

Table 5 presents the results for estimation (2). Columns 1-5 show the results for the different financial vulnerability multipliers. First, it can be stated that the coefficients have the same sign as the coefficients of table 3 which points out that the spread seems to be driving the signs of the interaction terms. When looking at the significance levels though, external finance dependence seems to lower the significance of the interaction term compared to the others and similarly does also the liquidity ratio. Interestingly, although the external finance dependence term is only significant at the 10% level for the overall period, it becomes more significant for the period of the financial crisis which is in line with the hypothesis that the dependence on external finance became an important issue during the crisis due to the credit crunch in financial markets.

Table 5. Overall results – Financial Markets and Financial Vulnerability

dependent variable: exports	financial vulnerability				
	(1)	(2)	(3)	(4)	(5)
	asset tang	exfin dep	trade cre	liqui rat	debt rat
constant	349.99*** (14.66)	370.48*** (15.99)	349.60*** (14.26)	351.92*** (14.61)	344.68*** (13.95)
spread*fin vuln	4.79*** (1.12)	0.12* (0.06)	8.86*** (2.30)	0.52** (0.26)	2.86*** (0.69)
spread*fin vuln*crisis	-4.38*** (1.24)	-0.16** (0.07)	-8.28*** (2.58)	-0.49** (0.26)	-2.66*** (0.75)
country, sector, month fixed effects	yes	yes	yes	yes	yes
White std errors	yes	yes	yes	yes	yes
Durbin-Watson test	0.790	0.770	0.791	0.800	0.810
R-Squared (adjusted)	0.944	0.943	0.947	0.945	0.947
Observations	11564	11334	11576	11576	11564

Note: ***, ** and * denote significant at the 1%, 5% and 10% levels, respectively. The standard errors are in parentheses. The financial crisis period is defined as March 2008 - July 2009.

5.2. Results for Export Destinations

The results for estimation (1) are portrayed in table 6. The found coefficients are similar to the ones found for total exports, which underlines the significance and robustness of the overall results. The hypothesis that export destinations with greater geographical distances are more severely affected by trade financing conditions can only partly be supported by these results. The coefficients for the UK are indeed less significant than the coefficients for the other export destinations which are further away from the euro area but coefficients for exports to Switzerland are highly significant which challenges the geographical proximity assumption. The different results for the UK and Switzerland could be due to the UK having worse economic fundamentals which led to a longer lasting impact of the crisis and potentially to a demand reduction, as pointed out below. The fact that exports to China and Russia have more significant coefficients than exports to the US might be explained with the higher perceived risk by creditors for supplying trade finance for trade with these countries. This is in accordance with Antràs and Foley (2011) who find that the institutions and contractual enforcement in the destination country have a large impact on financing terms. Trading with these countries is likely to involve more external financing to secure the transactions, which makes exports to these destinations more vulnerable to financial crisis. In case of the US, the

effect of conditions in financial markets on exports becomes more significant which emphasizes the greater sensibility of exports to financing conditions in times of crises.

Table 6. Results by Export Destination – Financial Markets

dependent variable: exports	export destination				
	(1) US	(2) China	(3) Russia	(4) UK	(5) Switzerland
constant	104.19*** (3.66)	34.37*** (5.25)	27.18*** (3.46)	117.37*** (3.13)	45.09*** (2.10)
spread	0.28* (0.13)	0.71*** (0.14)	0.39*** (0.08)	0.11* (0.06)	0.27*** (0.06)
spread*crisis	-0.37** (0.15)	-0.60*** (0.13)	-0.21*** (0.06)	-0.23* (0.13)	-0.19*** (0.06)
country, sector, month fixed effects	yes	yes	yes	yes	yes
White std errors	yes	yes	yes	yes	yes
Durbin-Watson test	1.407	0.363	0.787	1.190	1.130
R-Squared (adjusted)	0.945	0.727	0.796	0.948	0.923
Observations	12350	12350	12350	12350	12350

*Note: ***, ** and * denote significant at the 1%, 5% and 10% levels, respectively. The standard errors are in parentheses. The financial crisis period is defined as March 2008 - July 2009.*

In the following, the results for estimation (2) for each of the export destination countries will be presented. Exports to the US (table 4 in the Appendix) are generally driven by the spread, as in the crisis period, all coefficients are more significant. This is especially apparent for external finance dependence which is not significant for the overall period but highly significant for the crisis period. This is also in line with the findings of table 4 on external finance dependence.

For the case of exports to China (table 5 in the Appendix), results show again that the findings are driven mainly by the spread. All coefficients are highly significant, except the liquidity ratio which therefore seems to play a slightly minor role for exports to the Asian country.

Exports to Russia (table 6 in the Appendix) also show similar coefficients to the results of estimation (1) but significance levels are quite different for the results of estimation (2). Asset tangibility and debt ratio are found to have a very significant effect, whereas external finance dependence and trade credit availability have only little significance.

As the spread had already a low significant effect on exports to the UK (table 7 in the Appendix), the interaction terms also have overall low significances. The liquidity ratio has the most significant effect, followed by asset tangibility. All other interactions have only low or no significance at all.

Contrary to the findings for the UK, the spread and accordingly also the interaction terms have a high significance on exports to Switzerland (table 8 in the Appendix). All financial vulnerability measures do not change these high significances, except the liquidity ratio which leads to lower significance levels. One reason for the different findings for the UK and Switzerland could be that the financial crisis generally affected Switzerland only shortly whereas in the UK the crisis enhanced more severe economic problems which caused a slower recovery.¹⁹ Hence in the UK the real economy overall suffered more than in Switzerland which is likely to have a stronger negative impact on demand in the UK. The greater effect of demand side effects for exports to the UK could explain why trade finance effects are found to be less significant.

In sum, the obtained results show that the export destination matters for the effects of the financial crisis. However, from this sample it cannot be concluded without doubt that geographical proximity of trading partners has a quantitatively significant effect on exports via the trade finance channel. The high significance levels of the coefficients for exports to China could be explained by the fact that demand side effects played only a minor role. Thus demand side effects did not influence the estimation. The finding that the results for China, taking into account financial vulnerability factors, were more significant than for Russia could be due to demand side effects on exports and perceived risk associated with the export destinations themselves, which is independent of financial crises.²⁰ The different significance levels of the financial vulnerability factors for the exports to different destinations underlines the heterogeneity of exports, as exports to different countries can be subject to different circumstances and effects.

5.3. Results for Different Exporting Countries

When comparing the effect of the spread on exports of the five biggest exporters in the eurozone, similar results are obtained for all countries (table 7). The spread has a negative effect on exports during the crisis which is highly significant for all countries except France, where the effect is only slightly significant. Comparing these results to the aggregate exports of each country (figures 7-11) partly confirms these findings as France's exports seem in total

¹⁹ GDP growth in the UK took long to recover than in Switzerland and the increase in the unemployment rate and decrease in productivity were much longer lasting than in Switzerland.

²⁰ The lower R-squared obtained for the estimations of Russia and China partly confirm the assumption that other country specific factors independent of the financial crisis, that are not captured by trade finance or the employed fixed effects, play a role.

to have declined the least during the financial crisis. In addition, the coefficients for France are relatively small compared to the other countries which, considering that France is the second biggest exporter in the sample, might support the finding that the crisis had a smaller effect on French exports. The greater magnitudes of the coefficients for Germany are not very surprising, as Germany's export volume is much greater than those of the other countries.

Table 7. Results by Exporting Country – Financial Markets

dependent variable: exports	export destination				
	(1) Germany	(2) France	(3) Italy	(4) Spain	(5) Netherlands
constant	335.21*** (14.25)	348.61*** (15.63)	346.52*** (15.62)	347.87*** (15.90)	346.38*** (15.77)
spread	5.76*** (1.23)	0.31 (0.21)	1.10*** (0.27)	0.51*** (0.11)	1.12*** (0.29)
spread*crisis	-5.03*** (1.19)	-0.51* (0.32)	-1.04*** (0.33)	-0.45*** (0.10)	-0.98*** (0.28)
country, sector, month fixed effects	yes	yes	yes	yes	yes
White std errors	yes	yes	yes	yes	yes
Durbin-Watson test	0.891	0.757	0.760	0.758	0.762
R-Squared (adjusted)	0.946	0.942	0.943	0.942	0.943
Observations	12350	12350	12350	12350	12350

*Note: ***, ** and * denote significant at the 1%, 5% and 11% levels, respectively. The standard errors are in parentheses. The financial crisis period is defined as March 2008 - July 2009.*

Taking a closer look at German exports (table 9 in the Appendix) reveals that asset tangibility, trade credit availability and debt ratio have a more significant effect on exports than external finance dependence and the liquidity ratio.

In France (table 10 in the Appendix), coefficients are not very significant as the spread already had a low significance level which is driving the results here. The overall low significances for the case of France could indicate, as already mentioned before, that French exports were not affected as much by the financial crisis as exports in the other countries. This is in line with findings of Xiao (2009) who states that French banks have been relatively resilient to the global financial crisis compared to their European peers. This could contribute to explain why the trade finance channel could have a smaller and less significant effect in France.

The results for Italian exports (table 1 in the Appendix) are similar to the ones of Germany, as external finance dependence and liquidity ratio have a less significant effect than the other financial vulnerability variables.

Exports from Spain (table 12 in the Appendix) have been significantly affected by the financial crisis as the highly significant coefficients suggest. Only the interaction term with external finance dependence are not found to be significant.

Table 13 in the Appendix displays the findings on Dutch exports. While all coefficients are highly significant, external finance dependence is not significant for the overall period. However, it becomes significant for the crisis period which again underlines that the dependence of external finance of some sectors can play a role in financial crises.

It can be concluded that the major exporters of the eurozone were rather equally affected by the financial crisis regarding contagion via the trade finance channel. All countries were significantly affected by the crisis with the exception of France where only few of the coefficients were found significant. This could partly be due to a slightly lower total drop in exports of France compared to the other countries and partly to the finding that French banks suffered relatively less from the crisis in comparison with their European peers which could have mitigated negative effects on exports via the trade finance channel.

What also became evident is that the financial vulnerability multipliers matter. In every country, some of the interaction terms were more significant than in others. This suggests that the practice of the existing literature to first assume that sector characteristics are similar across countries and second to include the financial vulnerability indicators as time-invariant constants is questionable as it can lead to imprecise results.

5.4. Robustness Tests and Limitations

The extensive set of fixed effects used in the estimations already accounts for most concerns regarding potentially omitted variables. A correlation table (table 3 in the Appendix) for all independent variables shows that none of the variables are correlated with each other which disperses further potential endogeneity concerns. Including White standard errors makes sure that possible heteroskedasticity problems are not an issue. Augmented Dickey-Fuller tests for all variables indicate no unit roots, except for asset tangibility, which eliminates concerns for spurious results (table 4 in the Appendix). The fact that the hypothesis of a unit root for asset tangibility cannot be rejected seems a bit odd when looking at its stable graph for all countries on an aggregated level (figures 20-24 in the Appendix). Indeed, when the unit root test is repeated for asset tangibility without an intercept, the hypothesis of a unit root can be rejected. Durbin-Watson tests (see output tables 3-7 in section 5) for the different estimations reveal

that some autocorrelation cannot be completely ruled out. However, autocorrelation is overall not strongly biasing the results.

The choice of the crisis period from March 2008 – July 2009 is based on events and empirical evidence in financial markets and in line with the recession indicators from the Federal Reserve Bank of St. Louis. Even if this choice was questioned, an alteration of the crisis period from, for instance mid-2008 to mid-2009, would lead to very similar results. The possibility that the contagion of exports by financial markets needs more time was already tested in table 3. The results of the lagged spread are very similar to the standard findings. Taking the spread of the 3 month Euribor/Eurepo would not change the results as 3 month interest rates are extremely correlated with the 1 month interest rates.

One shortcoming of this paper is that no potential impact of demand side effects is included. However, the applied fixed effects in this paper might partly take into account shocks in countries or industries due to changes in demand. The effect of trade finance is found to be significant with similar results for the individual subsamples underlining the robustness of the findings. However, with the employed estimation technique it is not possible to quantify the supply side effects as to which extent they are responsible for the total decline in European exports. Nevertheless, the significant findings in accordance with existing literature point out that trade finance has to be taken into account by economic policy makers and academic analysis as an important transmission channel of the financial crisis.

6 Policy Implications

Compared to the crisis years 2008, 2009 and to some extent also the beginning of 2010, both financial and goods markets have calmed down and rebounded to pre-crisis activity and productivity levels. Particularly in financial markets though, governments and authorities have, in some cases quite heavily, intervened in order to prevent the whole financial system from collapsing. The crucial question after the crisis is what can be done to prevent similar crises in the future. The following section will therefore briefly summarize what we have learned about the crisis and its effects in general and from this paper in particular and about policy measures that have been employed to counteract the crisis in the trade finance market.

A crucial characteristic of the recent financial crisis was its global scale. Basically every region around the world had been hit by the crisis – either directly or indirectly via spill-overs through financial markets but also through goods markets. This paper confirmed the

simultaneity of the crisis impact on international trade for the euro area. In all examined countries, exports sharply declined due to conditions in financial markets. The great simultaneity of the crisis is not very surprising taking into consideration that financial markets are now more integrated than ever. This holds especially for the eurozone with their common currency. Consequently, global crises require global initiatives based on a high level of international cooperation among policy makers.

However, the results of this paper also point out that even in the highly developed and integrated euro area, some countries react differently than others. In France, the impact on exports by the financial crisis has not been as intense as in the other countries. Therefore, additional to international actions, national policy measures are also needed to address country specific issues of the crisis.

Another finding concerning the crisis is its great speed at which the events in financial but also goods markets developed. Although significant problems in the financial market were already obvious in the first quarter of 2008, single events such as the bankruptcy of Lehman Brothers in September of the same year triggered fast deteriorations in financial markets that quickly spilled over into goods markets. This paper has proven that the worsening of credit conditions affects international trade even in the same month or following month as exports started to crash in the third quarter of 2008 as well. These nearly immediate spill-overs that lasted for several months require immediate policy reactions in order to minimize these contagion effects that can multiply the magnitude and duration of the crisis. As will be pointed out in the following, policy makers intervened rapidly in the financial markets to prevent further spill-overs into the export sector. Without these interventions it is likely that the contagion effect on international trade would have been much worse regarding the magnitude and duration of the contagion.

As the credit crunch in the banking market was to a great extent due to a lack of trust and confidence in the stability and liquidity of other players in the financial market, it is key to restore that confidence as soon as possible. Otherwise the fear of a collapse of the financial sector might turn into a self-fulfilling prophecy as the problems of banks increase with every day of the credit crunch period which could eventually make a collapse more likely.

The measures that were implemented by authorities during the recent financial crisis actually took most of the aforementioned aspects into account. As Auboin and Engemann (2013) state, policy makers learned some lessons from the Asian and Latin American crises in the 90's and responded in a more systemic and planned way instead of ad-hoc solutions as in previous

crises. Typical crisis issues such as herding behavior, little market transparency and increased risk perception were already familiar to institutions. In April 2009 the G-20 Summit in London reacted to deteriorating conditions in international trade with a trade finance support package of up to \$250 billion of credits and guarantees for a time frame of 2 years.²¹ It aimed at improving co-lending and risk co-sharing between private banks and public institutions. Firstly, public export credit agencies introduced programs for short-term lending and guarantees. Secondly, the World Bank Group acted through the International Finance Corporation strengthening its Global Trade Finance Program towards the end of 2008 and introduced the Global Trade Liquidity Pool in mid 2009. Thirdly, regional development banks such as the European Bank for Reconstruction and Development, increased the limits of their trade facilitation programs and provided liquidity windows. Furthermore, central bank stepped in supplying trading companies and local banks with foreign exchange.²² Moreover fiscal stimulus packages were put in place to support the economy against financial contagion effects. These stimuli were sometimes even directly targeted at exporting firms, for example at the car industry in countries such as the US, France or Italy.

It has also to be considered that fiscal and monetary interventions do not come without any risk. One potential problem with rescue packages is moral hazard. Market participants could become less cautious paying less attention than necessary to risks if they know that the availability and affordability of trade finance is guaranteed by public institutions. This leads to a broader problem that is always attached to market interventions: market distortion. Markets were distorted directly as companies were supported in non-market ways and indirectly as the resource allocation in the market is skewed.²³ Generally, market distortions reduce market efficiency assuming that market mechanisms work properly. However, it is arguable how well the market mechanisms worked that caused the crisis. Nonetheless, the distorting effects of market interventions should always be accounted for as they can under certain circumstances only treat but not cure existing problems which might even lead to a prolongation of the crisis.

A major challenge for the future will be to adjust macroeconomic policy and prudential regulation to the new understanding of crisis and policy mechanisms. As the financial crisis

²¹ Auboin and Engemann (2013) state though that only \$140-150 billion have been used of the total \$250 billion package. However, just the existence of more potential credits and guarantees could have already significantly contributed to calm down market participants.

²² For a more detailed analysis of all the measures by the different institutions see for instance Auboin and Engemann (2013) and Chauffour and Malouche (2011).

²³ See Claessens et al. (2010) for further discussion

made painfully apparent, the architecture of international financial markets has fallen behind the international financial system which is integrating more and more at a high speed. Several reforms have already been tackled but it is still questionable if policy making and regulation authorities now have the competence and power to enforce market discipline that could prevent a similar crisis from recurring. As Claessens et al. (2010) conclude, financial regulation and macroeconomic policy has certainly not caused the crisis but it became evident that it has also not been up to the task of preventing the crisis from unfolding.

Lastly, the lack of data availability on especially trade finance markets was already noticeable during the Asian crisis. Unfortunately, the improvements of data availability and transparency in the trade finance market for a better assessment of effects and magnitudes were rather poor until the recent financial crisis. Although surveys by IMF, BAFT-IFSA and ICC shed some light on the trade finance market during and after the crisis, it would still be desirable to enhance the transparency of the trade finance market permanently in order to be able to observe and react to deteriorating market conditions in time.

7 Conclusion

The decline in world trade during the recent financial crisis was both in absolute and relative terms historical. The traditional literature could not satisfactorily explain why exports dropped so sharply as the interaction between financial crises and international trade did not receive much attention prior to the crisis. Therefore, in the few years since the crisis a new strand of literature has emerged that deals with producer side effects that can cause a crisis spill-over from financial markets into the export sector. This paper contributes to this literature providing additional evidence of how trade finance conditions affected exports during the crisis. The focus of this paper is on European exports as Europe is the biggest exporter in the world and thus quantitatively matters for world trade. Concretely, exports from the five biggest economies of the eurozone are examined. The employed dataset is very rich as exports of every country are distinguished on a sector level with 19 sectors in total. The exporting countries are also tested separately in order to see if the exports of European countries were equally affected by the crisis. Additionally, the exports were differentiated according to their export destinations. The analysis further includes indicators for the financial vulnerability of every sector in every country for every year of the sample. This takes into account that sectors

have different needs for external finance and are hence not equally affected by the financial crisis.

The overall results of this paper support previous findings of the literature that financing conditions play an important role for exports. Tighter credit conditions in the interbank market were passed down to exporting firms through a decrease in trade finance. The higher costs and lower availability of trade finance for exporters led in turn to a reduction of export volumes. Following Chor and Manova (2012), financial vulnerability measurements for every sector were included in the estimation. The overall results show that a shock in the trade finance market had indeed a negative significant effect on exports. This finding is found to be very robust as it is confirmed by the tests of the subsamples. The results of the individual exporting countries indicate that all the countries' exports have been affected negatively by the crisis. However, in the case of France, the results were not very significant which implies that French exports have been less impacted through the trade finance channel. This is in line with other evidence suggesting that banks in France have on average suffered less than their European peers. When it comes to the different export destinations, the assumption that a greater distance of the export destination has a stronger effect on exports via trade finance could not be confirmed with certainty. The results for the UK were indeed less significant than the results for the US, China and Russia but the results for Switzerland were very significant. Comparing the different significance levels between the UK and Switzerland but also between China and Russia demonstrates that other factors apart from the distance, such as demand effects and perceived risk of the export destinations, are likely to have played an important role. The evidence of the interaction with the financial vulnerability indicators further shows that these indicators are not the same and that their impacts are not equally significant in each country. This suggests that the practice of the existing literature of assuming constant and identical levels of these indicators for all countries is questionable. Concerning policy implications, the results suggest that policy measures have to be implemented quickly and on a coordinated global scale in order to mitigate and contain the negative spill-overs into international trade. Additionally, apart from multilateral initiatives, measures that address country specific needs are essential since countries are not equally affected by the crisis. A limitation of this paper is that other important factors, such as demand side effects, cannot be tested in this set-up. For future research, an empirical model that can test simultaneously for supply and demand side effects would be ideal as the magnitude and significance of both effects could be compared directly.

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Appendix

Table 1. Matching SITC sectors with SIC sectors

Industry	SIC	SITC
Food and Kindred Products	20	01,02,04,05,06, 07,09,11
Textile Products	22	65
Apparel Products and Clothing Accessories	23	84
Lumber and Wood Products	24	63
Furniture and Fixtures	25	82
Paper and Allied Products	26	64
Drugs	282	54
Plastic Materials	283	57,58
Petroleum Refining and Related Products	29	33
Rubber and Plastics Manufactures	30	62
Leather and Leather Products	31	61
Non-metallic Mineral Manufactures	32	66
Primary Metal Products	33	67,68
Fabricated Metal Products	34	69
Machinery Equipment	35	71,72,73,74,75
Electronic and other Electrical Equipment	36	76,77
Transportation Equipment	37	78, 79
Scientific and Controlling Instruments	38	87, 88
Miscellaneous Manufacturing Products	39	89

Table 2. Summary statistics Financial vulnerability variables

	Mean	Median	Maximum	Minimum	Std. Dev.	Observations
exports (in million USD)	347.964	152.626	7721.229	0.705	679.284	12540
spread (in bps)	17.051	6.850	123.800	1.600	22.864	12350
debt ratio	0.599	0.595	0.973	0.066	0.121	11760
liqui ratio	2.093	1.686	20.885	0.155	1.846	11760
external finance dependence	0.132	0.411	19.895	-28.875	3.396	11508
trade credit	0.142	0.134	0.897	0.009	0.065	11760
asset tangibility	0.266	0.246	0.945	0.055	0.118	11748

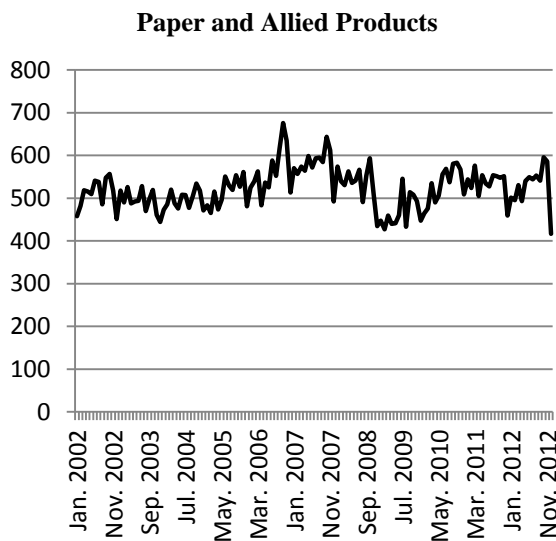
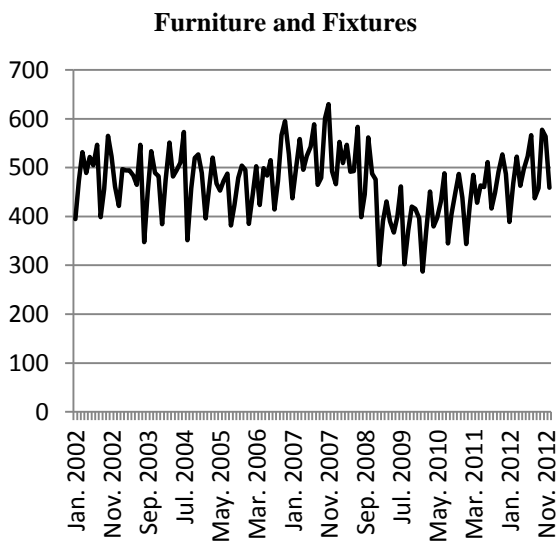
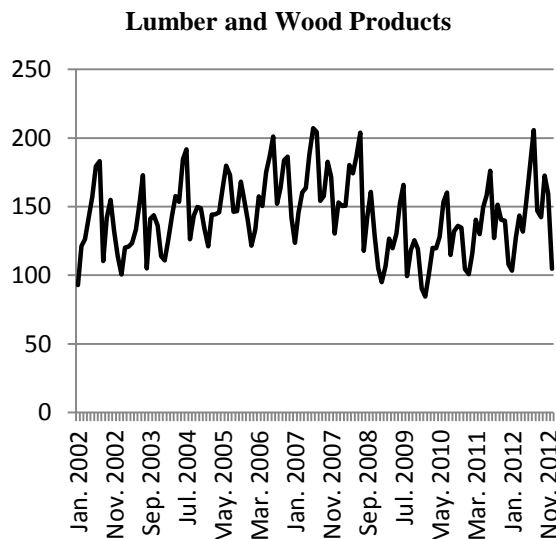
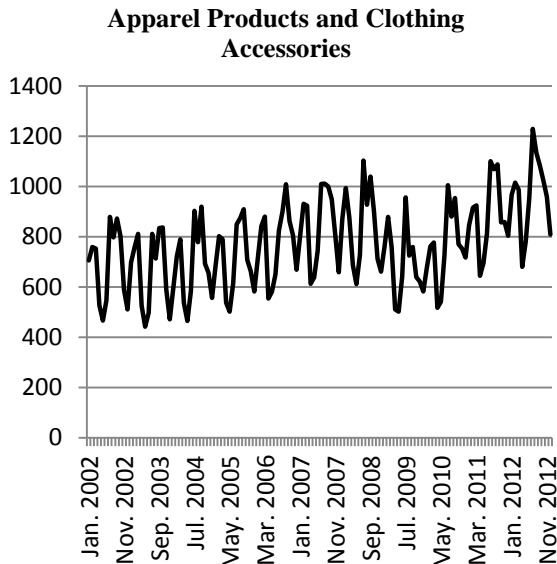
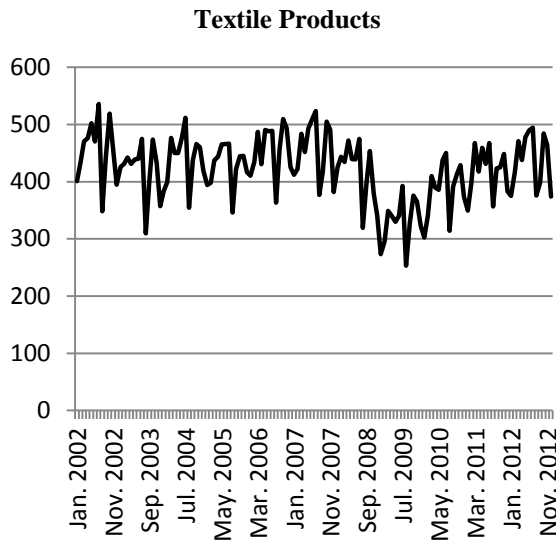
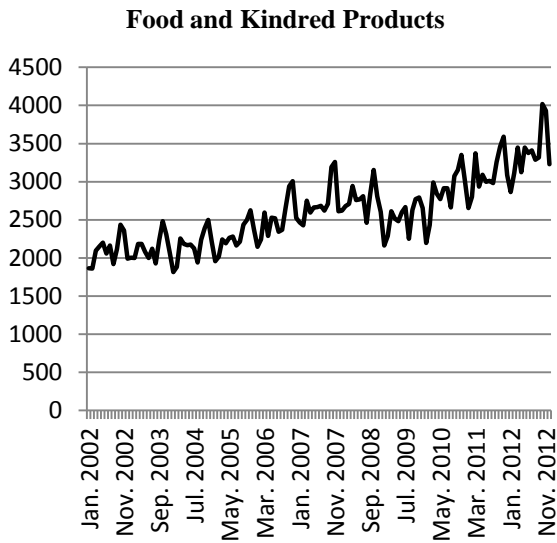
Table 3. Correlation table of independent variables

	spread	asset tang	exfin dep	liqui ratio	trade credit	debt ratio
spread	1.000					
asset tang	-0.045	1.000				
exfin dep	0.034	-0.002	1.000			
liqui ratio	0.010	-0.208	-0.004	1.000		
trade credit	-0.036	-0.066	-0.017	-0.276	1.000	
debt ratio	-0.002	0.098	-0.061	-0.288	0.372	1.000

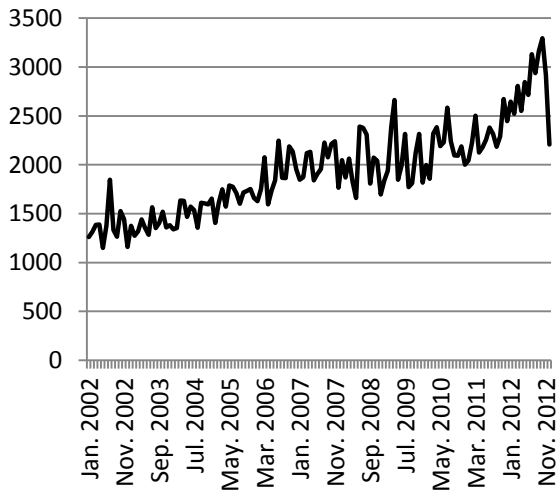
Table 4. Unit root tests of all variables**(Augmented Dickey-Fuller test)**

variable	ADF - Fisher Chi-square
exports	0.0001
spread	0.0000
asset tang	0.8606
exfin dep	0.0000
liqui ratio	0.0000
trade credit	0.0000
debt ratio	0.0000

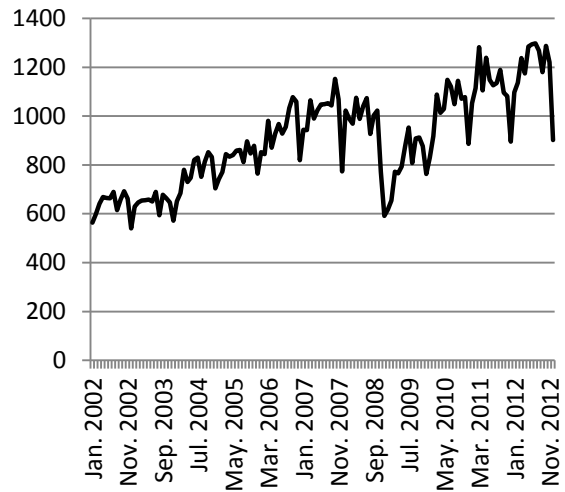
Figures 1-19. Exports of every sectors in million € (aggregated over all countries)



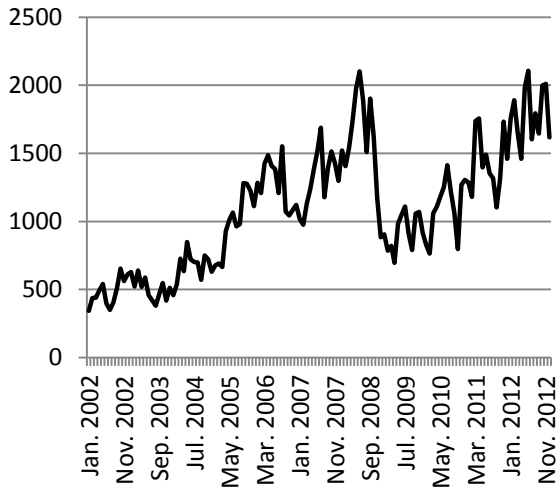
Drugs



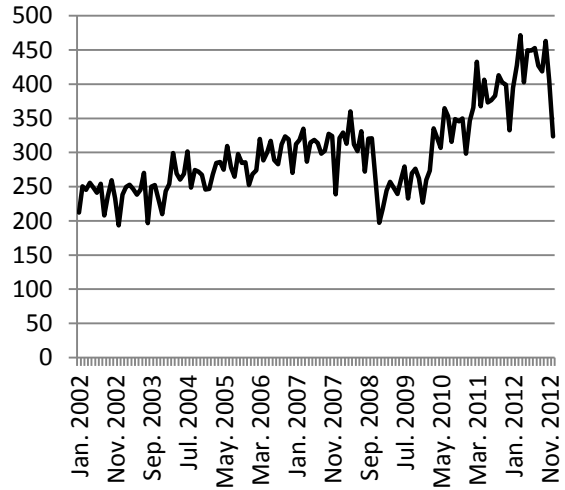
Plastic Materials



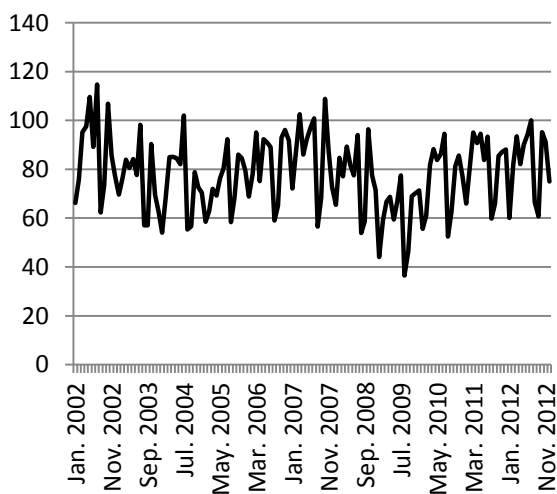
Petroleum Refining and Related Products



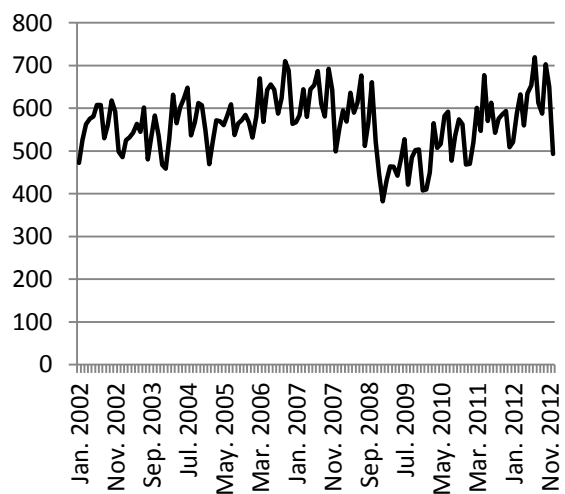
Rubber and Plastics Manufactures



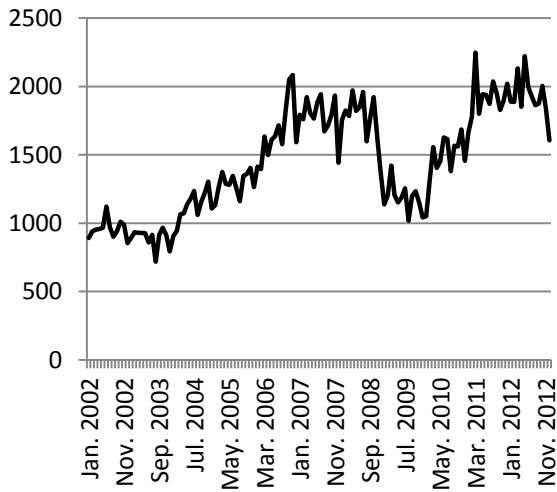
Leather and Leather Products



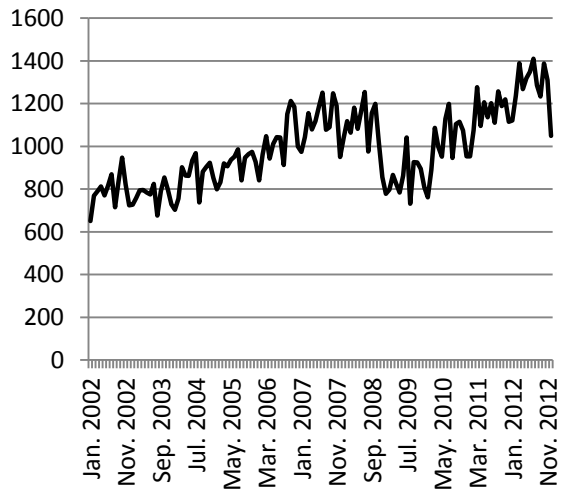
Non-metallic Mineral Manufactures



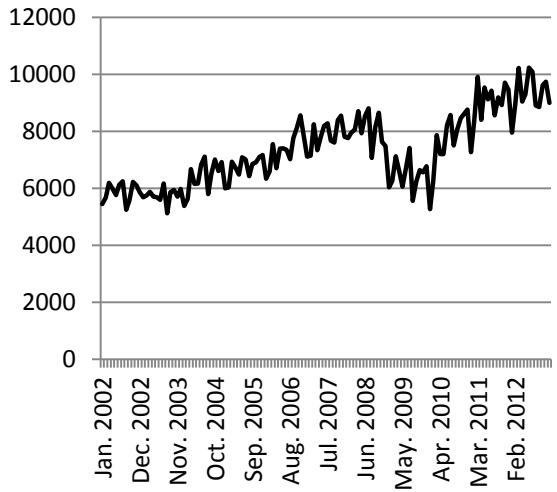
Primary Metal Products



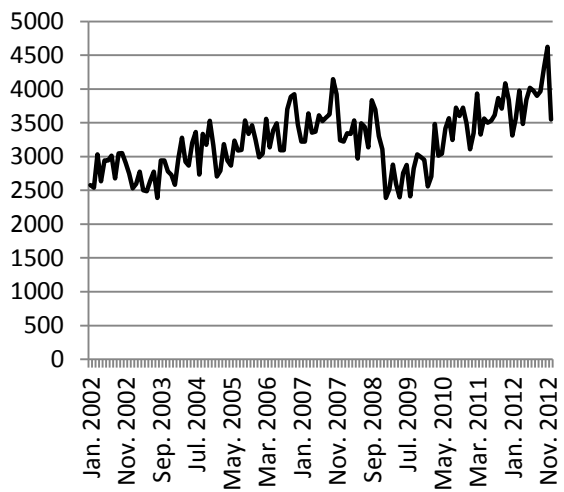
Fabricated Metal Products



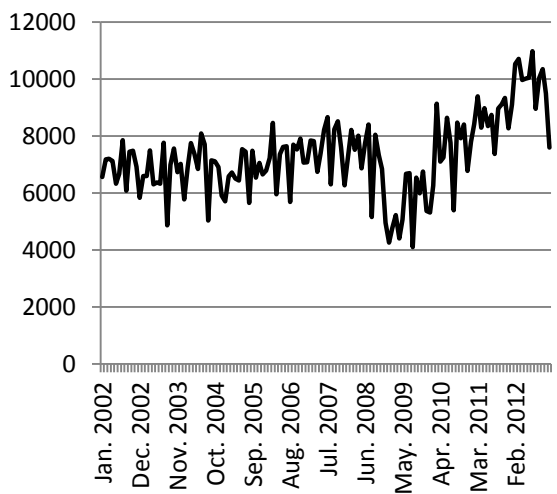
Machinery Equipment



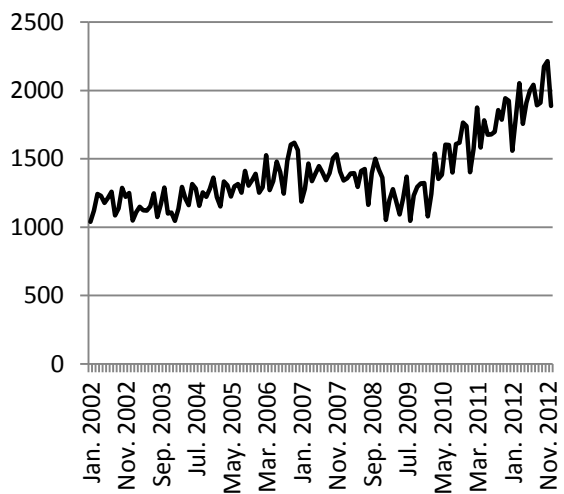
Electronic and other Electrical Equipment



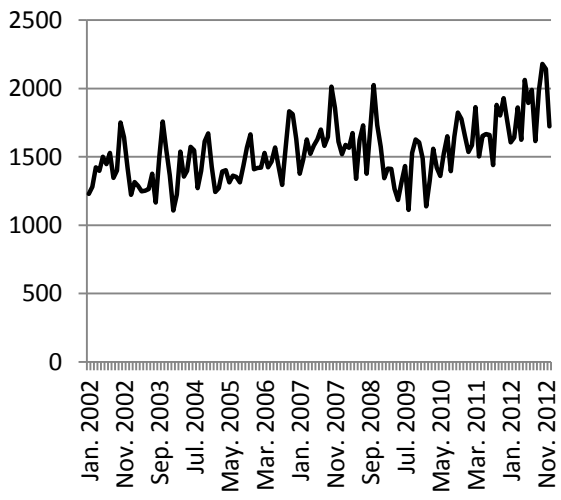
Transportation Equipment



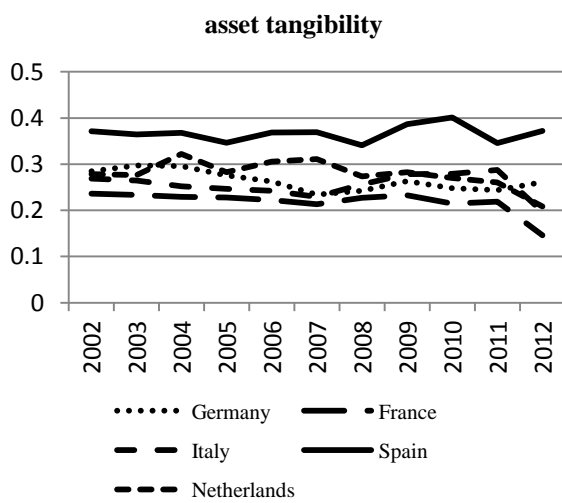
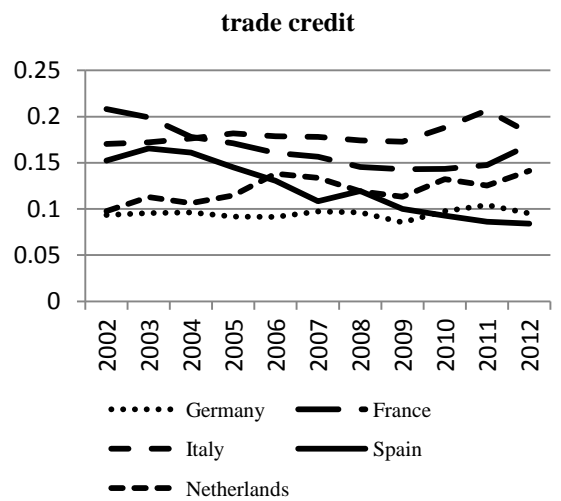
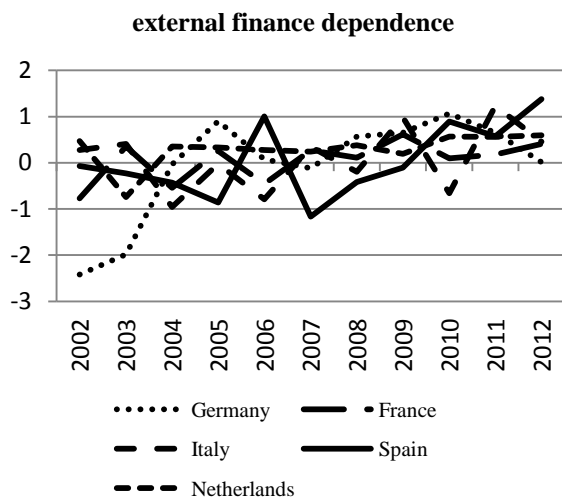
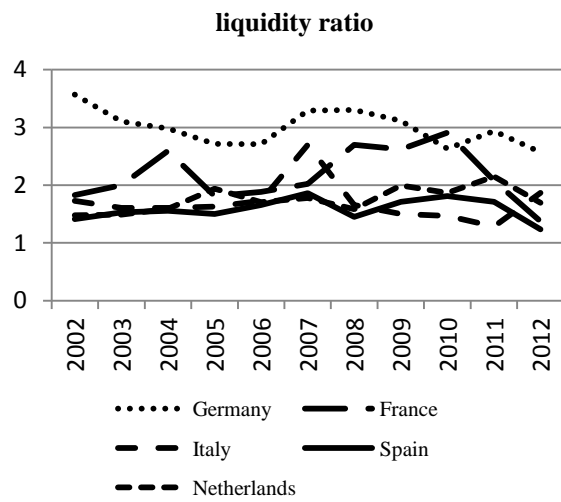
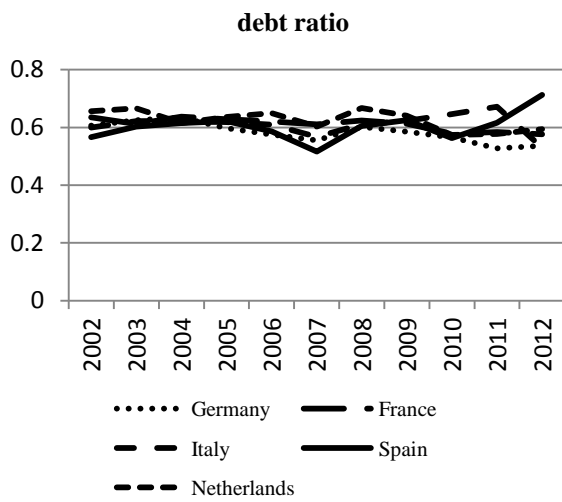
Scientific and Controlling Instruments



Miscellaneous Manufacturing Products



Figures 20-24. Financial vulnerability variables



Tables 4 - 8. Exports by Export Destination

Table 4. Exports to the US – Financial Markets and Financial Vulnerability

dependent variable: exports	financial vulnerability				
	(1) asset tang	(2) exfin dep	(3) trade cre	(4) liqui rat	(5) debt rat
constant	109.00*** (3.55)	112.86*** (3.79)	109.33*** (3.70)	108.75*** (3.68)	108.66*** (3.63)
spread*fin vuln	0.76* (0.37)	0.01 (0.01)	1.15* (0.72)	0.10* (0.06)	0.41* (0.22)
spread*fin vuln*crisis	-1.03** (0.44)	-0.03*** (0.01)	-1.76** (0.85)	-0.11** (0.06)	-0.58** (0.25)
country, sector, month fixed effects	yes	yes	yes	yes	yes
White std errors	yes	yes	yes	yes	yes
R-Squared (adjusted)	0.947	0.947	0.947	0.948	0.948
Observations	11564	11334	11576	11576	11564

Note: ***, ** and * denote significant at the 1%, 5% and 10% levels, respectively. The standard errors are in parentheses. The financial crisis period is defined as March 2008 - July 2009.

Table 5. Exports to China – Financial Markets and Financial Vulnerability

dependent variable: exports	financial vulnerability				
	(1) asset tang	(2) exfin dep	(3) trade cre	(4) liqui rat	(5) debt rat
constant	39.60*** (5.88)	45.77*** (6.38)	38.70*** (5.64)	40.44*** (5.42)	36.60*** (5.50)
spread*fin vuln	1.84*** (0.34)	0.08*** (0.02)	3.84*** (0.83)	0.20** (0.11)	1.22*** (0.25)
spread*fin vuln*crisis	-1.60*** (0.34)	-0.09*** (0.03)	-3.24*** (0.8)	-0.19** (0.11)	-1.05*** (0.24)
country, sector, month fixed effects	yes	yes	yes	yes	yes
White std errors	yes	yes	yes	yes	yes
R-Squared (adjusted)	0.723	0.72	0.724	0.723	0.726
Observations	11564	11334	11576	11576	11564

Note: ***, ** and * denote significant at the 1%, 5% and 10% levels, respectively. The standard errors are in parentheses. The financial crisis period is defined as March 2008 - July 2009.

Table 6. Exports to Russia – Financial Markets and Financial Vulnerability

dependent variable: exports	financial vulnerability				
	(1) asset tang	(2) exfin dep	(3) trade cre	(4) liqui rat	(5) debt rat
constant	30.77*** (3.74)	34.98*** (3.98)	30.35*** (3.70)	31.40*** (3.80)	29.03*** (3.66)
spread*fin vuln	1.03*** (0.22)	0.01 (0.02)	2.04 (0.48)	0.11** (0.06)	0.66*** (0.14)
spread*fin vuln*crisis	-0.56*** (0.20)	-0.01 (0.02)	-0.97* (0.44)	-0.08* (0.05)	-0.37*** (0.12)
country, sector, month fixed effects	yes	yes	yes	yes	yes
White std errors	yes	yes	yes	yes	yes
R-Squared (adjusted)	0.789	0.784	0.790	0.790	0.793
Observations	11564	11334	11576	11576	11564

Note: ***, ** and * denote significant at the 1%, 5% and 11% levels, respectively. The standard errors are in parentheses. The financial crisis period is defined as March 2008 - July 2009.

Table 7. Exports to the UK – Financial Markets and Financial Vulnerability

dependent variable: exports	financial vulnerability				
	(1) asset tang	(2) exfin dep	(3) trade cre	(4) liqui rat	(5) debt rat
constant	122.63*** (3.19)	125.24*** (3.24)	123.25*** (3.27)	122.46*** (3.22)	123.04*** (3.24)
spread*fin vuln	0.33* (0.19)	-0.01 (0.02)	0.31 (0.39)	0.03** (0.02)	0.13 (0.11)
spread*fin vuln*crisis	-0.63* (0.38)	-0.01 (0.02)	-1.29* (0.81)	-0.05** (0.03)	-0.36* (0.22)
country, sector, month fixed effects	yes	yes	yes	yes	yes
White std errors	yes	yes	yes	yes	yes
R-Squared (adjusted)	0.95	0.949	0.95	0.949	0.95
Observations	11564	11334	11576	11576	11564

Note: ***, ** and * denote significant at the 1%, 5% and 11% levels, respectively. The standard errors are in parentheses. The financial crisis period is defined as March 2008 - July 2009.

Table 8. Exports to Switzerland – Financial Markets and Financial Vulnerability

dependent variable: exports	financial vulnerability				
	(1) asset tang	(2) exfin dep	(3) trade cre	(4) liqui rat	(5) debt rat
constant	47.99*** (2.23)	51.62*** (2.39)	47.96*** (2.15)	48.87*** (2.22)	47.36*** (2.13)
spread*fin vuln	0.83*** (0.19)	0.02*** (0.01)	1.51*** (0.35)	0.07* (0.04)	0.44*** (0.10)
spread*fin vuln*crisis	-0.57*** (0.17)	-0.02*** (0.01)	-1.01*** (0.32)	-0.06 (0.04)	-0.3*** (0.09)
country, sector, month fixed effects	yes	yes	yes	yes	yes
White std errors	yes	yes	yes	yes	yes
R-Squared (adjusted)	0.922	0.921	0.922	0.922	0.923
Observations	11564	11334	11576	11576	11564

Note: ***, ** and * denote significant at the 1%, 5% and 10% levels, respectively. The standard errors are in parentheses. The financial crisis period is defined as March 2008 - July 2009.

Tables 9 – 13. Exports by Exporting Country

Table 9. Exports of Germany – Financial Markets and Financial Vulnerability

dependent variable: exports	financial vulnerability				
	(1) asset tang	(2) exfin dep	(3) trade cre	(4) liqui rat	(5) debt rat
constant	352.61*** (14.80)	371.02*** (16.26)	351.82*** (14.26)	357.50*** (14.92)	348.60*** (14.20)
spread*fin vuln	18.62*** (3.98)	0.35 (0.31)	49.19*** (13.10)	0.84* (0.44)	11.09*** (2.59)
spread*fin vuln*crisis	-16.59*** (3.91)	-0.89* (0.55)	-43.79*** (13.08)	-0.78* (0.44)	-9.85*** (2.48)
sector, month fixed effects	yes	yes	yes	yes	yes
White std errors	yes	yes	yes	yes	yes
R-Squared (adjusted)	0.946	0.943	0.947	0.945	0.947
Observations	11564	11334	11576	11576	11564

Note: ***, ** and * denote significant at the 1%, 5% and 10% levels, respectively. The standard errors are in parentheses. The financial crisis period is defined as March 2008 - July 2009.

Table 10. Exports of France – Financial Markets and Financial Vulnerability

dependent variable: exports	financial vulnerability				
	(1) asset tang	(2) exfin dep	(3) trade cre	(4) liqui rat	(5) debt rat
constant	363.66*** (15.77)	370.82*** (16.20)	363.54*** (15.68)	363.4*** (15.73)	363.68*** (15.69)
spread*fin vuln	1.26* (0.80)	0.05 (0.05)	1.43 (1.29)	0.11 (0.09)	0.44 (0.36)
spread*fin vuln*crisis	-1.65 (1.14)	-0.13 (0.09)	-2.65 (1.98)	-0.13 (0.09)	-0.76 (0.52)
sector, month fixed effects	yes	yes	yes	yes	yes
White std errors	yes	yes	yes	yes	yes
R-Squared (adjusted)	0.943	0.943	0.943	0.943	0.943
Observations	11564	11334	11576	11576	11564

Note: ***, ** and * denote significant at the 1%, 5% and 11% levels, respectively. The standard errors are in parentheses. The financial crisis period is defined as March 2008 - July 2009.

Table 11. Exports of Italy – Financial Markets and Financial Vulnerability

dependent variable: exports	financial vulnerability				
	(1) asset tang	(2) exfin dep	(3) trade cre	(4) liqui rat	(5) debt rat
constant	362.97*** (15.85)	370.75*** (16.19)	361.34*** (15.68)	363.28*** (15.86)	361.23*** (15.65)
spread*fin vuln	2.04*** (0.74)	0.05* (0.03)	5.65*** (1.48)	0.17 (0.13)	1.93*** (0.53)
spread*fin vuln*crisis	-2.02** (0.91)	-0.05* (0.03)	-5.26*** (1.81)	-0.22 (0.17)	-1.78*** (0.62)
sector, month fixed effects	yes	yes	yes	yes	yes
White std errors	yes	yes	yes	yes	yes
R-Squared (adjusted)	0.943	0.943	0.943	0.943	0.943
Observations	11564	11334	11576	11576	11564

Note: ***, ** and * denote significant at the 1%, 5% and 10% levels, respectively. The standard errors are in parentheses. The financial crisis period is defined as March 2008 - July 2009.

Table 12. Exports of Spain – Financial Markets and Financial Vulnerability

dependent variable: exports	financial vulnerability				
	(1) asset tang	(2) exfin dep	(3) trade cre	(4) liqui rat	(5) debt rat
constant	363.18*** (15.99)	370.79*** (16.21)	362.93*** (16.00)	362.53*** (15.94)	363.01*** (15.96)
spread*fin vuln	1.4*** (0.33)	0.01 (0.02)	3.01*** (0.76)	0.42*** (0.11)	0.78*** (0.17)
spread*fin vuln*crisis	-1.18*** (0.28)	-0.02 (0.02)	-3.00*** (0.63)	-0.35*** (0.09)	-0.73*** (0.16)
sector, month fixed effects	yes	yes	yes	yes	yes
White std errors	yes	yes	yes	yes	yes
R-Squared (adjusted)	0.943	0.943	0.943	0.943	0.943
Observations	11564	11334	11576	11576	11564

Note: ***, ** and * denote significant at the 1%, 5% and 10% levels, respectively. The standard errors are in parentheses. The financial crisis period is defined as March 2008 - July 2009.

Table 13. Exports of the Netherlands – Financial Markets and Financial Vulnerability

dependent variable: exports	financial vulnerability				
	(1) asset tang	(2) exfin dep	(3) trade cre	(4) liqui rat	(5) debt rat
constant	362.60*** (15.94)	370.90*** (16.16)	362.49*** (15.93)	362.29*** (16.01)	362.47*** (15.86)
spread*fin vuln	3.26*** (0.85)	0.01 (0.08)	5.73*** (1.75)	0.43*** (0.12)	1.41*** (0.39)
spread*fin vuln*crisis	-2.66*** (0.88)	-0.27** (0.13)	-4.89*** (1.83)	-0.39*** (0.12)	-1.30*** (0.40)
sector, month fixed effects	yes	yes	yes	yes	yes
White std errors	yes	yes	yes	yes	yes
R-Squared (adjusted)	0.943	0.943	0.943	0.943	0.943
Observations	11564	11334	11576	11576	11564

Note: ***, ** and * denote significant at the 1%, 5% and 10% levels, respectively. The standard errors are in parentheses. The financial crisis period is defined as March 2008 - July 2009.