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Testing the trade credit and trade link: evidence from data on export credit insurance

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Abstract Trade finance has received special attention during the financial crisis as one of the potential culprits for the great trade collapse. Several researchers have used micro level data to establish the link between trade finance and trade, especially so during the financial crisis, and have found diverting results. This paper analyses the effect of trade credit on trade on a macro level through a whole cycle. We employ Berne Union data on export credit insurance, the most extensive dataset on trade credits available at the moment, for the period of 2005–2011. Using an instrumentation strategy we can identify a significantly positive effect of insured trade credit, as a proxy for trade credits, on trade. The effect of insured trade credit on trade is very strong and remains stable over the cycle, not varying between crisis and non-crisis periods.

Keywords Trade credit · Financial crisis · Import estimation

JEL Classification F13 · F34 · G21 · G23

1 Introduction

Interest from academia in the role of trade finance has grown in the context of the financial crisis and the subsequent global economic downturn. The "trade finance" hypothesis has gained popularity among some economists in their search of

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plausible explanations for the "big trade collapse" of late 2008 to late 2009, when global trade outpaced the drop in GDP by a factor that was much larger than anticipated under standard models. As summarized by Eichengreen and O'Rourke (2010)[1]: "the roots of this collapse of trade remain to be fully understood, although recent research has begun to shed light on some of the causes (see Baldwin (2009); and Chor and Manova (2012))". While most authors agree that the fall in demand has been largely responsible for the drop in trade flows, the debate focused on the extent to which other potential culprits, such as trade restrictions, a lack of trade finance, vertical specialization, and the composition of trade, may have played a role.[2]

The problem for allocating a proper "share" of the trade collapse to trade finance has been one of measurement, and to some extent, definition. In some papers, a distinction is made between trade finance, defined as bank-intermediated traditional financing instruments such as letters of credit, and trade credit, defined as inter-company loans with no bank intermediation (Amiti and Weinstein 2011). While there is no absolute conventional definition of trade finance, bankers have attempted to agree on a broader set of criteria, which eventually encompass both bank-intermediated and direct forms of trade credit. It is hence acknowledged that trade finance covers the "various financial obligations, with varying degrees of risk mitigation and lending involved in facilitating the movement of merchandises between the importer and exporter (and vice versa)".[3] This covers, as in the dataset for this paper, both bank-intermediated and inter-firm trade finance.

With respect to data, empirical work on trade finance has been limited by the lack of a comprehensive dataset, despite the existence of market surveys pointing to the sharp fall of trade finance during the financial crisis (ICC 2009; IMF-BAFT 2009). Although the exact amount of "missing" trade finance may remain unknown, the literature produced in this context made great progress in highlighting the wider link existing between financial conditions, trade credits and trade. Firm-level empirical work has considerably helped in establishing this causality. Amiti and Weinstein (2011), in a seminal paper, established the causality between Japanese firms' exports, their ability to obtain credit and the health of their banks. With firm-level, high frequency customs and credit data, Bricongne et al. (2012) demonstrated that French export-oriented firms in sectors more dependent on external finance have been most affected by the crisis, while Manova (2012) showed that in the United States the cost of external finance may prevent firms, originally fit to export, to actually do so (the role of high implicit trade credit interest rates had also been highlighted by Petersen and Rajan 1997).

If trade finance, notably during periods of crisis, is a potentially strong transmission belt between the financial sector and the real economy, firm-level data—providing for key behavioural indications, need to be complemented by a

[1] http://www.voxeu.org/article/tale-two-depressions-what-do-new-data-tell-us-February-2010-update.

[2] Eaton et al. (2011) find that demand shocks can explain 80 % of the decline in trade and for some countries, like China and Japan, this share is a lot smaller. Hence, a significant share of the trade collapse remains to be explained.

[3] See the Bankers Association of Finance and Trade (BAFT) website's for an expansion of such definition (www.baft-ifsa.org).

macro/micro interfaced approach. Also the link between financial sector conditions, availability of trade credits and trade needs to be established over a full cycle.[4] This paper attempts to do so, using for the first time a database on trade credits large enough to relate it to global trade flows, and a consistent approach linking finance, trade credits and trade at a macro level.

We have used the largest and most consistent database currently available for trade finance, that is insured trade credit collected by the members of the Berne Union of export credit agencies and private export credit insurers, available quarterly per destination country (almost 100 countries) covering the 2005–2011 period. In addition to the richness of the database, it is important for the significance of macroeconomic analysis that the total amount of trade credit recorded annually by the data (close to US$ 1 trillion) be somewhat proportionate to trade flows (US$18 trillion annually for global trade) and overall credit in the countries tested. This enables us to make statements about aggregate effects which can complement previous micro level studies. We have used short-term trade credit data to relate credit to other quarterly flows such as GDP, trade and money.[5]

The paper uses a two-stage approach in its endeavour to link up financial conditions and trade credit availability, in a first stage, and trade credit availability and trade flows, in a second stage. This approach is aimed at avoiding endogeneity problems linked to reverse causality between trade credit and trade, as the volume of trade demand impacts on the demand for trade credit, and trade credit availability impacts trade as well. We use data on the actual level of risk of trade credit (claims on insured trade credit default), which is an important determinant of the supply of trade credit. Under the first stage, the study finds that the volume of insured trade credit available is strongly correlated with overall economic and financial conditions over a full economic cycle—from the upswing of 2005 to the peak of the financial crisis in 2009, and the stabilization of activity in 2010–2011. Insured trade credit is significantly determined by the level of liquidity in the economy and by GDP as a measure of national income. The risk of trade credit has a small but highly significant effect on trade credit availability. In the second stage, trade credit is found to be a strong determinant of trade, in this case imports because trade credit data is spread by destination country. Real GDP and relative prices of foreign and domestic goods, the two traditional explanatory variables of standard import equations, also come out as strong determinants of imports.

Previous studies have opened the way for our work. First, several papers analyse empirically the effect of trade finance on trade during the recent financial crisis. Chor and Manova (2012) provided a significant contribution by linking United States imports to credit conditions during the recent financial crisis. They find that countries with tighter credit markets, measured by their inter-bank interest rate, exported less to the US during the recent financial crisis. We extend the picture by linking directly global imports and trade credit. In their own paper, Amiti and Weinstein (2011) use bank health as a proxy for trade finance. We expand on their

[4] Note that we use the term trade credit for credit extended to finance international transactions (not for domestic transactions).

[5] 80 % of total credit insured is short-term, only 20 % is long-term (over a year) (IMF-BAFT 2009).

findings by using Berne Union data, covering both bank-intermediated and non-bank intermediated trade credit (examples of the latter being suppliers and buyers' credit). While one could usefully argue that bank and non-bank intermediated trade credit respond to different determinants (such as bank and company health, which may be different at a point in time), we tried to capture that element by using both liquidity and GDP as determinants of trade credit—regardless of the latter's origin.

Using monthly data for individual French exporters at the product and destination level, Bricongne et al. (2012) found that financially constrained exporters have been hit more by the crisis than unconstrained exporters. This result also suggests that trade credit impacts trade transactions, which our paper therefore tested successfully at the macro level. Testing this link at the macroeconomic level is important, as some other studies remained inconclusive, when using a micro approach, about the impact of trade finance on trade, in particular during the great trade collapse of 2009 (see e.g. Paravisini et al. 2011; Levchenko et al. 2010; Behrens et al. 2011).

Second, our paper confirms some of the findings by earlier studies using trade credit insurance data, albeit on a smaller scale, generally data provided by individual export credit insurers.[6] Using data on a single private credit insurer, Van der Veer (2010) establishes a causal link between exports and the private supply of credit insurance, also using the insurer's claims ratio as an instrument for insured exports. Felbermayr and Yalcin (2013) estimate the effect of export credit insurance on exports using data of the German export credit agency Euler–Hermes applying a fixed effects estimator, not instrumenting the credit insurance variable. Our dataset includes the data from more than 70 export credit agencies and private export credit insurers. According to the Berne Union, these insurers account for more than 90 % of the insured trade credit market.[7] Furthermore, as in Van der Veer (2010) we can establish a causal link between insured trade credit and trade, using the actual risk of trade credit insurance as an instrument for insured trade credit. The paper most related to ours is the one by Korinek et al. (2010), who also use Berne Union data to analyse the relation between short-term trade credits and trade with a special focus on the financial crisis. We can extend their work by identifying a causal effect of trade credits on trade using our instrumentation strategy.

The paper is structured as follows: Sect. 2 introduces the dataset and gives summary statistics. Section 3 explains our empirical strategy. Section 4 then presents our empirical results. Finally, Sect. 5 gives a conclusion.

2 Data

Finance is the 'oil' of commerce. The expansion of international trade and investment depends on reliable, adequate, and cost-effective sources of financing. For decades, the financial sector has efficiently supported the expansion of world trade by delivering mostly short-term trade credit. 80 % of total trade finance

[6] See Van der Veer (2010), Felbermayr and Yalcin (2013), Felbermayr et al. (2012), Moser et al. (2008) and Egger and Url (2006).

[7] Berne Union website, at www.berneunion.org.

according to IMF-BAFT (2009) is short-term, either in the form of structured finance, such as letters of credit using the merchandise as collateral, or open account liquidity against receivables. Short-term finance is necessary for most international trade transactions because a time-lag between the production of the goods and their shipment by the exporter, on the one hand, and the reception by the importer, on the other. Generally, exporters would require payment, at the latest, upon shipment (at the earliest upon ordering), while importers would expect to pay, at the earliest, upon reception. This time-lag, as well as the opposite interests between the exporters and importers with regards to payment of the merchandises, justifies the existence of a credit, or at least a guarantee that the merchandise will be paid. The credit can either be extended directly between firms—a supplier or a buyer's credit, or by banking intermediaries, which may offer the exporter or the importer to carry for them part of the payment risk (and some other risks involved in the international trade transaction) for a fee. For example, under a letter of credit, the bank of the buyer provides a guarantee to the seller that it will be paid regardless of whether the buyer ultimately fails to pay. The risk that the buyer will fail to pay is hence transferred from the seller to the letter of credit's issuer. In both cases, bank-intermediated transactions or inter-company credit, the risk on non-payment can be insured.

Unfortunately, the international statistical system has failed to keep track of the expansion of trade finance to support international trade. One reason is statistical segmentation between inter-firm credit, collected through enterprise surveys or customs data, and bank-intermediated data, which comes from bank reporting. The former statistics, when accounting "open account" financing, hardly differentiates between trade finance and other forms of short-term cross border finance. The latter, about inter-bank credit, is often based on old exchange controls-based collection system or outdated surveys. All in all, international statistics on trade finance produce inconsistent, poor and at times misleading data. The G-20 has acknowledged this situation and asked for data improvement in this area.[8]

For the time being, the largest source of regularly collected, methodologically consistent data on trade finance is data collected by trade credit and investment insurers. They collect data on trade credit, which is subject to insurance. As any credit, an insurance against default can be obtained from these insurers.

2.1 Berne Union data

Export credit insurers, both public and private, provide insurance on trade credits, thereby reducing the commercial and political risk for trading partners. The risk of non-payment is insured, but also other risks can be covered including the risk of loss or alteration of the merchandise or political risks. Insurance may apply to bank-intermediated trade credit, i.e., letters of credit and the like, and inter-firm trade credit, e.g. suppliers and buyers' credit. In the case of inter-firm credit, the export credit insurer guarantees to indemnify an exporter in case the importer fails to pay

[8] Documents from the G-20 in Cannes (2011) refer to the need to improve statistical information on trade finance (see report of the Development Working Group 2011).

for the goods or services purchased. In return, the export credit insurer charges the exporter a premium. In the case of bank-intermediated credit, the export credit insurer would relieve the importers' and the exporters' bank from some of the commercial risk involved in the transaction.

Berne Union data provides data on insured trade credit, hence on an important part of the trade credit market. It is at the present moment the best possible proxy for overall trade credit. The Berne Union is the international trade association for credit and investment insurers having more than 70 members, which include the world's largest private credit insurers and public export credit agencies. The volume of trade credit insured by members of the Berne Union covers more than 10 % of international trade (Berne Union 2010). The Berne Union data shows that the average country uses insured trade credits for about 20 % of its imports (median 19 %). However, this ratio varies over countries (see Fig. 3 in the Appendix). The minimum of the ratio is about 1 % and the maximum is about 70 %. Countries that do not use insured trade credits at all are not captured in our data, but this bias should be very limited, as there is almost no country in the world that does not use trade credit insurance at all.

The Berne Union dataset includes both data on short-term (ST) and medium- and long-term transactions (MLT). Short-term trade credit insurance includes insurance for trade transactions with repayment terms of one year or less, while medium- and long-term trade credit insurance covers transactions for more than 1 year, typically 3–5 years. Since, as mentioned above, according to the IMF-BAFT some 80 % of total trade credit is short-term, our analysis has focused on short-term trade credit insurance. According to the International Chamber of Commerce Trade Credit Registry, the average tenor of short-term trade credit transactions is around 95 days. Hence, the relationship between global economic activity, global trade, demand and credit is almost direct. All these macroeconomic variables are available quarterly (as well as annual indeed) for most countries in the world. Given the roll-over character of short-term finance (three-month credit financing a trade transaction of that duration, for goods probably produced within close time-span), short-term trade credit is easy to relate to short-term economic activity; in other words, the lag structure with the rest of economic activity is easier to design than with long-term trade credits, financing multi-annual contracts.

The Berne Union collects quarterly data on short-term credit limits by destination countries. Credit limits, as reported by the Berne Union, are the amount of actual trade credit an insurer has committed to insure at a particular point in time. In the following we will refer to credit limits as insured trade credits. In 2008, Berne Union members extended trade credit insurance worth US$ 1 trillion, which fell to about US$ 700 billion in 2009 and then rose again to about US$ 900 billion in 2011. Given the lack of a global, comprehensive set of statistics on trade credit, it is difficult to estimate the total volume of the trade credit markets (insured and non-insured). Hence, Berne Union data capture a reasonable share of it. Note that insured trade credits are a specific fraction of overall trade credits. One may, for example, argue that they differ with regard to the risks involved, both commercial or political, compared to non-insured trade credits. Therefore, with respect to the overall trade finance market our sample covers a specific segment, which one has to

consider interpreting our results. Nevertheless, the Berne Union data is by far the most extensive dataset on trade finance available at the moment.

Additionally, the Berne Union reports data on short-term claims paid by destination countries which captures the actual risk of the trade credit insurance activity. In the case of an inter-firm credit, if the buyer fails to pay for the goods purchased, the exporter can apply for compensation of its loss under the insurance policy. Thus, claims paid measure the amount which exporters have been indemnified for by their export credit insurance. Claims paid increase in times in which political and/or commercial risk rises. Both insured trade credits and claims paid are deflated such that they are in constant dollars using the same deflator as for real imports and real GDP.

2.2 Country characteristics

Our aim is to study the relation between the overall credit market and insured trade credit, and between insured trade credit and trade. The Berne Union provides for credit insurance data by destination country, not by country of origin. Hence, we analysed the impact of insured trade credit on the destination country's aggregate imports. WTO quarterly data on countries' imports of merchandise and commercial services are used alternatively.[9] Real imports have been obtained by applying deflators from the IMF International Financial Statistics (IFS).[10]

Data on gross domestic product (GDP) is taken from the World Development Indicators of the World Bank, thus deflated by a common price deflator. For the relative price measure, the recent dataset on real effective exchange rates produced by the Bruegel Institute is used (for a detailed description of the dataset, see Bruegel 2012). The real effective exchange rate is calculated against a basket of currencies of 138 trading partners. The real effective exchange rate is calculated as

$$REER = \frac{NEER \times CPI}{CPI^*}$$

where *NEER* is the geometrically weighted average of the bilateral nominal effective exchange rates of the country under study with each of the 138 trading partners, *CPI* is the consumer price index of the country under study and *CPI** is the geometrically weighted average of the consumer price indexes of the foreign countries. An increase in the real effective exchange rate implies that the exchange rate of the country under study appreciates.

To measure liquidity in the economy, we use the monetary aggregate M1, a measure of sight deposits and of transaction-based money, and therefore in direct

[9] Commercial services such as marketing, design, engineering, maintenance, transportation, telecommunications and computer services are often part of contracts related to the movement of merchandises. For example, the sale of machinery for outward processing manufactures is often associated to installation, maintenance, computer software design, etc. In industries such as natural resource exploration or satellite launching, the service can even hardly be separated from the merchandise itself. Therefore, it seems to make sense to add statistics of commercial service to imports to merchandise. We have nonetheless excluded services for robustness checks purposes, with little change in results.

[10] Note that the data does not include public services.

relation to the level of transactions in the real economy. Deposits making credit, M1 can be considered as one proxy for short-to-medium term credit.[11] We preferred it to broader credit statistics, which could be potentially misleading when attempting to establish a direct relationship between the credit market (and in general financial conditions available to "real" actors of the economy—such as producers, consumers and traders) and trade credit. Another reason is that credit statistics have been inflated by large leveraging practices (such as sub-primes) during the upswing, and deflated by large deleveraging during the down-swing, thereby not being reflective of the actual volume of finance supplied for cross-border real economic transactions. Quarterly data on M1 have been obtained from the IMF IFS database.

2.3 Summary statistics on the relation between insured trade credit and imports

Our sample comprises 91 countries from the first quarter of 2005 till the fourth quarter of 2011 (unbalanced panel). Among the 91 countries, 35 are high income countries, 26 are upper-middle income countries, 21 lower-middle income countries and 9 low income countries according to the World Bank's country classification by income groups.[12] With these destination countries, we account for about three-quarters of world imports of goods and services. The list of countries included in our sample can be found in Table 2 in the appendix.

Trade credit has proved to be important for international trade, and with it trade credit insurance, during the financial crisis. Figure 1 looks at the relationship between insured trade credit and imports over the recent economic cycle, by taking the average of all countries. It shows that both imports and short-term insured trade credits increased until the beginning of 2008. Short-term insured trade credit thus fell quite sharply in the second quarter of 2008, slightly before imports which collapsed one quarter later, at the end of 2008. In the second half of 2009, imports have been recovering, reaching their pre-crisis level at the end of 2010. Figure 1 may at first sight be interpreted as establishing a link between insured trade credit and the great trade collapse in 2008, the one preceding the other. However, no causal interpretation can actually be established from this apparent correlation.

On the one hand, Fig. 1 would suggest that, dropping one quarter earlier than imports, the fall in insured trade credit is directly responsible for that of imports. On the other hand, one could counter-argue that, short-term insured trade credits having dropped one quarter earlier than imports, firms had already anticipated the decline in orders for the next quarter. In that case, lower expectations on the demand for imports would be responsible for the fall in demand for insured trade credit. This alternative interpretation highlights a potential reverse causality problem that underlines the need for an instrumentation strategy, which is explained in Sect. 3.

[11] It can be argued that financial institutions, through the process of "transformation" use short-term resources for long-term loans. This is a fair argument, However, this possibility is limited by prudential ratios, in particular the liquidity and stable funding ratios, from the Basel international framework.

[12] Countries are classified according to their gross national income (GNI). See http://data.worldbank.org/about/country-classifications/country-and-lending-groups Accessed 03.09.2012.

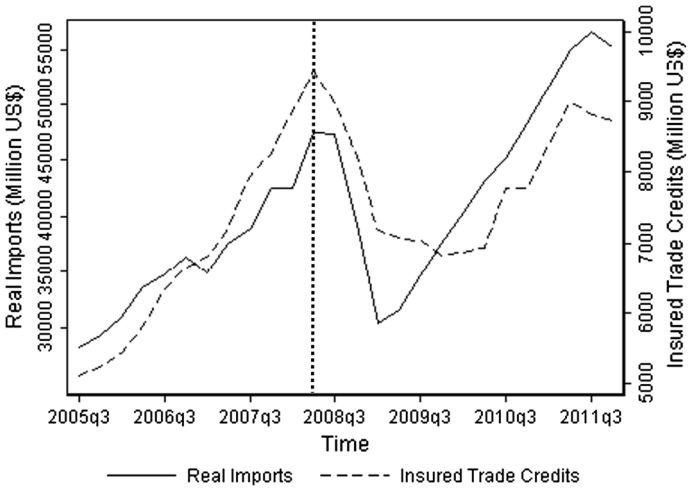

Fig. 1 The relation between imports and insured trade credits in million US$ (averaged over all countries)

We have been able to exploit data for the different country income groups over a full cycle. Table 3 in the appendix includes a summary of basic statistics drawn from our estimation sample. The average amount of short-term insured trade credits granted to companies exporting to a country is about US$ 7 billion per quarter, ranging from US$ 1 million to US$ 73 billion, the median being about US$ 2 billion per quarter.

In comparison to the short-term insured trade credits, short-term claims paid are considerably lower, with a mean of about US$ 3 million per country and per quarter. This stresses the low-risk character of trade credits. Although the perceived risk of international transactions is relatively high, the actual risk is generally low. With a mean of US$ 3 million of claims per country for US$ 7 billion in average trade credits, only 0.05 % of transactions resulted in a claim to the insurance company, while the maximum of claims per insured trade credits over the years from 2005 to 2011 has been 0.2 %. This statistic is very consistent with the ICC Registry on Trade Finance, which also confirms a total of 0.2 % loss default rate for short-term trade finance, insured or not insured, in the period 2005–2011, over US$ 2.5 trillion in short-term trade transactions (ICC 2011).

In Fig. 2 the relation between short-term insured trade credits and short-term claims paid over time is illustrated, albeit the two variables are on different scales. Short-term insured trade credits and short-term claims paid seem to be somewhat negatively correlated over time.

Short-term claims paid increased during the financial crisis in 2009, and insured trade credits were reduced. Indeed, the small ratio of claims paid to short-term insured trade credits indicate that, even in the low part of the cycle, the risk level for such activity has remained small (for example relative to claim/default on other forms of credit, such as real estate-related credit, at the same period). A supply

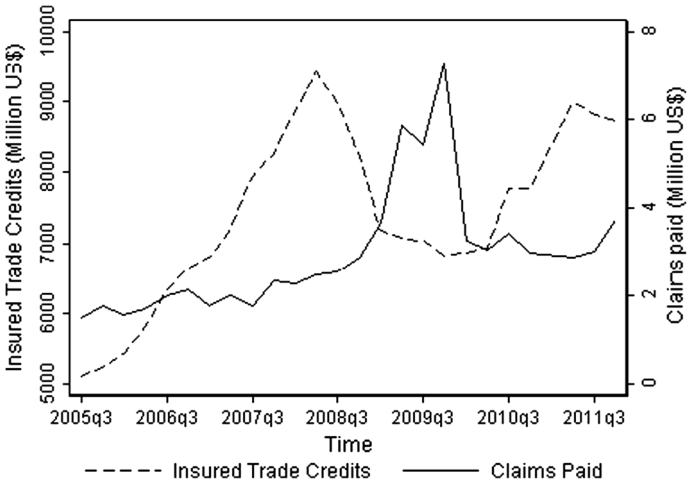

Fig. 2 The relation between short-term insured trade credits and short-term claims paid over time (averaged over all countries)

effect may explain why the increase in claims led export credit insurers to reduce somewhat their short-term credit exposure, despite the absolute low level of risk. When credit insurers observe rising claims, i.e., higher actual risks, they might adjust the risk profile and the amounts they commit to insure according to changes in country and company risk.

However, a comparison between gross insured trade credits and gross claims might be somewhat misleading. Countries importing the most generally have higher volumes of insured trade credit and consequently more claims paid. Hence, using total gross short-term claims paid as a total measure of risk may not be appropriate. Instead, we have used the share of claims paid out of total credit insured for a country as our preferred risk measure.

3 Empirical strategy

3.1 Objectives

One of the intriguing questions during the recent financial crisis has been whether a lack of trade finance has been one of the culprits of the great trade collapse. We have seen that short-term insured trade credits, as a proxy for overall trade credits, and imports are positively correlated. However, we cannot yet make a statement on the causal impact of trade credits on imports due to the potential reverse causality between trade credits and imports already mentioned in Sect. 2. Therefore, we opted for a two-stage approach. In the first stage, we estimate trade credit availability in relation to overall economic and financial conditions in the economy. The second stage establishes the impact of trade credits on imports using the predicted value of the first stage. Some of the determinants of trade credit availability do not impact

imports directly and vice versa are not affected by imports. Hence, using this exogenous variation in the predicted value of trade credit availability, we can identify the effects of trade credit on imports, in the second stage, by excluding the reverse channel (imports affecting trade credits).

$$\log(TF_{jt-1}) = \delta_0 + \delta_1 \log(STC_{jt-2}) + \delta_2 D_{crisis} + \delta_3 \log(L_{jt-2}) + \delta_4 \log(gdp_{jt-1}) + \delta_5 \log(reer_{jt-1}) + \omega_j + u_{jt} \tag{1}$$

$$\log(M_{jt}) = \beta_0 + \beta_1 \log(\hat{TF}_{jt-1}) + \beta_2 D_{crisis} + \beta_3 \log(gdp_{jt-1}) + \beta_4 \log(reer_{jt-1}) + \alpha_j + \varepsilon_{jt} \tag{2}$$

$\log(TF_{jt-1})$ stands for the logarithm of short-term insured trade credits granted for exports to country j in quarter $t-1$. $\log(STC_{jt-2})$ measures the logarithm of the share of short-term claims paid of insured exports to country j in quarter $t-2$. D_{crisis} is a dummy being one for the crisis period of the fourth quarter 2008 till the fourth quarter 2009 and 0 otherwise.[13] $\log(L_{jt-2})$ is a liquidity measure for which we use the logarithm of the monetary aggregate M1 of country j in quarter $t-2$. $\log(gdp_{jt-1})$ measures the logarithm of absolute real GDP of country j in quarter $t-1$. $\log(reer_{jt-1})$ is a measure of the logarithm of country j's relative price of foreign and domestic goods in quarter $t-1$, where we use the real effective exchange rate. $\log(M_{jt})$ are aggregate imports of country j in quarter t. Finally, α_j and $\omega_j\omega_j$ are country fixed effects and ε_{jt} and u_{jt} are the idiosyncratic errors.

In Eq. (1) short-term insured trade credit is regressed on its measure of risk (the share of short-term claims paid), on the level of liquidity in the economy linked to real transactions (M1), on a measure of relative prices between countries (real effective exchange rates), on real GDP, and on a crisis dummy. Taking these explanatory variables individually, we presume the share of claims paid to have a negative effect, and M1 as a measure of liquidity to have a positive effect on insured trade credits. The higher the actual risk of default on trade credit, the more cautious export credit insurers are in granting trade credit insurance coverage. Moreover, the higher the liquidity in the economy, the cheaper and more available trade credit and hence trade credit insurance, leading normally to an increase in supply and demand. We use the second lag of the share of short-term claims paid and M1 because we assume that it takes export credit insurers and trade partners about one quarter to adjust the supply and demand of credit insurance to the actual risk and liquidity in the market. Real GDP, as the overall measure of economic activity and size of economies, influences the demand for traded goods and hence trade credit. It should thus have a positive effect on insured trade credits.

The effect of the real effective exchange rate on insured trade credit can be ambiguous. The argumentation is directly linked to the effect of the real effective

[13] One may argue that the financial crisis already started earlier. However, the real crisis began with the crash of Lehman Brothers in the third quarter of 2008. Nevertheless, in the robustness checks we also use a different definition of the crisis period beginning in the first quarter of 2008. Our results remain basically unchanged.

exchange rate on imports. Under the J-curve effect, an increase (an appreciation) in the real effective exchange rate may have two successive, opposite effects, on imports and hence on the trade balance. In the short run, imports would fall and the trade balance would improve. In the longer term, this would be the opposite, imports may rise above the pre-appreciation level, and the trade balance would deteriorate. In the short run, this is because at the time of an unexpected appreciation, most import and export orders are fixed, as they are placed several months in advance. Hence, the value of the pre-contracted level of imports falls in terms of domestic products, which implies that there is an initial improvement in the trade balance. The fall in import prices may be partly or fully offset by the substitution, if available, of domestic goods by imported goods, but this consumption switch may require time and adjustment. When these changes have taken place, a real exchange rate appreciation would have increased imports in volume in a manner that would offset the price effect, thereby increasing nominal imports relative to the pre-appreciation level (Krugman and Obstfeld 2009). Thus, as we use only one lag and therefore look at a rather short-term effect, the effect of the real exchange rate on insured trade credit may also be negative.

While we believe in the economic rationale for having global economic activity, relative prices, and the crisis dummy as explanatory variables for insured trade credits, they are also needed in the first stage equation from a technical point of view, as they are exogenous explanatory variables of the second-stage.

Equation (2) incorporates insured trade credit as a determinant of the standard, macroeconomic equation for imports, imports depending normally on national income, and on relative prices of foreign and domestic goods (see for example, Goldstein and Khan 1985; Emran and Shilpi 2010, on import demand estimation).[14] We regress a country's aggregate real imports in quarter t on the predicted value of short-term insured trade credits obtained from the first-stage equation, the standard controls of import equations, real GDP and the real effective exchange rate, and the crisis dummy. As it is well established, real GDP, as a measure of the size of an economy, should have a positive impact on real imports. Following the same reasoning as above, the real effective exchange rate may have a negative effect on imports in the short run, i.e., in the time span of the estimation period. This effect would normally turn positive if we considered much longer lags (J-curve effects are thought to last between 6 and 12 months, perhaps more, see Krugman and Obstfeld 2009), but this is not the case in this study. Under Eq. (2), we also presume the financial crisis dummy to have a negative impact on imports, as trade collapsed during the financial crisis. Not including these variables as additional controls to the insured trade credit variable would lead to an omitted variables bias as they would be included in the error term of the estimation equation.

In Eq. (2), we regress a country's real imports in quarter t on the explanatory variables in quarter $t - 1$. This is especially important for trade credits as the financing of the trade transaction is usually needed already one quarter before the

[14] We do not use the standard gravity equation as we think it is less suited for addressing the endogeneity concerns we have regarding insured trade credits. Furthermore, we do not have bilateral trade credit data but data on short-term insured trade credits by destination countries only. Therefore, we rely with our specification on the classical import estimation equation adding trade finance as an explanatory variable.

transaction takes place, i.e., working capital financing. Therefore, in Eq. (1) we regress insured trade credits in quarter $t-1$ on the financial sector variables (the actual risk of trade credits and liquidity) in quarter $t-2$ plus the exogenous regressors of Eq. (2). Again our argument for using the lags is that the supply of insured trade credits takes about one quarter to adjust to changes in the risk environment and the availability of liquidity in the market as export credit insurers do not regularly adjust their credit limits, but rather on a quarterly basis.

3.2 Dealing with the reverse causality issue

Testing for endogeneity as proposed by Hausman (1978, 1983) we find insured trade credits to be endogenous at the 1 % significance level using pooled ordinary least squares (OLS), 5 % significance level for random effect and close to 10 % significance level for fixed effects ($p = 0.000$, $p = 0.038$, $p = 0.103$, see Table 4 in the appendix for the regression results). This endogeneity may be due to the reverse causality problem or a potential omitted variable bias. In order to deal with the reverse causality problem, we use the share of short-term claims paid, i.e., short-term claims paid over total turnover of insured trade credit, as an instrument for short-term insured trade credits in Eq. (1). The share of short-term claims paid can be seen as the actual risk of trade credits, which should not be influenced by the value of imports.

Dividing claims paid by the total turnover of insured trade credit may raise endogeneity concerns. However, we argue that it is the reverse. Not dividing claims paid by the total turnover covered will cause our instrument to be endogenous. This is because short-term claims paid, as reported by the Berne Union data, consist of two components:

$$STC_{jt} = r_{jt} * T_{jt}$$

The risk of non-payment of the trading partner, r_{jt}, and the total turnover of insured trade credit over the period. In order to only control for the risk of non-payment, which influences short-term insured trade credits but reversely is not influenced by short-term insured trade credits, we thus have to divide claims paid by the total turnover:

$$\frac{STC_{jt}}{T_{jt}} = r_{jt}.$$

The instrument is valid as it does have a significantly negative impact on short-term insured trade credits and does not influence imports directly but only via its effect on insured trade credits. Especially, the actual risk of trade credit insurance should have an effect on the supply of insured trade credits by the export credit insurers. Therefore, the exogenous variation we are capturing mainly explains the availability of trade credits which is in our interest. In addition, we use liquidity as a second instrument as it influences trade credits but does not have a direct influence on imports, only indirect via the financing of imports, hence trade credits. We have also tested whether short-term claims per credit and liquidity have a direct effect on real imports. As shown in Table 5 in the appendix, controlling for insured trade credits,

real GDP, the real effective exchange rate and the crisis dummy, the two instruments do not have a direct effect on real imports. Thus, the instruments are relevant. In order to check for the strength of the instruments, we report the F-statistics in the first-stage regression of Table 1a. The F-statistics, except of one, are well above 10, the threshold recommended by Staiger and Stock (1997) commonly referred to in the literature. As we have one endogenous variable and two instruments our model is over identified. The test of over identification shows that the instruments as a group are exogenous as we cannot reject the Null hypothesis that the instruments are uncorrelated with the error term (see Table 1a). In contrast to insured trade credits, the actual risk of credit insurance and liquidity should not be influenced by the aggregate value of imports.

We do not only solve the reverse causality problem with our instrumentation strategy but also a potential omitted variable bias. Certainly, one may still worry about factors influencing both the risk of trade credit insurance or liquidity and imports that we have not included in our estimation equation, such as institutional factors.[15] These factors, though, are captured by our country fixed effects as they do not vary a lot over time. Furthermore, we control for the financial crisis as it is a shock that has influenced imports, trade credits, risk, liquidity and GDP at the same time. For example, the overall economic situation, which may influence our two instruments and the variable of interest, is captured by GDP. In sum, with our instrumentation strategy we use the exogenous variation of the actual risk of trade credit insurance and liquidity to identify a causal effect of short-term insured trade credits on imports.

Equation (1) and (2) are estimated using two-stage least squares (2SLS), random effects instrumental variable estimator (RE IV) and fixed effects instrumental variable estimator (FE IV). Using RE IV and FE IV we can control for observed and unobserved time-constant country effects, such as institutions. We will use the Hausman test to check whether RE IV or FE IV should be our preferred specification. In all specifications we use heteroskedasticity-robust standard errors, taking into account the time-series structure of our data.

4 Results

4.1 Main specification

4.1.1 Linking trade credit to overall economic and financial conditions (Table 1a)

Tables 1a, b contain the first-stage and second-stage results of our main specification. Columns 1–3 of these tables give the 2SLS, RE IV and FE IV

[15] Indeed, other fixed effects could have been included to account for such "institutional factors" such as changes in monetary policy in reaction to the financial crisis, which certainly affected liquidity and other variables. The large number of potential fixed effects is linked to the fact that the estimation equations do not derive from a theoretical model, that would have isolated trade finance from the LM (money) function, and discussed its impact on the (income) IS function. We acknowledge that this would have been a very different paper in scope and ambition.

Table 1 (a) First-stage and (b) second-stage results of the import estimation

Variables	(1)		(2)		(3)	
	L.lSTtrade credit	Beta coefficients	L.lSTtrade credit	Beta coefficients	L.lSTtrade credit	Beta coefficients
(a)						
L.lrealgdp	0.739***	**0.687**	1.133***	**1.053**	1.424***	**1.323**
	(0.0129)		(0.0313)		(0.050)	
Crisis	0.039	0.008	0.072***	**0.015**	0.065***	**0.013**
	(0.0423)		(0.013)		(0.0131)	
L.lreer	0.158	0.007	−0.221**	**−0.009**	−0.497***	**−0.021**
	(0.211)		(0.079)		(0.087)	
L2.ST claims per credit	−0.0184**	**−0.019**	−0.0151***	**−0.016**	−0.0143***	**−0.015**
	(0.0071)		(0.0039)		(0.0038)	
L2.lm1	0.223***	**0.311**	0.0158**	**0.022**	0.0057	0.008
	(0.0058)		(0.0078)		(0.0077)	
Constant	−3.001***		−3.026***		−4.452***	
	(1.007)		(0.379)		(0.416)	
Estimation Method	2SLS		RE IV		FE IV	
Observations	1,776		1,776		1,776	
R-squared	0.887		0.859		0.855	
Number of countries	91		91		91	
F-statistic	748.85		15.77		6.51	
Over identification test						
nR^2	0.0129		0.0720		0.0142	
p-value	0.909		0.788		0.905	

Table 1 continued

Variables	(1)		(2)		(3)	
	lrealimports	Beta coefficients	lrealimports	Beta coefficients	lrealimports	Beta coefficients
(b)						
L. ST trade credit	0.412***	**0.487**	0.365***	**0.432**	0.322**	**0.381**
	(0.0206)		(0.124)		(0.140)	
L.lrealgdp	0.470***	**0.516**	0.459***	**0.504**	0.406**	**0.446**
	(0.0209)		(0.143)		(0.202)	
Crisis	−0.153***	**−0.037**	−0.146***	**−0.035**	−0.140***	**−0.034**
	(0.0230)		(0.0114)		(0.0112)	
L.lreer	−0.302***	**−0.015**	−0.0737	−0.004	0.0218	0.001
	(0.0954)		(0.0494)		(0.0830)	
Constant	2.870***		2.266***		2.647***	
	(0.446)		(0.435)		(0.668)	
Estimation Method	2SLS		RE IV		FE IV	
Observations	1,776		1,776		1,776	
R-squared	0.957		0.958		0.958	
Number of countries	91		91		91	

Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Coefficients in bold are statistically significant

results, respectively, with the beta coefficients reported next to it. The results in Table 1a show that financial conditions prevailing in the economy (money and credit, as measured by M1; and risk, as measured by the claims on trade credit insurance), as well as the overall level of economic activity (as measured by real GDP) have strong explanatory effects on insured trade credit supplied at any point in time.

With respect to risk and money, one would expect the former to have a negative effect on insured trade credit, and the latter to have a positive effect. Both came out clearly in the regression. The risk of credit insurance, measured as the share of claims per total turnover of insured trade credit, has a significant negative impact on insured trade credits.[16] This can be explained via the supply side, credit insurers being more hesitant to extend credit insurance during risky times. However, we see that this effect, while significant, is relatively small. That can be explained by the fact that, while being more prudent in choosing new exposures, credit insurers tend to support their customers during periods of increased risk. The liquidity measure M1 has a significantly positive effect on insured trade credits, which seems to be mainly driven by differences in liquidity between countries. This confirms that the overall conditions of liquidity in the economy have a sizable impact on the availability of trade credits, through insured trade credits.

With respect to real economic activity, it also appears that real GDP has a significant positive effect on short-term insured trade credits. The coefficients imply that a 1 % increase in real GDP leads to a 0.7–1.4 % increase in short-term insured trade credits. Controlling for observed and unobserved country fixed effects leads to an increase in the real GDP coefficient. Hence, there seems to be roughly a 1-to-1 relation between a change in GDP and the change in insured trade credits. Larger countries have a higher demand for insured trade credits, which should lead to a less than proportional effect of real GDP on trade credit because only part of the production is traded. At the same time, export credit insurers are probably also more willing to extend insurance to firms exporting to larger economies, which explain the proportional effect of GDP on trade credit.

The crisis dummy is insignificant in the 2SLS estimation, not considering the panel structure of the data, and positively significant, albeit relatively small, for the RE and FE IV regressions. Assuming that the crisis had a significant positive effect on insured trade credits may be counter-intuitive. This result raises a question mark. Figure 1 may help in answering that question. Although short-term insured trade credits decreased during the crisis, in 2008–2009, its average levels remained higher than in the non-crisis period. Between 2005 and the crisis period, the average level of short-term insured trade credits per country had more than doubled.

Similarly, the real effective exchange rate is insignificant in the 2SLS estimation, but negatively significant in the RE and FE IV regression. The negative effect of the real effective exchange rate hints at the J-curve effect in the short run (as we only test short-run effects in our equations): the primary effect of the real effective exchange rate appreciation is to lower the value of the pre-contracted level of

[16] The short-term claims per credit variable has been rescaled to be on similar scales as the rest of the regressors.

imports in terms of domestic products, and hence to reduce the amount of trade credit, financing this lower value of imports. As a result, the regression shows that an appreciation of the real effective exchange rate by 1 % leads to a decrease in insured trade credits by 0.2–0.5 %. As referred to above, Krugman and Obstfeld (2009) indicate that for most industrial countries J-curve effects last for more than 6 months but less than a year. As we use the first lag of the real effective exchange rate, we look at an adjustment period of 3 months, which lies in the beginning of the J-curve. One would therefore expect a negative coefficient, which appears in the regression.

To be able to compare the coefficients of explanatory variables, we have calculated beta coefficients. The coefficients express the changes in the standard deviation of the dependent variable, if the explanatory variable was to change by one standard deviation. Under these coefficients, real GDP comes up by far as the variable with the strongest explanatory power. Overall, an R^2 of about 0.85 seems to suggest that our explanatory variables of the first-stage equation have sufficient explanatory power.

4.1.2 Causal effect of trade credits on imports (Table 1b)

Independently of the specification, short-term insured trade credits have a positively significant effect on real imports (Table 1b). For an increase by 1 % of insured trade credits in country *j*, country *j*'s imports increase by 0.4 %. This means in effect that the 27.8 % drop of insured trade credit from its peak value of over US$ 1 trillion in the second quarter of 2008 to US$ 734 billion in the first quarter of 2010, would be responsible for a reduction in real imports by about 11 % (hence, in a total of 7 quarters). Therefore, one can confirm the findings by Amiti and Weinstein (2011), and Chor and Manova (2012), whereby trade finance gaps have a significant impact on trade flows, at a macro level.

Additionally, real GDP has a statistically significant impact on real imports. A 1 % increase in real GDP, which can be seen as a measure of overall demand/national income, leads in this specification to a 0.5 % increase in real imports. The income elasticity would be larger if we did not control for insured trade credit (see Houthakker and Magee (1969) and Marquez (2002) for a discussion of income elasticities of import equations). Though, it is in line with the finding of Senhadji (1998) that imports react relatively slowly to changes in domestic income. His results show that short-run income elasticities are on average less than 0.5, whereas long-run income elasticities are close to 1.5.

Table 1b results also show that the crisis dummy has a significantly negative effect, which could be anticipated, as imports literally collapsed during the crisis.

The real effective exchange rate is significant in the 2SLS estimation but insignificant in the RE and FE IV estimations. It is not clear why, but one potential explanation for these non-significant effects is that we use real imports. Hence, there could be no negative price effect of the real appreciation during the period covered by the estimation.

The R^2 of the import equation is about 0.96 for all three specifications, thereby confirming their good explanatory power. This seems logical as we use standard and regularly tested import equations with usual controls, only adding one variable—even if it is measuring as an important factor as trade credit. Comparing the beta coefficients underlines the impact of insured trade credits on trade flows. These coefficients, as well as the great significance of all variables in this equation suggest that economists should take greater account of trade credit developments when forecasting/analysing trade. Subject to more theoretical work, one could wonder whether import equations should include a permanent financing variable into it. In any case, Table 1b confirms the overall conclusions of previous papers by Amiti and Weinstein (2011), Chor and Manova (2012), and others, that trade finance matters for trade.

The results in Table 6 in the appendix show that the effects of insured trade credits are less important on imports when insured trade credits are not instrumented. Not taking into account the endogeneity of insured trade credits, obviously leads to downward biased estimates. This may either be due to the reverse causality or due to a potential omitted variable bias. Hence, our instrumentation strategy helps to better capture the real magnitude of the effect of trade credits on trade at the macro level.

The Hausman test between RE IV and FE IV yields that the Null hypothesis, by which the difference in coefficients is not systematic, cannot be rejected. The Chi squared test statistic is 0.03 with Prob > Chi squared = 0.9999. Hence, although RE IV may be inconsistent due to the assumption that ω_j and α_j are uncorrelated with u_{jt} and ε_{jt}, it should be our preferred estimation as the coefficients do not systematically differ from the ones of the FE IV estimator and RE IV is more efficient than FE IV.

4.2 Robustness checks

4.2.1 Testing for heterogeneous effects of trade credits

Since the financial crisis has played an important role in drawing the attention to the role of trade credits on trade, we tested whether the trade credit effect differed during crisis and non-crisis periods in Table 7 in the appendix. To do so, we included in the specification a term (L.lSTtrade credit*Crisis) allowing for the interaction between the crisis dummy and short-term trade credit—the interaction term, measuring the specific effect of trade credit on real imports during the period of crisis. The coefficient of the trade credit variable (L.lSTtrade credit) measures the effect of trade credit on imports during the non-crisis period.[17]

During the non-crisis period, from 2005 to 2008, and 2010 to 2011, the trade credit elasticity of real imports lies between 0.3 and 0.4. The interaction term for the crisis period, by being insignificant, means that there is no difference in the

[17] To instrument the interaction term we have regressed the endogenous variables insured trade credits on our instruments and the other explanatory variables in the first stage. The predicted value has then been interacted with the crisis dummy.

trade credit effect during the crisis and non-crisis periods, hence this effect remains stable over the whole cycle/period. This seems surprising, as we had thought that the effect of trade credit could have been much stronger during periods of crises, particularly when trade credits lacked. In fact, Table 7 in the appendix shows that trade credits have an equally important role for imports during both periods.

The rest of our explanatory variables remain very robust when including the interaction term. Coefficients do not vary significantly. Real GDP has still a strong positively significant effect on real imports of about 0.5. The crisis dummy has a significantly negative effect on real imports. The real effective exchange rate is only significant in the 2SLS regression but not if we control for country random or fixed effects, like in Table 1b.

4.2.2 Imputing short-term claims data

The database on short-term claims paid data contains about 36 % zeros in the estimation sample.[18] Zeros may be explained by the fact that export credit insurers have not paid any claims in a quarter to a particular country, or because of rounding. All values below US$ 50,000 may have been set to zero by reporting insurers. Furthermore, rounding in general leads to a loss of variation in the claims paid data. A value reported in our data can stand for values between US$ 1,000,000*x − 50,000 and 1,000,000*x + 50,000. Therefore, in addition to using the data as such, we use the procedure for coarsely grouped data of Hasselblad et al. (1980). The basic assumption is that the pre-rounded value of claims has a lognormal distribution and that the mean of the distribution depends on the independent variables of the model. We impute the missing information using the expectation-maximisation (EM) algorithm. Imputation does not generate the true values of claims paid but enables us to handle the data in a way that leads to valid statistical inference. Therefore, we generate 120 plausible values for short-term claims paid (see Heitjan and Rubin (1990) for a discussion on how many imputed datasets one should generate). Thus, we recalculate coefficients and standard errors taking into account that values are imputed (see Rubin 1987).

Table 8 in the appendix presents second-stage results using the multiply imputed short-term claims data. The effect of short-term insured trade credits on imports remains significantly positive. It even increases from 0.4 to about 0.5. Likewise, real GDP remains significantly positive, though it is insignificant in the FE IV regression and for all estimations the size of the effect decreases. The crisis dummy remains significantly negative and very stable. As before, the real effective exchange rate comes out as significant in the 2SLS regression, but it is not in the RE and FE IV regressions.

[18] This is also why we do not take the logarithm of the share of short-term claims paid, as we would lose a large part of our observations otherwise.

4.2.3 *Excluding commercial services*

As the need for trade finance may differ between commercial services and merchandise trade, we have excluded commercial services from the dependent variable. The regression results of the second-stage are shown in Table 9 in the appendix. For the random and fixed effects IV regressions the coefficients of insured trade credits are about the same as with commercial services included in the dependent variable, only for the 2SLS regression the coefficient is smaller. Hence, excluding commercial services does not significantly change our results which indicates that the need of trade credit for commercial services is not so different from the one for merchandise.

4.2.4 *Different definition of the crisis period*

In order to test the robustness of the results with respect to the definition of the crisis period, we have rerun our basis regressions with another definition of the crisis period in Table 10 in the appendix. The crisis dummy is defined as being 1 for the period from the 1st quarter of 2008 to the 4th quarter of 2009. The results remain basically unchanged. The negative effect of the crisis period on real imports is smaller but remains significant. The decrease in the coefficient can be explained by the different definition of the crisis period, as the impact on trade was less severe in the beginning of 2008. Still, the other coefficients remain basically the same. The positive effect of insured trade credit on imports is a bit stronger and real GDP becomes insignificant in the fixed effects IV regression.

Overall, the above checks applied to our estimation results comfort the generally strong robustness of these results.

5 Conclusion

This paper establishes a strong causal link between short-term trade credit insurance, as a measure of trade credit, and trade at a macro level through a full cycle. Using quarterly country-level data of export credit insurers from the Berne Union for the period of 2005–2011, we find that a 1 % increase in trade credit granted to a country leads to a 0.4 % increase in real imports of that country. This effect does not vary between crisis and non-crisis periods. These results stress the importance of trade finance for international trade. Although the debate on the great trade collapse shed the light on the role of trade credit during periods of crises, trade credit appears to be equally important in non-crisis periods. The policy lesson to be drawn is that market incentives for supplying trade credit must be maintained at a high level, particularly during the current period of deleveraging of the financial system (in which bankers may be tempted to reduce exposure to cross-border

banking). Also, access to trade credit insurance can be facilitated and supported, taking into account the low-risk character of the trade credit industry.

There are several avenues for future work on trade finance. First, more extensive data would be needed to be able, on the micro side, to know more about the determinants, the choice between the different instruments of trade finance and the company-impacts. For this, transaction-level data would be needed. Transaction-level data would be also important to analyse inter-firm credit patterns, which are important to understand supply-chain financing arrangements. This would in particular help understand whether any contraction or expansion in the financing of supply-chains has an impact on production and trade sharing within these supply-chains, thereby linking the "vertical specialisation" hypothesis raised as a potential culprit of the great trade collapse (Eaton et al. 2011) and the "trade finance" hypothesis.

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Appendix

See Fig. 3; Tables 2, 3, 4, 5, 6, 7, 8, 9 and 10.

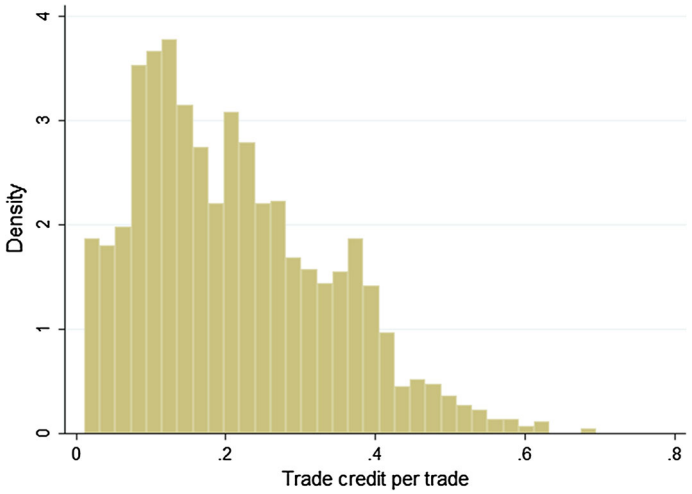

Fig. 3 Histogram of the ratio of insured trade credits scaled by real imports. Figure shows the distribution of insured trade credit over real imports in our estimation sample

Table 2 List of countries included in the estimation sample

Albania	Finland	Namibia
Algeria	France	Nepal
Argentina	Germany	Netherlands
Armenia	Greece	New Zealand
Australia	Guatemala	Pakistan
Austria	Haiti	Paraguay
Bahamas	Honduras	Poland
The Bangladesh	Hungary	Portugal
Belarus	Iceland	Qatar
Belgium	India	Romania
Belize	Indonesia	Samoa
Bolivia	Ireland	Saudi Arabia
Bosnia and Herzegovina	Italy	Seychelles
Botswana	Jamaica	Singapore
Brazil	Japan	Slovak Republic
Bulgaria	Jordan	Slovenia
Cambodia	Kazakhstan	South Africa
Cape Verde	Kenya	Spain
Chile	Korea, Republic of	Sri Lanka
China, P.R.: Hong Kong	Kyrgyz Republic	Sudan
China, P.R.: Mainland	Latvia	Sweden
Colombia	Lithuania	Switzerland
Costa Rica	Luxembourg	Tonga
Croatia	Macedonia, FYR	Turkey
Cyprus	Malaysia	Uganda
Czech Republic	Malta	Ukraine
Denmark	Mexico	United States
Egypt	Moldova	Uruguay
El Salvador	Mongolia	Venezuela, Republica Bolivariana de
Estonia	Morocco	
Ethiopia	Mozambique	

Table 3 Descriptive statistics

Variables	Mean	Sd	Median	Min	Max	Obs.
ST trade credit	7,352.37	12,825.22	1,941.55	1.1	73,254.7	1,776
Log(ST trade credit)	7.21	2.29	7.57	0.1	11.2	1,776
Real imports	36,312.07	76,431.91	9,150.66	29.9	613,943.5	1,776
Log(Real imports)	8.98	1.94	9.12	3.39	13.33	1,776
Real GDP	123,913.2	387,834.2	20,576.5	64.1	3,345,458	1,776
Log(Real GDP)	9.76	2.13	9.93	4.16	15.02	1,776

Table 3 continued

Variables	Mean	Sd	Median	Min	Max	Obs.
M1	1,096,748	2,195,367	24,533.4	27.4	6,994,741	1,776
Log(M1)	10.29	3.21	10.11	3.31	15.76	1,776
ST claims paid	2.83	7.01	0.40	0	119.4	1,776
Log(ST claims paid)	−4.07	6.58	−0.92	−13.82	4.78	1,776
ST claims per credit	0.97	2.44	0	0	42.5	1,776
Log(ST claims per credit)	−4.87	6.11	−8.78	−13.82	3.75	1,776
Real effective exchange rate (reer)	100.57	9.74	99.70	51.7	159.2	1,776
Log(reer)	4.61	0.09	4.60	3.95	5.07	1,776

Summary statistics of the variables included in our estimation are given for the estimation sample. ST insured trade credit, real imports, real GDP, ST claims paid and M1 are reported in million US$. The real effective exchange rate is an indicator being 100 in the last quarter of 2007. Short-term claims per credit are rescaled such that they are on a similar scale as the other explanatory variables

Table 4 Hausman (1978, 1983) test for endogeneity of insured trade credits

Variables	(1) lrealimports	(2) lrealimports	(3) lrealimports
L. ST trade credit	0.409***	0.289***	0.466***
	(0.021)	(0.044)	(0.164)
L. lrealgdp	0.472***	0.556***	0.213
	(0.022)	(0.049)	(0.218)
Crisis	−0.083***	−0.059***	−0.077***
	(0.0199)	(0.0095)	(0.024)
L. lreer	−0.333***	−0.152	0.037
	(0.0981)	(0.044)	(0.089)
Residual	−0.0131***	−0.097**	−0.269
	(0.026)	(0.047)	(0.165)
Constant	3.002***	2.205***	3.414***
	(0.455)	(0.231)	(0.704)
Estimation method	Pooled OLS	RE	FE
Observations	1,776	1,776	1,776
R-squared	0.959	0.959	0.943
Number of countries	91	91	91

Short-term insured trade credits are not instrumented in this regression. *Residual* is the residual of the first-stage regression in Eq. (1). If *Residual* is significant, it means that short-term insured trade credit is endogenous. In the fixed effects regression country fixed effects are used. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 5 Testing whether the instruments have a direct effect on real imports

Variables	(1) lrealimports
L. ST trade credit	0.307***
	(0.0594)
L. lrealgdp	0.575***
	(0.0516)
Crisis	−0.0684***
	(0.0173)
L. lreer	−0.332*
	(0.1934)
L2. ST claims per credit	−0.003
	(0.004)
L2. lm1	0.000
	(0.000)
Constant	2.689***
	(0.8732)
Estimation method	2SLS
Observations	1,776
Number of countries	91

Short-term insured trade credits are not instrumented in this regression. In addition to the usual explanatory variables used in the second-stage regression we add the instruments claims per credits and liquidity. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 6 Estimation results without instrumenting short-term insured trade credits

Variables	(1) lrealimports	(2) lrealimports	(3) lrealimports
L. ST trade credit	0.306***	0.206***	0.203***
	(0.0118)	(0.0381)	(0.0439)
L. lrealgdp	0.575***	0.661***	0.639***
	(0.0115)	(0.0602)	(0.109)
Crisis	−0.144***	−0.134***	−0.133***
	(0.0218)	(0.00998)	(0.00980)
L. lreer	−0.285***	−0.0993	−0.0704
	(0.0908)	(0.0725)	(0.0812)
Constant	2.520***	1.545***	1.655**
	(0.415)	(0.508)	(0.704)
Estimation method	Pooled OLS	RE	FE
Observations	1,949	1,949	1,949
R-squared	0.960	0.958	0.958
Number of countries	91	91	91

Table includes the estimation of the effect of insured trade credits on real imports without instrument insured trade credits. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 7 Second-stage results of import estimation controlling for a special crisis effect

Variables	(1)		(2)		(3)	
	lrealimports	Beta coefficients	lrealimports	Beta coefficients	lrealimports	Beta coefficients
L. ST trade credit	0.409***	**0.484**	0.302**	**0.367**	0.267*	**0.318**
	(0.0212)		(0.146)		(0.158)	
L.lSTtrade credit*Crisis	0.0121	0.022	−0.0019	−0.004	−0.0026	−0.005
	(0.0129)		(0.0042)		(0.0043)	
L. lrealgdp	0.470***	**0.516**	0.492***	**0.536**	0.483**	**0.527**
	(0.0211)		(0.184)		(0.227)	
Crisis	−0.218***	**−0.052**	−0.130***	**−0.031**	−0.123***	**−0.029**
	(0.0732)		(0.0292)		(0.0301)	
L. lreer	−0.296***	**−0.015**	−0.0486	−0.003	−0.0056	−0.0002
	(0.0968)		(0.0631)		(0.0901)	
Constant	2.856***		2.269***		2.415***	
	(0.451)		(0.565)		(0.731)	
Estimation method	2SLS		RE IV		FE IV	
Observations	1,776		1,776		1,776	
R-squared	0.957		0.959		0.959	
Number of countries	91		91		91	

Table includes the second-stage results of our basic specification including an additional insured trade credit*crisis interaction term. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Coefficients in bold are statistically significant

Table 8 Second-stage results of import estimation using multiply imputed short-term claims data

Variables	(1)		(2)		(3)	
	lrealimports	Beta coefficients	lrealimports	Beta coefficients	lrealimports	Beta coefficients
L. ST trade credit	0.519***	**0.614**	0.528***	**0.624**	0.493**	**0.583**
	(0.0298)		(0.169)		(0.220)	
L. lrealgdp	0.408***	**0.448**	0.355*	**0.390**	0.296	0.325
	(0.0286)		(0.182)		(0.294)	
Crisis	−0.146***	**−0.035**	−0.169***	**−0.041**	−0.167***	**−0.040**
	(0.0293)		(0.0167)		(0.0195)	
L. lreer	−0.581***	**−0.029**	−0.089	−0.004	0.0188	0.0009
	(0.1174)		(0.059)		(0.106)	
Constant	3.129***		1.353*		1.737	
	(0.551)		(0.770)		(1.293)	
Estimation method	2SLS		RE IV		FE IV	
Observations	1,776		1,776		1,776	

Table 8 continued

Variables	(1)		(2)		(3)	
	lrealimports	Beta coefficients	lrealimports	Beta coefficients	lrealimports	Beta coefficients
Number of countries	91		91		91	
Number of imputations	120		120		120	

Robust standard errors in parentheses, applying Rubin's adjustment of standard errors for multiple imputations (Rubin 1987). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Coefficients in bold are statistically significant

Table 9 Second-stage results of import estimation using only merchandise imports

Variables	(1) lrealimportsmerch	(2) lrealimportsmerch	(3) lrealimportsmerch
L. ST trade credit	0.239***	0.332**	0.389**
	(0.0221)	(0.134)	(0.161)
L. lrealgdp	0.648***	0.495***	0.274
	(0.0225)	(0.152)	(0.232)
Crisis	−0.163***	−0.165***	−0.164***
	(0.0236)	(0.0124)	(0.0129)
L. lreer	−0.221**	−0.0703	0.0988
	(0.110)	(0.0527)	(0.0952)
Constant	1.762***	1.886***	2.848***
	(0.512)	(0.460)	(0.766)
Estimation method	2SLS	RE IV	FE IV
Observations	1,776	1,776	1,776
Number of countries	91	91	91

Table includes the estimation of our basic regression excluding commercial services from the dependent variable. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 10 Second-stage results of import estimation using a different definition of the crisis period

Variables	(1) lrealimports	(2) lrealimports	(3) lrealimports
L. ST trade credit	0.410***	0.437***	0.466***
	(0.0211)	(0.150)	(0.180)
L. lrealgdp	0.472***	0.394**	0.213
	(0.0213)	(0.164)	(0.240)

Table 10 continued

Variables	(1) lrealimports	(2) lrealimports	(3) lrealimports
Crisis	−0.0832***	−0.0815***	−0.0773***
	(0.0206)	(0.0239)	(0.0260)
L. lreer	−0.333***	−0.118**	0.0370
	(0.0977)	(0.0577)	(0.0978)
Constant	3.002***	2.578***	3.414***
	(0.455)	(0.433)	(0.706)
Estimation method	2SLS	RE IV	FE IV
Observations	1,776	1,776	1,776
Number of countries	91	91	91

1st quarter 2008 to 4th quarter 2009

Table includes the estimation of our basic regression using a different definition of the crisis period. The crisis dummy is defined as 1 for the period between the 1st quarter of 2008 and the 4th quarter of 2009. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

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