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What Do We Know about the Relationship between Access to Finance and International Trade?¹

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Abstract

The recent financial crisis has focused attention on the relationship between access to finance and international trade, triggering a burgeoning segment of the literature evaluating this link empirically. We review the role of finance in international trade and the main theories connecting them. Moreover, we provide a structured road map to recent empirical studies while summarizing what we have learned to date about this relationship. We separately analyze studies that rely on aggregate, industry-level, and firm-level data, emphasizing the differences between those that analyze ordinary times and those that focus on banking and financial crises. We discuss the role of diverse measures of access to finance, financial health, and financial vulnerability along with the key challenges in estimating the relationship between trade and finance. We conclude that once the heterogeneity of methodologies and measures of access to and dependence on finance is accounted for, the empirical literature suggests an important role for finance in determining export participation at the extensive margin but weaker results for the intensive margin of trade. Moreover, while empirical studies tend to favor a causal relationship moving from finance to trade, there is some evidence suggesting causality moving in the opposite direction, which merits further investigation.

JEL Classification: D92, F12, F36.

Key words — international trade, export margins, credit constraints, access to finance

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1. Introduction

The financial crisis that began in 2007 ushered in the world's largest recession since the Great Depression. According to the International Monetary Fund (IMF), gross domestic product (GDP) in 2009 fell by 0.57% worldwide and by 3.48% for the advanced economies, the largest decline in the past 50 years. The global recession was associated with a collapse of international trade, now known as the "great trade collapse" (GTC; Baldwin, 2009). The volume of exported goods and services fell by a staggering 11.2% in advanced economies and by 7.6% in emerging and developing economies (Figure 1). The magnitude of this sudden stop in global trade promptly triggered new analyses and research to explain its causes and implications. In the aftermath of the global financial crisis, the immediate conjecture was that the credit crunch may have caused the large decline in world trade by reducing exporters' access to finance. A few years later, there is some consensus that the demand for intermediates and durable goods played a large role. Recent research by Eaton, Kortum, Neiman, & Romalis (2011) attributes more than 70% of the decline in trade-to-GDP ratios during the Great Recession to the large drop in demand, an estimate supported by further evidence based on micro data (Behrens, Corcos, and Mion, in press). The remaining 20% to 30% of the decline is currently attributed to a series of other factors, among which the contraction of trade finance during the crisis is considered to play a prominent role in part because an emerging body of theoretical and empirical research has identified a positive relationship between relationship between access to finance and certain measures of export (Chor & Manova, 2012; Amiti & Weinstein, 2011).

Figure 1

In this paper, we focus on this body of research and tackle three issues. First, we provide an outline of the role of trade finance in international trade and how it differs

from trade credit. Second, we discuss the theoretical work that explains its functioning. And third, we survey the existing empirical evidence on the subject, discussing the key challenges faced by researchers and the solutions adopted. In particular, we focus on the role of measurement error, endogeneity and selection bias, and demand shocks. Our final objective is evaluating the current knowledge on the relationship between finance and trade and providing a road map of the literature and its challenges to researchers.

In order to provide a synthesis of these studies, we pooled the existing studies in Tables 1 and 2 that provide five lessons. (i) Studies that focus on aggregate data, either at the country or the industry level, are consistent in finding an important role of financial development and credit and external financial dependence (measured in various ways) in explaining the existence of export flows and their magnitude. (ii) The majority of studies that use firm- or plant-level data identify an important role of access to finance, financial health, and external financial vulnerability in explaining the extensive margin of exports in terms of export entry, status, number of destinations, and number of products exported. These results are consistent with the existence of relevant fixed costs to export that play a prominent role in international trade theory. (iii) Studies that analyze the intensive margin of export—the magnitude of export sales, intended as export-to-total sales, volume of exports, or export growth—provide somewhat mixed results on the role of finance, which is sometimes positive and significant but small, and sometimes statistically insignificant. (iv) Studies that focus on financial shocks due to banking or financing crisis find that such shocks explain a significant but relatively small portion of export adjustment, particularly in industries with more pronounced external financial dependence. These results imply that policy intervention in the form of support of exporters' financing during financial crisis may provide some assistance in smoothing adjustment but by no means counterbalance large export contractions due to demand shocks. (v) There are only a few studies that explicitly test the direction of

causality between trade and finance and they reach opposite conclusions; these contradictory results warrant further studies.

Tables 1 and 2

The paper is organized as follows: Section 2 explains the basic elements of trade finance and the differences with respect to trade credit. Section 3 discusses recent models linking trade and finance. Section 4 reports the various definitions of credit constraints used in the literature. Section 5 presents the related empirical evidence. Section 6 addresses the relative econometric issues, and Section 7 concludes.

2. What is Trade Finance and What Does Access to Finance Mean?

Why do exporters need credit in a way that differs from domestically oriented firms? How does trade finance fulfill this need?

Firms typically rely on external capital (in addition to their own capital, internal cash flows, and reinvested earnings) to finance fixed and variable costs. Examples of fixed costs are research and development, advertising, and fixed capital equipment. Examples of variable costs are intermediate input purchases and inventories, and payments to workers before sales and payments of their output take place. Certain idiosyncratic features of international trade entail additional fixed and variable costs compared with production for domestic markets (Manova, in press; Feenstra, Li, & Yu, 2011). First, export activities entail extra up-front expenditures that may force firms to rely on external finance—for example, learning about the profitability of new export markets; making market-specific investments in capacity, product customization, and regulatory compliance; and setting up and maintaining foreign distribution networks. Second,

exporting generates additional variable trade costs due to international shipping, duties, and freight insurance, some of which are incurred before export revenues are realized. In addition, cross-border delivery can take longer to complete than domestic orders, a fact that increases the need for working capital requirements relative to those of firms that sell only domestically. For example, ocean transit shipping times can be as long as several weeks, during which the exporting firm typically waits for payment.

Governments, banks, and other financial institutions have developed a wide set of specialized instruments to provide so-called trade finance to overcome the aforementioned obstacles to exporting—that is, financial instruments that are used and sometimes tailored to satisfy exporter needs, normally providing both liquidity and insurance. Most such contracts require some form of collateral (e.g., tangible assets such as inventories).

Although the role of trade finance in international trade appears anecdotally important, reliable estimates are difficult to obtain because neither banks nor firms usually report export loans separately from other loans on their balance sheets. Some estimates suggest that up to 90% of world trade relies on at least one trade finance instrument (Auboin, 2009), although as noted by Love (2011), the source of this figure is uncertain.

The finance literature makes an important distinction between trade credit and trade finance. *Trade credit* is an agreement between two parties in which a customer can purchase goods on account without paying cash immediately and can pay the supplier at a later date. Usually when goods are delivered, a trade credit is given for a specified number of days (30, 60, or 90) and is recorded in the accounts receivable section of the firm's balance sheet. Trade credit is a relatively expensive form of financing; implicit interest rates can exceed 40% if the borrower does not take advantage of early-payment discounts.¹ Firms may engage (and record in their accounts) trade credit even if they not engaged in international trade.

Trade finance generally refers to formal borrowing by firms from banks or other financial institutions to facilitate international trade activities.

Banks and financial institutions essentially provide trade finance for two purposes. First, it serves as a source of working capital for individual traders and international companies in need of liquid assets. Second, it provides insurance against the risks involved in international and domestic trade, such as price or currency fluctuations, and especially nonpayments.

Each of these two functions is fulfilled by a certain set of credit instruments explained in detail, for example, in Chauffour and Malouche (2011):

- (i) open accounts in interfirm or supply chain financing;
- (ii) traditional bank financing for investment capital, working capital, and pre-export finance;
- (iii) more direct payment mechanisms, such as letters of credit, suppliers' credit linked to bank financing, countertrade, factoring and forfeiting, instruments of risk management (such as advance payment guarantees, performance bonds, refund guarantees, hedging). Direct payment mechanisms are quantitatively more relevant, and within this group the most widely used instrument to provide liquidity is the commercial letter of credit, a form of documentary credit.² A second method of providing liquidity is credit to the buyer or supplier. Credit counters the off-balance-sheet financing provided by documentary credit and represents the more traditional form of lending. Credit may be provided in the form of working capital or overdraft or term loan facilities. Third, countertrade arrangements are used in situations and countries in which a shortage of foreign exchange reserves or liquid assets may prevent exchange of goods for money. Under such arrangements, buyers and sellers agree that goods will be traded at a fixed value without involving the

use of cash or credit terms, but rather in the form of barter-exchange, counterpurchases, or buy-back promises. Countertrade emerged as an important instrument after the breakup of the former Soviet Union. A fourth instrument is termed factoring (if trade is domestic) or forfeiting (if trade is international). In this case, the seller remits guaranteed debt from a sale on credit to a financial firm that pays the face value of the debt minus a discount in cash up front. The seller is then no longer liable for default of the buyer when the debt comes to maturity.

- (iv) Finally, export credit insurance and guarantees against the risks involved in international and domestic trade, chiefly price or currency fluctuations. Trade finance instruments that combine an insurance component and a credit component are often offered by government agencies involved in export promotion.

While access to trade finance may be important for international activities, it is sometimes difficult to distinguish access to trade credit more generally, and these difficulties are evident given the varieties of measures used in the empirical work we will examine after discussing theories of trade credit and trade finance in the next section.

3. Theoretical Underpinnings

From an aggregate perspective, the relationship between financial development and international trade at the country level was recognized long before the recent crisis. An early study by Kletzer and Bardhan (1987) shows that even in a world in which countries have identical technology or endowments, comparative advantage may differ in the presence of credit market imperfections, modeled as both moral hazard in international credit markets under sovereign risk and as cross-country differences in credit contract enforcement under incomplete information. Matsuyama (2005) and Qui

(1999) make a similar point, albeit in a different framework and using different types of frictions, but they also focus on a cross-country perspective with representative firms. Finally, while in many cross-country studies the financial development is taken as an endowment, Do and Levchenko (2007) show the reverse link—namely, that financial development depends on trade patterns. They show that financial development is endogenous to the extent that it is determined by the demand for external finance in individual countries: If comparative advantage in trade affects a country’s production patterns, then countries specializing in goods that are more financially dependent will have a high demand for external finance and therefore a high level of financial development as measured by country-level data. Do and Levchenko (2007) develop a model with these features and test it using a panel with 96 countries and 30 years of industry-level data in which industries make different use of external finance (in the sense of Rajan and Zingales, 1998). They construct a measure of external finance need of export and show that a country’s financial development is robustly influenced by the external finance need of its export, thus underscoring the issue of endogeneity that may affect this relationship.

Although these studies relate a country’s level of financial development to international trade, they do not consider the role of financing specifically for exporters and importers. Introducing this distinction requires the specification of some form of firm-level heterogeneity in motivations and incentives to partition the population of firms among importers, exporters, and domestically oriented firms. Many models developed within the new trade theory with monopolistic competition allow this characterization; in addition, they provide an excellent framework to exploit the richness of microeconomic data. Many recent contributions introduce finance elements into new trade theory models. This is a somewhat natural step because from a firm-level perspective a large segment of the finance literature focuses on access to credit that can be connected to

trade theory. Given our focus on international transactions, we discuss trade credit only briefly and later introduce the main theoretical explanations for trade finance in an open-economy environment.

Love (2011) provides an exhaustive discussion of the different theories explaining the existence of trade credit. Her analysis focuses in particular on the following explanations: (i) theories of comparative advantage in information acquisition by suppliers on the financial health of the buyers, (ii) comparative advantage in liquidating repossessed goods in the event of nonpayment, (iii) the use of trade credit as a warranty for product quality to allow the customer sufficient time to test the product, (iv) price discrimination by suppliers between cash and credit customers or in an oligopolistic supplier market, (v) sunk costs and customized products generated by the repeated interaction between pairs of suppliers and customers, and finally (vi) theories of moral hazard positing that suppliers may be less susceptible to the risk of strategic default than banks because inputs are less liquid and thus less easily diverted than cash.

Naturally, several descriptions of trade credit can also explain the existence of trade finance, although specific features of international transaction would suggest additional determinants that are at play. Formal explanations of why trade finance may be more important in an open economy than in a closed economy are recent. One element of differentiation is that international and domestic trade finance loans carry different levels of risk and international trade may require stronger credit protection. Ahn (2011) develops a model in which letters of credit emerge as payment tools in international trade. That model explains why the riskiness of international transactions increases relative to domestic transactions during economic downturns and why international trade finance is more sensitive to adverse loan supply shocks than domestic trade finance. Banks' optimal screening decisions in the presence of counterparty default risks explain why banks maintain a higher precision screening test for domestic firms and a

lower precision screening test for foreign forms, which justifies the more widespread use of letters of credit.

Using a broader concept of finance, a small segment of the theoretical literature has emerged to explain the importance of access to credit for exporters. These studies develop partial equilibrium models that can provide testable implications using firm- or plant-level micro data and therefore they tend to develop from the Melitz (2003) model. The first models with heterogeneity and financial features are those of Chaney (2005) and Manova (in press). Newer models focus on the dynamic aspects of the relationship between finance and export growth (Caggese and Cunat, 2013; Kohn, Leibovici and Szkup 2012; Besedeš, Kim, and Lugovskyy, 2011) or develop the banking component of the model (Feenstra et al., 2011; Eck, Engemann, and Schnitzer, 2012) discussed at the end of this section.

Two key elements of these models shape the related empirical analyses and testable implications. First, there are sizable fixed costs for entering a foreign market that must be paid up front, a cash-in-advance constraint. Part of the empirical trade literature has extensively estimated the size of such fixed costs (e.g., Das, Roberts, & Tybout, 2007) but the issue of how they are financed has been traditionally disregarded, assuming perfect capital markets. Second, the inability of firms to fully pledge the returns of foreign sales to financiers causes informational frictions and monitoring problems. Lenders may be reluctant to provide financing for export ventures because information about foreign markets and their profitability is difficult or costly to obtain.³ Such reluctance is aggravated by the fact that the enforcement of contracts in an international setting is potentially incomplete.

Both Manova (in press) and Chaney (2005) embed credit frictions in the Melitz (2003) model with fixed cost, and firms' heterogeneity derives the implication that larger, more-productive firms are less likely to be credit constrained and therefore more likely

to export. However, while Manova assumes that firms must borrow to finance exports, Chaney conjectures that firms must finance the costs for entering foreign markets using cash flows from domestic sales. Higher productivity generates larger profits in both models, but in the Manova model it increases the probability of repaying the debt, whereas in the Chaney model it increases the probability of reinvesting earnings. In both cases, however, there is a positive link among productivity, the ability to finance the fixed cost, and the probability of assuming export status (extensive margin).

The implications of the two models, however, differ with respect to the intensive margin (i.e., the magnitude of firms' exports conditional on the export status). In Manova's (2008) model, credit affects the extensive margin because variable production costs need to be financed with external capital as well. In Chaney's (2005) model, once a firm has enough liquidity to pay the fixed cost of exporting, it is able to finance the variable costs of expanding the scale of production with internal funds or even by external borrowing.

Interestingly, Manova's (in press) model weakens the sharp prediction of Melitz's (2003) model that the likelihood of exporting increases with a firm's productivity. In a range of intermediate productivity levels, firms may have an incentive to shrink their exports below the unconstrained first-best, a situation in which they may not be able to obtain sufficient funding to repay financiers. With a lower level of exports, the need for external finance is also lower and exporters manage to satisfy the participation constraint of financiers.

The role of financial institutions in the models just discussed is quite limited and lacks the nuances brought about by banks' monitoring problems and the diversity of funding instruments.

One major issue in international trade transactions is the increased difficulty for banks to observe firms' productivity than in a closed economy, and evaluating potential export profits may be more difficult because of informational problems, an issue that has motivated many papers focused on trade credit. Feenstra et al. (2011) explicitly model the monitoring process of banks in such an environment. Banks lend below the amount needed for first-best production to maintain incentive compatibility. The longer time required for export shipments prompts a tighter credit constraint on exporters than on purely domestic firms, even in an exporter's home market. The greater risk faced by exporters also affects the credit extended by banks. Extra fixed costs reduce exports on the extensive margin but can be offset by collateral held by exporting firms. Schmidt-These theoretical studies neglect the heterogeneity of financing instruments, an issue that may provide interesting research avenues. Schmidt-Eisenlohr (2009) studies the optimal choice between different payment contracts used to allocate risk and to finance the time gap between production and sales along with their implications for trade. The equilibrium contract depends on both financial market characteristics and contracting environments in both the source and the destination country. Antràs and Foley (2011) develop a model in which the choice of trade finance instrument depends on importers' default risk and the risk of non-delivery; they focus on the different degrees of contract incompleteness in importer-exporter bilateral trade relationships.

Eck et al. (2012) focus specifically on a trade credit form of supplier credits and cash in advance and relate it to international trade, trying to explain why trade credit/finance is so widely used in international trade despite its high cost. They develop a model in which trade credit can alleviate financial constraints arising from asymmetric information because it serves as a quality signal and reduces the larger uncertainty pervasive in international transactions, relative to regular bank loans.

Russ and Valderrama (2009) integrate the choice between bank and bond financing into a new trade theory model to show the differential effects of financial policy on the distribution of firm size, welfare, aggregate output, gains from trade, and the real exchange rate in a small open economy. When firms borrow to finance investment, they face a choice between bank and bond financing. Bond borrowing is unmonitored and harder to access (due to fixed costs of issuing debt) but involves a lower interest rate. Bank borrowing involves lower fixed costs but higher interest rates. Increasing bank efficiency and reducing bond transaction costs increase welfare but have opposite effects on the extensive margin of trade, aggregate exports, and the real exchange rate.

4. The Measurement of Access to Finance

Good measures of trade finance are difficult to obtain for three main reasons. First, banks do not report export trade finance separately on the assets side of their balance sheets and are reluctant to release sensitive data related to the identity of their clients that engage in trade finance. Second, firms do not report export financing independently on the liability side. Third, it is technically difficult and cost-ineffective for statistical agencies to track trade finance in balance of payment statistics.

As discussed in Auboin (2009), until 2004 a series of trade finance statistics was derived from balance of payments and Bank for International Settlements (BIS) banking statistics, thanks to an interagency effort by the International Monetary Fund, World Bank, BIS, and the Organisation for Economic Co-operation and Development (OECD) but this effort has since been discontinued. Currently, the only reliable source of statistics concerning trade finance is the Berne Union database, although these data refer only to the insurance component. This organization collects data on the amount of business of more than 70 export credit agencies and private export credit insurers that account count for more than 90% of the insured trade credit market. Absent official

country-level statistics on trade finance, survey-based data on banks' activities at least provide some information on developments in trade finance, a tool that has been relied on during the recent financial crisis (see Asmundson, Dorsey, Saito, Niculcea, & Kachatryan, 2011).

Here we are concerned with how access to finance is measured is measured in empirical work. Roughly speaking, the literature has focused on (i) indirect measurement through industry-level indicators of external financial vulnerability, (ii) subjective measures self-reported by firms, (iii) a wide variety of objective measures constructed from balance sheet data, and (iv) a combination of the previous measures.

Measures of external financial vulnerability exploit cross-industry variation in financial dependence. They are based primarily on three measures of financial vulnerability, generally constructed from firm-level commercial data such as Compustat North America. Thus, they often consider only publicly traded firms. Financial vulnerability is captured by the following measures: (i) measures of dependence on external finance, such as the fraction of total capital expenditure not financed by internal cash flows from operations, as in the work of Rajan and Zingales (1998). (ii) Access to buyer-supplier trade credit is measured as the ratio of the change in accounts payable to the change in total assets, which reflects how much credit firms receive in lieu of the requirement to make up-front or spot payments (Fisman & Love, 2007). (iii) A measure of asset tangibility similar to that in Claessens and Laeven (2003) is the share of net plant, property, and equipment in total book-value assets and reflects firms' ability to pledge collateral in securing external finance. These measures are interpreted as capturing a pseudo-technological dependence on finance of each individual sector because they are measured using data from U.S. publicly traded firms, which arguably face the lightest frictions in accessing capital markets.

These objective indicators are complemented and sometimes substituted by subjective measures collected through questionnaires to entrepreneurs or managers. The most comprehensive subjective measures are reported in the World Business Environment Surveys (WBESs). In these representative surveys, firms' managers are simply asked whether they consider access to credit as an obstacle to their business. In some surveys, these questions refer to access to credit in general, whereas in other surveys, questions are specified in terms of both quantity and prices. Answers are then ranked on a 1 to 4 scale (or to 5 in some surveys), where 1 corresponds to the absence or irrelevance of this constraint.

Finally, objective measures are reconstructed either from balance-sheet information or using combinations of other responses to questionnaires. A non-exhaustive list of these measures includes (i) the ratio of cash flow to total assets; (ii) the ratio of total debt to total assets; (iii) the stock of short-term debt normalized by total assets; (iv) the quick ratio (the sum of cash, cash equivalents, and net receivables divided by current liabilities); (v) working capital (the difference between current assets and current liabilities normalized by total assets); (vi) the liquidity ratio, defined as the ratio of a firm's current assets minus its short-term debt to total assets; and various other measures.

We look more deeply into the choices of different authors and their implications for the estimation strategy in Section 5 and Table 2. For now, it is important to note that since perception measures may be biased by the opinions of individual respondents and are generally imprecisely quantified, efforts have been made to verify the correspondence between objective and subjective measures. For example, Hallward-Driemeier and Aterrido (2009) use the WBES to compare the subjective perception of respondents with balance-sheet-based measures of constraints for a large number of obstacles to business; they report that the two are generally positively and significantly correlated

and that such correlation would suggest that researchers should feel at ease using subjective measures. We select 27 WBESs from the Business Environment and Enterprise Performance Survey (BEEPS) to show how the two measures are correlated. Similar to other WBESs, the BEEPS includes a section where firms can identify the main constraints to their business, such as access to financing and cost of financing.⁴ Using these subjective measures may help better capture the business environment and thus minimize omitted variable bias. However, it is important to note that these qualitative indicators do not perfectly match their quantitative counterparts. We use an approach developed by Kuntchev, Ramalho, Rodriguez-Meza, and Yang (2012) to study access to credit for small enterprises; this approach exploits other answers to the WBES on loan applications, rejections, and so on. Figure 2 compares the subjective measures reported by each firm in the BEEPS with the objective measure derived by other questions. In both cases, the measures cover the range from credit unconstrained to fully credit constrained. Figure 2 suggests a positive correlation between the two measures. Interestingly, these measures correlate with country-wide measures of the amount of credit to the private sector as a percentage of GDP, a variable collected by the World Bank in its World Development Indicators. Figure 3 shows (i) a positive correlation between country-wide credit and the share of firms classified as either unconstrained or constrained but (ii) a negative correlation with the per country share of firms reporting full or partial credit constraints.

Figure 2

Figure 3

5. Trade and Finance: Evidence

The empirical literature was scant until the latter part of the 2000s when studies on trade and finance started mushrooming. Table 1 lists the studies we are aware of and

provides details for some studies. Table 2 provides a structured summary of the results and identifies the margins examined, the measures of access to credit used, and the results of the estimation. The existing analyses use aggregate data, industry-level data, and firm-level data with various approaches and results. Clearly this wealth of approaches has the potential to confound meta-research.

(a) Aggregate and industry-level views

The classic analysis of the relationship between credit and trade is due to Kletzer and Bardhan (1987). Their analysis is further developed by Beck (2002), who shows that two-sector small economies with a better-developed financial sector have a comparative advantage in sectors with large scale economies and, all else equal, are net exporters of the goods they produce, relative to less financially developed countries. Tests of these models rely necessarily on cross-country aggregate data. Estimation results from a 30-year panel with 65 countries support the predictions of the model: Countries with a higher level of financial development have higher shares of manufactured exports in both GDP and total merchandise exports and have a higher trade balance in manufactured goods. In a similar fashion, but under a model-free estimation strategy, the first step by Ronci (2004) to analyze the relationship between short-term credit and international trade focuses on financial crises episodes (see Section 5(e)).

Manova (2008) provides a more detailed analysis using industry-level data for a large number of countries and studies the empirical connection between shocks to the availability of external finance and export behavior. The result shows that equity market liberalizations increase exports disproportionately in financially vulnerable sectors that require more outside finance or use fewer collateralizable assets. These liberalizations are more pronounced in economies with initially less-active stock markets (indicating that foreign equity flows may substitute for an underdeveloped domestic financial system) and in the presence of higher trade costs caused by restrictive trade

policies. Manova (in press) tests the model discussed in the previous section to establish causality; the model uses industry-level data and exploits cross-country variations in the level of financial development and cross-industry dispersion in external financial vulnerability. The analysis first establishes that weak financial development and financial vulnerability reduce both domestic output and export; 20% to 25% of the impact of credit constraints on trade is driven by reductions in total output. Of the additional trade-specific effect, about 25% is due to entry into export at the extensive margin, while two-thirds is due to changes in exporters' sales at the intensive market. In a particularly broad analysis of the extensive margin, the results show that financially developed economies export more in financially vulnerable sectors because they can (i) enter multiple markets, (ii) ship more products to each destination, and (iii) sell more of each product.

Together, these papers support the view of a positive link between credit and trade at the country and industry levels, although this relationship may simply be masking the common determinant that richer countries tend to be more open and have better-developed credit sectors. One of the most important caveats of this approach is that the correlation between credit and export may be affected by reverse causality because an increase in relative foreign demand for sectors intensive in external funds might lead to both higher exports from these industries and to more borrowing in the economy, as measured by private credit. Therefore, financially developed economies may result in increased exporting of the more financially dependent goods even if there were no credit constraints. Moreover, the results of Do and Levchenko (2007) support the notion that causality may go from exporting due to comparative advantage to financial development. The implications of these studies are reflected in a handful of firm-level studies discussed in the next subsections.

(b) Firm-level views

Many recent papers have focused on the trade/finance nexus exploiting rich micro data. The primary focus has been on determining the relationship between measures of access to finance on the extensive and intensive margins, with a recent push to calibrate quantitative models of firm dynamics. As in some theoretical models, the extensive margin has been interpreted in at least three ways: (i) export status (exporter versus non-exporter), (ii) the number of destination markets served by an individual firm, and (iii) the number of products exported by an individual firm, as well as the combinations of (i) and (ii), (i) and (iii), and (i), (ii), and (iii). The intensive margin normally refers to the magnitude of foreign sales, expressed either in monetary values or as a share of total sales.

To guide our analysis, instead of discussing all individual studies, we constructed Table 1, which lists the authors and years of various studies, the most important details of the individual studies, the focus of the analysis, and the results. Most papers adopt a single-country perspective and focus on developed countries, for which presumably more reliable data are available, there is sufficient variation to justify regrouping the papers depending on whether they focus on advanced economies or not.

(i) Advanced economies

A widely used dataset is the Belgian Business Registry, which covers the population of firms (census) required to file their accounts with the National Bank of Belgium; Behrens et al. (in press) provide an excellent description of these data. Muûls (2008) develops a two-country Chaney-Manova-style model with heterogeneous firms and focuses on export status, entry, destinations, total exports, and products. In her empirical specification, credit constraints measured by a credit score have a significant effect on the extensive margin in terms of export status and number of destinations but the effects on the number of exported products, the intensive margin at the destination

level (the volume of exports), and the probability of becoming an exporter are not statistically significant. Bellone, Musso, Nesta, and Schiavo (2010) use a panel of French firms and find evidence that more firm-level measures of credit use and credit scores play a role in explaining export status but are insignificant to explain the intensive margin.

Minetti and Zhu (2011) take a similar approach and use a confidential Italian dataset, the Capitalia survey of small- and medium-sized firms (fewer than 500 employees) that also contains detailed balance-sheet information but only for certain years and for a limited number of firms. Minetti and Zhu (2011) focus on the 2001 Capitalia survey and analyze the extensive margin in terms of both pure exporting status and the number of destinations (at most, eight regions in the survey) and the intensive margin in terms of total foreign sales. Their paper is particularly interesting for two reasons: First, they exploit a peculiar feature of the Italian banking system (restriction to interprovince entry) to control for endogeneity (see the next section). Second, they use (binary) subjective measures of credit constraints because in their dataset firms are asked directly whether they feel credit constrained. Since this measure does not allow them to gauge the severity of the constraint (for example, some firms could be denied a larger amount of bank credit than others or have easier access than others to forms of financing alternative to bank loans), they also exploit information on firm characteristics and the industries in which firms operate, showing that credit constraints especially hinder exports by firms with no long-established relationships with creditors and those with few creditors. Finally, their analysis also reveals that liquidity constraints depress firms' exports, especially in industries with high external financial dependence (as defined in Section 4), a result that is consistent with Manova (in press). With the same Capitalia data, Forlani (2010) uses balance-sheet information to construct various measures of credit constraint (equity ratio and quick ratio) and finds

results consistent with those of Minetti and Zhu (2011). It should be noted that the dataset used by these authors contains data only for on small- and medium-size firms. On the one hand, these firms are somewhat more likely to face financing constraints; on the other, they are less likely to be exporters. Therefore, the advantage of this dataset is that it allows the estimation of the effect of liquidity constraints for the firms that may be more affected by them. In another attempt to use both subjective and balance-sheet measures of credit, Eck et al. (2012) find evidence supporting the view that trade credit fosters exporting and importing at both the intensive and the extensive margins for German firms in 2004 (BEEPs data) and self-reported difficulties in accessing credit create a drag on both margins.

Finally, with even more finely disaggregated data, Antràs and Foley (2011) provide a unique investigation into the role of contractual heterogeneity in the financing terms of trade. The authors describe the various nuisances of a rich transaction-level dataset provided by a U.S.-based exporter of frozen poultry and other refrigerated foods. They show that importers located in countries with weak contractual enforcement and more distant from exporters tend to favor options such as cash in advance or letter of credit terms. Exporters, on the contrary, tend to use letters of credit infrequently. Repeated successful interactions tend to limit the use of terms that require prepayment. As the authors discuss, these results can be rationalized by the model whenever (i) misbehavior on the part of the exporter is of little concern to importers and (ii) local banks in importing countries are typically more effective than the exporter in pursuing financial claims against importers.

(ii) Emerging and developing economies

Berman and Héricourt (2010) perform a unique firm-level study in a cross-country context by using the WBES for nine countries as well as cross-country variations in financial development. They find that lower financial constraints have a positive effect

on the extensive margin. Their study also examines the interaction effect between firms' credit constraints and productivity and concludes that productivity has a greater impact on export participation in more financially developed countries. However, the authors also find no role of financial constraints on the extensive margin in terms of destinations and on the intensive margin.

Alvarez and Lopéz (2012) find that financial development has an impact on export status in Chile but with different effects on small and large firms. Feenstra, et al. (2011) find a positive significant role of finance for both the intensive and the extensive margins for Chinese firms.

Zia (2008) in Pakistan and Kappoor, Ranjan, and Raychaudhuri (2012) in India also find a positive significant role of access to subsidized credit, the former focuses on changes in export sales after the elimination of subsidized credit to a specific segment of the textile sector, the latter on the level and growth of individual exports by subsidized firms in India.

Tables 1 and 2 provide more details on some of these studies that we regroup in the next pages. Here, we want to stress that these papers clearly highlight two elements of this firm-level literature. First, many different approaches can be used to measure access to credit. Second, the results may appear contradictory but the discrepancies can be conceivably the outcome of the various empirical models and measures.

(c) Dynamic and quantitative evidence

Caggese and Cunat (2013); Kohn, Leibovici and Szkup (2012); and Besedeš, Kim and Lugovskyy (2011) focus on export growth and the dynamics of export and exporters in connection with financial constraints. Caggese and Cunat (2013) provide a more explicitly dynamic model in the spirit of Manova (in press) that specifically accounts for the probability of bankruptcy. They also use the Capitalia survey, but they study the capital structure

and the financial constraints faced by the firms as determined endogenously, given the investment decisions of the firms and their idiosyncratic demand shocks. Frictions to financing affect exports along two dimensions: directly, by hindering the payments of export fixed costs and, indirectly, by altering the selection into entry in the home market and the riskiness of operating firms. Financially constrained firms, which would become exporters in an unconstrained model, may postpone their decision to export in foreign markets because the fixed costs associated with exporting may increase their bankruptcy risk. The main measure of firms' financing constraints is reconstructed from three questions in the survey that ask (i) whether a firm had a loan application turned down recently, (ii) whether the firm desires more credit at the market interest rate, and (iii) whether the firm would be willing to pay a higher interest rate than the market rate in order to obtain credit. A positive answer to any of these questions identifies a credit-constrained firm, and 14% of the firms in this sample appear credit-constrained. Caggese and Cunat (2013) find evidence consistent with the idea that financing constraints are relevant for explaining export status, but less relevant for explaining the intensive margin.

Kohn, Leibovici, and Szkup (2012) study a somewhat similar small open economy with heterogeneous firms subject to financing constraints and working capital requirements. Firms need to pay their labor costs in advance and a fixed cost if they export, subject to a borrowing constraint that depends on the amount of assets held as collateral. The model is calibrated to match moments from Chilean plant-level data. The authors find that, in contrast to standard models of international trade with sunk export entry costs, theirs can account for the observed *new* exporter dynamics, in addition to the cross-sectional facts matched by standard models.

Finally, Besedeš, Kim, and Lugovsky (2011) study the effect of credit constraints on the growth of exports at the product level. Their model produces the key implication that credit constraints play a key role in early stages of exporting, but not in later

stages. Although this result is obtained in a representative firm framework reminiscent of the predictions of the Kohn, Leibovici, and Szkup (2012) paper, these authors produce empirical estimates using product-level data on exports to 12 European Union members and the United States confirming that exports from more credit-constrained exporters grow faster. Moreover, export growth rates decrease with duration and converge across countries. Larger initial export volume reduces subsequent growth. These results confirm that credit constraints are an important factor in early stages of export but their effect diminishes over time. At the country-level, the characteristics of the financial environment are measured by the average lending rates charged by a country's banking system and the share of private credit in GDP.

(d) Government support and trade insurance

Some trade finance instruments contain an insurance component that can be provided either privately or by government organizations (Figure 4). In addition, governments in emerging and development countries may introduce or discontinue credit subsidies to promote export; such subsidies can be exploited with appropriate estimation strategies. Zia (2008) studies the relevance of subsidized credit in promoting firm-level export growth and analyzes the efficiency of credit allocation using loan-level data for Pakistan. This study exploits the exogenous nature of the discontinuation of subsidized credit for exporters of cotton yarn to estimate the effect of credit on the volume of exports. The results indicated that removing a 6% rate subsidy from a market lending base of 14% leads to a 29% (significant) decline in firm exports. Importantly, the results are heterogeneous across types of firms; exports of large, publicly listed, and group network firms are unaffected and the results persist over several years. Kappoor et al. (2012) exploit a similar exogenous policy change in India. They adapt a difference-in-differences methodology to focus on the introduction of subsidized direct credit to exporters in 1998

that was subsequently reversed in 2000. This study also finds that subsidized credit expanded export earnings when introduced but, interestingly, once removed it did not affect export growth, a result that would be consistent with an influence of access to finance on export participation in the presence of fixed costs of exporting but not on the intensive margin of trade.

Figure 4

There is currently little evidence regarding the role of public guarantees offered by import-export government agencies in promoting trade. The role of private guarantees has been explored even less. Both Egger and Ural (2006) and Moser, Nestmann, and Wedo (2008) find a small positive impact of Austrian and German public export credit guarantees on trade in the long run.⁵ While government guarantees are quantitatively limited, target-specific destination markets and industries and are generally of long duration, private credit insurance is likely to be quantitatively more relevant and more related to trade patterns because terms are usually much shorter (typically 60 to 120 days). These differences also imply that variations in the private credit insurance supply are more likely to affect exports than variations in the public credit insurance supply. In a rare study of trade insurance, Van der Veer (2010) reports that private insurers covered an estimated 16.7% of Dutch exports in 2006, compared with 0.9% of exports insured by the Dutch state. If a similar ratio characterized U.S. exports, a back-of-the-envelope calculation would suggest that about 50% of U.S. exports would be guaranteed by either private or public insurance. Van der Veer quantifies the impact of changes in the supply of private credit insurance and exports using the Berne Union dataset from 1992 to 2006. He consistently finds a positive and statistically significant effect of private credit insurance on exports. Based on these estimates, the reduction in private insurance exposure during the 2008-09 international trade collapse would explain about 5% to 9% of the drop in world exports.

Auboin and Engemann (2012) also use the Berne Union dataset. The volume of trade credit insured by members of the Berne Union is about 10% of total international trade for the period they examine. The average length of short-term transactions is 95 days. The estimation strategy uses aggregate data for the quarters between 2005 and 2011 and addresses the reverse causality issues discussed in the next section. The authors find that a 1% increase in trade credit granted to a country leads to a 0.4% increase in real imports of that country during both crisis and noncrisis periods. These results imply that trade insurance was not only relevant during the GTC but should be regarded as an important determinant of trade more independently of the financial cycle.

(e) Financial and banking crises

Given that banking and financial crises result in large shocks to the supply of credit, these episodes represent intriguing environments to study the relationship of interest. Unfortunately, with some exceptions, evidence on banking crises is limited for crises other than the recent global financial crisis.

From an aggregate perspective, three relevant cross-country studies are those by Ronci (2004), Iacovone and Zavacka (2009), and Bernard and Martin (2012). Ronci (2004) studies a panel of 10 economies that experienced financial and balance of payment crises. Ronci uses the change in outstanding short-term credit in U.S. dollars reported in the World Bank's *Global Development Finance* as a proxy for trade credit; this measure includes both short-term credit for trade (as reported by the OECD) and international banks' short-term claims (as reported by the BIS). Measures of total import and export volume are regressed on various macroeconomic variables and the proxy for trade financing; the regression results show that the latter affects both export and import volumes positively and significantly but with small estimated elasticity measures. A fall of 20% in trade finance explains only a decline of 0.6% in exports and 1.6% in imports. An important problem with this approach is that a portion of exports is financed

outside the banking system (for example, within the boundaries of multinational firms), which may explain why export volumes may not be very sensitive to changes in bank-financed trade credit. Similar conclusions are reached also by Iacovone and Zavacka (2009), who exploit industry-level differences in external financial dependence and find that exports in sectors more heavily dependent on external finance suffer significantly more during a crisis in the 23 banking crises between 1980 and 2000 in their study. Berman and Martin (2012) focus on the effect of past banking crises (1976-2002) on trade; their efforts are directed at African exporters, arguing that these countries are particularly vulnerable to a banking crisis in the countries to which they export. Interestingly, similar to Eaton et al. (2011), Berman and Martin also distinguish between an income effect that generates a shock for the demand for exports and a disruption effect that operates through trade financing. For the average country, the disruption effect of trade finance is moderate—that is, a deviation from the gravity-predicted trade of between 1 and 5 percent—but much larger and long-lasting for African exporters as the fall in trade relative to the gravity equation estimate is 10 to 15 percentage points higher than for other countries in the aftermath of a banking crisis.

The recent financial crisis and the subsequent GTC triggered a vivid debate on the role of various factors that presumably determined the trade collapse. To understand the magnitude of these contractions, consider a survey jointly administered by the IMF and the BAFT-IFSA (the Bankers Association for Finance and Trade [BAFT] merged with the International Financial Services Association [IFSA]). The survey establishes that changes in trade finance conditions were particularly pronounced among large banks that suffered more during the financial crisis. Consequently, they had a greater need to quickly deleverage and responded by increasing pricing margins. As a result, the letters of credit and terms of credit of trade-related lending worsened, particularly among large banks. Figure 5 shows that the drop in trade was larger than the contraction in trade

finance, but the latter was significant nonetheless. At the onset of the crisis in 2007-08, trade finance actually increased; even during the peak of the crisis (2008-09), it fell by only one-third relative to the collapse in goods exports; there was much geographic variation, but the largest drop was in Central Asia and Southeastern Europe. The situation remained negative but stable in 2009:Q2 and recovery started by the end of 2009. When the survey banks were interviewed about the perceived causes of the contraction of trade finance, they returned answers surprisingly similar to the consensus emerging among economists. Respondents identified the fall in the demand for trade activities as the major source of decline in the value of trade finance, but they attributed about 30% of the fall to the reduced credit availability at either their own institutions or counterparty banks.

FIGURE 5

While economists agree that tightened credit conditions may have affected trade, the importance of credit relative to other factors such as demand shocks and restrictions is an open research question. Initial evidence based on monthly U.S. imports studied by Chor and Manova (2012) is consistent with the findings of Iacovone and Zavacka (2009) and suggests that countries with tighter credit availability during the crisis exported less to the United States.

A number of recent studies focusing on firm-level performance provide additional insight. Amiti and Weinstein's (2011) analysis of Japan's "lost decade" contributes to the literature with an important methodological point. They manage to link bank-level conditions with firm-level export performance to identify the effects of credit shocks exogenous to individual firms but originating in troubled banks so to avoid potential biases induced by endogeneity (see the next section). Similarly, Paravisini, Rappoport, Schnabl, and Wolfenzon (2011) document that the reduction in loans from poorly performing banks significantly reduced exports at the intensive margin in Peru during

the GTC. This work has a similar approach to Amiti and Weinstein's (2011) because the authors manage to match customs and firm-level bank credit data to accurately measure the exogenous credit shock. The authors estimate that a 10% contraction in credit supply translates into a 2.3% (3.6%) fall in the exports intensive margin.

Bricongne, Fontagn, Gaulier, Taglioni, and Vicard (2012), who also focus on the GTC, use monthly French firm-level data through April 2009 at the product and destination level for about 100,000 individual French exporters and show that (i) the drop in French exports is mainly due to the intensive margin of large exporters and (ii) small and large exporters are evenly affected when sectorial and geographical specialization is controlled for. They measure financial constraints using a national register of reported payment incidents and find that larger incidence of credit constraints and dependence on external finance are linked to larger trade contractions during the GTC. Behrens et al. (in press) focus on detailed firm-level Belgian data and compare the contraction of exports and imports with the contraction of domestic sales in the months between 2007 and 2009 using a difference-in-differences approach and 2007-08 as a control period. They find that the contractions of export sales and imports are substantially similar to the collapse of domestic sales. Moreover, they find that the Belgian trade collapse is due mostly to smaller quantities sold and unit priced that are charged at the intensive margins rather than changes at the extensive margin of exporters and importers. Importantly, they find no explanatory power for financial variables, suggesting that reduced access to credit played only a minor role, if any, in explaining the contraction of sales. Considered jointly, these studies suggest that finance can explain between 20 and 33 percent of the GTC for the two advanced economies they examine.

Finally, when considering the different types of instruments used in trade finance during the recent crisis in their transaction level data, Antràs and Foley (2011) document that (i) the exporter was more likely to demand cash-in-advance terms for transactions with

new customers, and (ii) customers that traded on cash-in-advance terms before the crisis disproportionately reduced their purchases.

6. Econometric and Measurement Issues

The analysis of the impact of financial variables on international trade poses three main econometric challenges: (i) The estimates of financial constraints may be inconsistent because of measurement error. (ii) They may be biased because of endogeneity bias. (iii) They may be biased because of sample selection, implying external validity concerns. (iv) They may not be robust to the inclusion of proxies for demand shocks. In this section, we review these econometric challenges and provide a summary of the empirical strategies adopted to address them. We also discuss the main concerns regarding the reliability of the estimates.

(a) Measurement error

First, we consider the presence of measurement error in the variables of interest and the possible solutions adopted in the literature to minimize it. The problem may be reduced by using administrative rather than survey data, since the former tend to be of better quality. However, when this is not possible and data reliability is a concern, an instrumental variable approach for the variable of interest is preferred—for instance, trade finance, liquidity constraints, and the like. A two-stage least-squares model can be estimated, in which in the first stage, the financial variable is approximated by a valid instrument. A crucial assumption with this approach is that measurement error is classical—that is, it is uncorrelated with the true value of the instrumented variable

(b) Endogeneity bias

The second econometric challenge regards the presence of endogeneity bias arising from two distinct sources. First, omitted variables may generate endogeneity bias. For example, firm productivity may be better observed by lenders than by econometricians working with only a subsample of the information available about each firm. Lenders may also be better informed than econometricians regarding any possible internal agency problem that would affect the solvency of the exporters. For instance, firms are more likely to be financially constrained if they enter foreign markets primarily for prestige considerations using external finance.

Researchers need to find a suitable instrumental variable for the financial constraints to correct these otherwise biased estimates. Such an instrument should be correlated with the ability of the firm to finance its activities, but it should not be correlated with the ability of the firm to export. Exogenous shocks to the firm's cash flow represent good examples of such an instrument. They have been measured in the literature in several ways. Overdue payments to suppliers, the share of payments settled by debt swaps or offsets and exchange of goods for goods, or the amount of sales lost because of events outside the firm's control are popular choices since these measures are often the only ones available. However, they may be an imprecise proxy for liquidity constraints because they may also reflect low demand for the firm's products or low productivity. Studies based on more detailed data from a specific country typically exploit better instrumental variables given the richer information set available. For example, Minetti and Zhu (2011) use the changes in the regulations of the Italian banking system—specifically, the number of bank branches locally available to firms—as an instrument for credit rationing. While they capture credit restrictions likely to affect the firm's ability to borrow, they are unlikely to have an impact on the firm's exports.

The second source of endogeneity bias is reverse causality, as noted by Greenaway, Guariglia, and Kneller (2007). On the one hand, firms with better financial standings may be more likely to participate to international markets. On the other hand, firms trading internationally may improve their financial health and relax their credit constraints by diversifying the sources of financing and the relative risks. To shed light on this issue, these authors analyze the evolution of firms' financial health over time, before and after entering foreign markets. They find that continuous exporters enjoy better average financial health than starter exporters and conclude that firms improve their financial status through exports, Bellone et al. (2010), using a similar empirical strategy but working with a sample of French instead of U.K. firms, reach opposite conclusions. Iacovone and Zavacka (2009) test whether being financially constrained during the recent crisis is negatively correlated with being a larger exporter before the crisis and is not significantly correlated with being a small exporter before the crisis. As an additional robustness check of reverse causality, the authors repeat the estimation on a subsample of observations where the financial turmoil originated in a neighboring country one or two years before spreading into the country where the analyzed exporting firms are located. Their empirical evidence points in the opposite direction, suggesting that reverse causality can be dismissed as a concern.

To gain further insights on the link between the health of banks supplying external finance and export growth, Amiti and Weinstein (2011) construct a unique dataset matching Japanese firm-level information to banking data. They use the residuals from the regression of the changes in bank market-to-book value on the industry-time dummies and the changes in a firm's share price as an instrument of (bank) financial health. They conclude that while bank health influences a firm's exports, it is unaffected by the firm's financial health.

(c) Selection bias

Finally, the last econometric challenge faced by researchers is sample selection bias that arises because, by definition, positive foreign sales are observables only for exporting firms. To deal with such issues, researchers estimate a Heckman selection model augmented with the inverse Mills ratio. The inverse Mills ratio is estimated from a probability model where the dependent variable is a dummy for being an exporter. Among the dependent variables, firm characteristics that are not relevant in the subsequent estimation steps are omitted one at a time to eliminate selection bias.

(d) The role of demand

Thus far in this section we have focused on the link between trade finance and a firm's export decisions but downplayed the importance of demand. Positive demand shocks not only may expand exports for existing exporters but also may induce new exporters to try international markets; in both cases, they may even be sufficiently important to overturn the role of credit rationing. The failure to control properly for demand shocks may substantially alter the interpretation of empirical results.

The initial literature on exports and trade finance was particularly focused on financial constraints and neglected the potential relevance of output shocks. Several papers adopt country-industry dummy variables. In a more sophisticated specification, Chor and Manova (2012) account for the effect of aggregate production on trade flows by controlling for industry dummies and their interactions with the monthly log industrial production index in each sending country. This is the most common treatment in the studies in which the issue is addressed explicitly. The interaction with industry fixed effects allows the demand effect to vary across sectors. However, it also imposes the condition that changes in output are proportional at both the aggregate and sectorial

levels. Other options include constructing indexes aggregating the demand shock for destination countries using export shares by destination country as a weight (Coulibaly, Sapriza, & Zlate, 2013; Contessi and de Nicola, 2013).

Of note, the existing quantitative evidence posits an important role for demand in explaining the trade collapse. In particular, Eaton et al. (2011) evaluate the relative importance of shocks to demand, trade deficit, productivity, and trade frictions by structurally estimating a general equilibrium model with data from 23 countries.⁶ This comprehensive exercise underscores the role of the decline in demand for (durable) manufacturing as the main driver for the decline in trade. The decline in demand for manufacturing (durable) accounts for 80% (65%) of the fall in the global trade-to-GDP ratio. Trade frictions played a significant role only in China and Japan, while they had almost no effect in the rest of the world. The conclusions from the structural estimation of the multicountry general equilibrium model are echoed by the empirical study of Behrens, Corcos, and Mion (in press), who forcefully summarize their findings, saying that “It is not a trade crisis, just a trade collapse”—that is, the fall in international trade is explained mainly by a contraction along the intensive margin, a decline in demand, and a unit price driven by a contraction of GDP growth in the destination countries.

Finally, Jiao and Wen (2012) embed the Melitz (2003) model in an incomplete-markets neoclassical framework with an endogenous credit market to examine the differential effects of financial and nonfinancial shocks on aggregate output and international trade flows. They show that trade volume declines far more sharply and significantly than that of output (with an elasticity larger than 3) under financial shocks than under nonfinancial shocks, a result consistent with the stylized fact that most countries that experienced major financial crises had significantly larger and sharper contractions in exports than aggregate output. In the long run, however, a deeper financial market is a

great source of comparative advantage: it raises not only the level of aggregate productivity but also the ratio of trade volume to domestic output. The latter result is reminiscent of the work of Kletzer and Bardhan (1987) and Beck (2002). Ultimately, quantitative explorations following Eaton et al. (2011) and Jiao and Wen (2012) will have to confront the stylized facts emerging from the empirical literature.

7. Conclusions and Policy Implications

The worldwide fall in trade observed in the aftermath of the financial crisis has focused the attention of several researchers on the relationship between finance and trade, accelerating the development of an interesting trade literature emerged in the recent years. The contributions range from developing new models to explain the existence of trade finance and the relationship of financial vulnerability and development and trade, to testing these models using aggregate and micro data. The empirical analysis has been shaped on the one hand by the theoretical predictions and on the other by the available data. For instance, the definition of “access to credit” and financial vulnerability changes substantially from author to author and essentially depends on the available information in the datasets used.

In this paper we summarize the existing evidence, suggesting that the at-times conflicting findings could be explained in part by the fact that researchers used different empirical models and different definitions of the variables of interest.

After analyzing several papers, we came to five conclusions. (i) Studies that focus on aggregate data, either at the country or the industry level, are consistent in finding an important role of financial development and credit and external financial dependence (measured in various ways) in explaining the existence of export flows and their magnitude, but evidence of reverse causality is also present. (ii) Firm-level data predominantly identify an important role of access to finance and external financial

vulnerability in explaining the extensive margin, a result consistent with the existence of relevant fixed costs to export. (iii) The conclusions regarding the intensive margin of export are somewhat mixed results on the role of finance. Conclusion (ii) and (iii) suggest that the export support may be more effective when it targets relatively smaller firms for a relative short time. (iv) Studies that focus on financial shocks due to banking of financing crisis find that such shocks explain a significant but relatively small portion of export adjustment, particularly in industries with more pronounced external financial dependence. These results imply that policy intervention in the form of support of exporters' financing during financial crisis may provide some assistance in smoothing adjustment but by no means counterbalance large export contractions due to demand shocks. (v) There are only a few studies that explicitly test the direction of causality between trade and finance and they reach opposite conclusions; these contradictory results warrant further studies.

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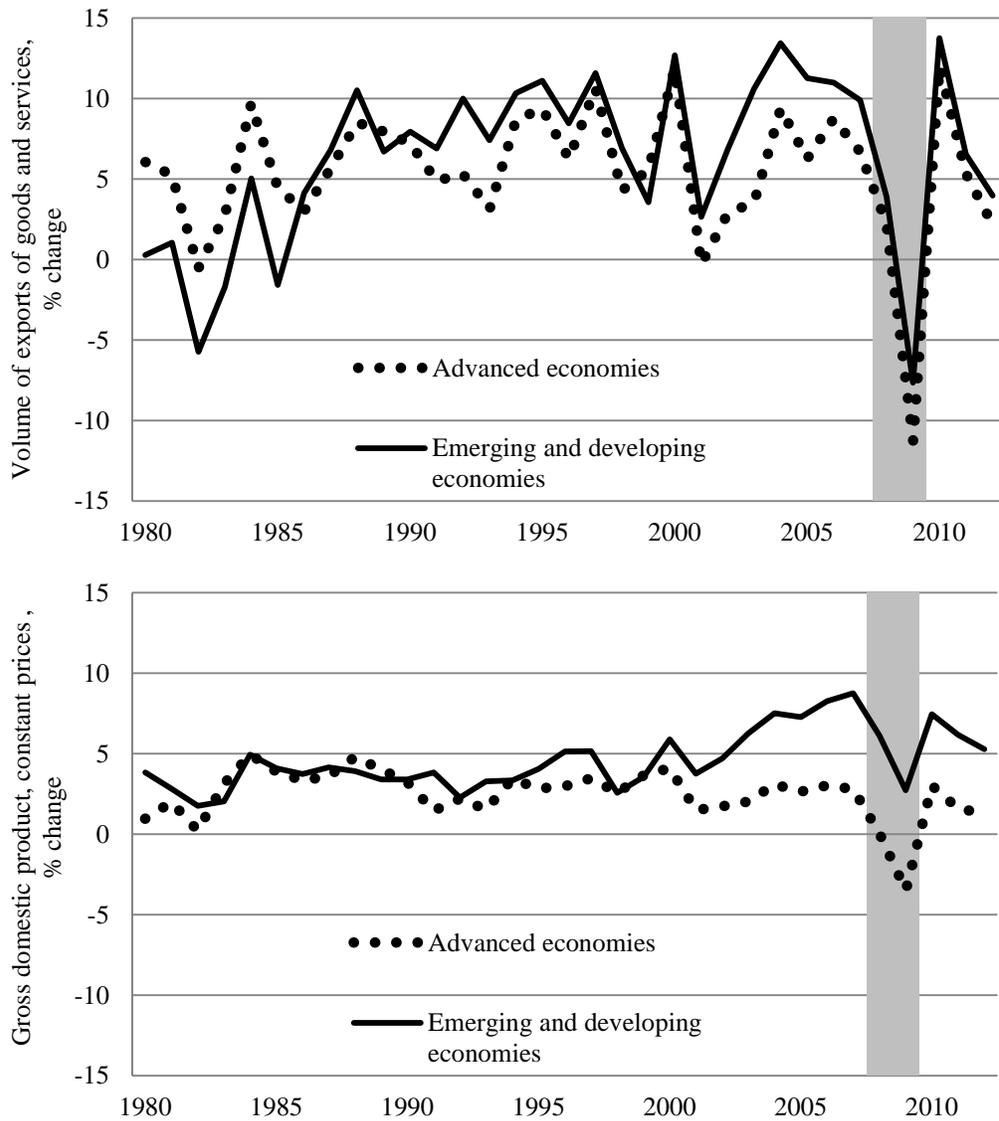
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A. Figures

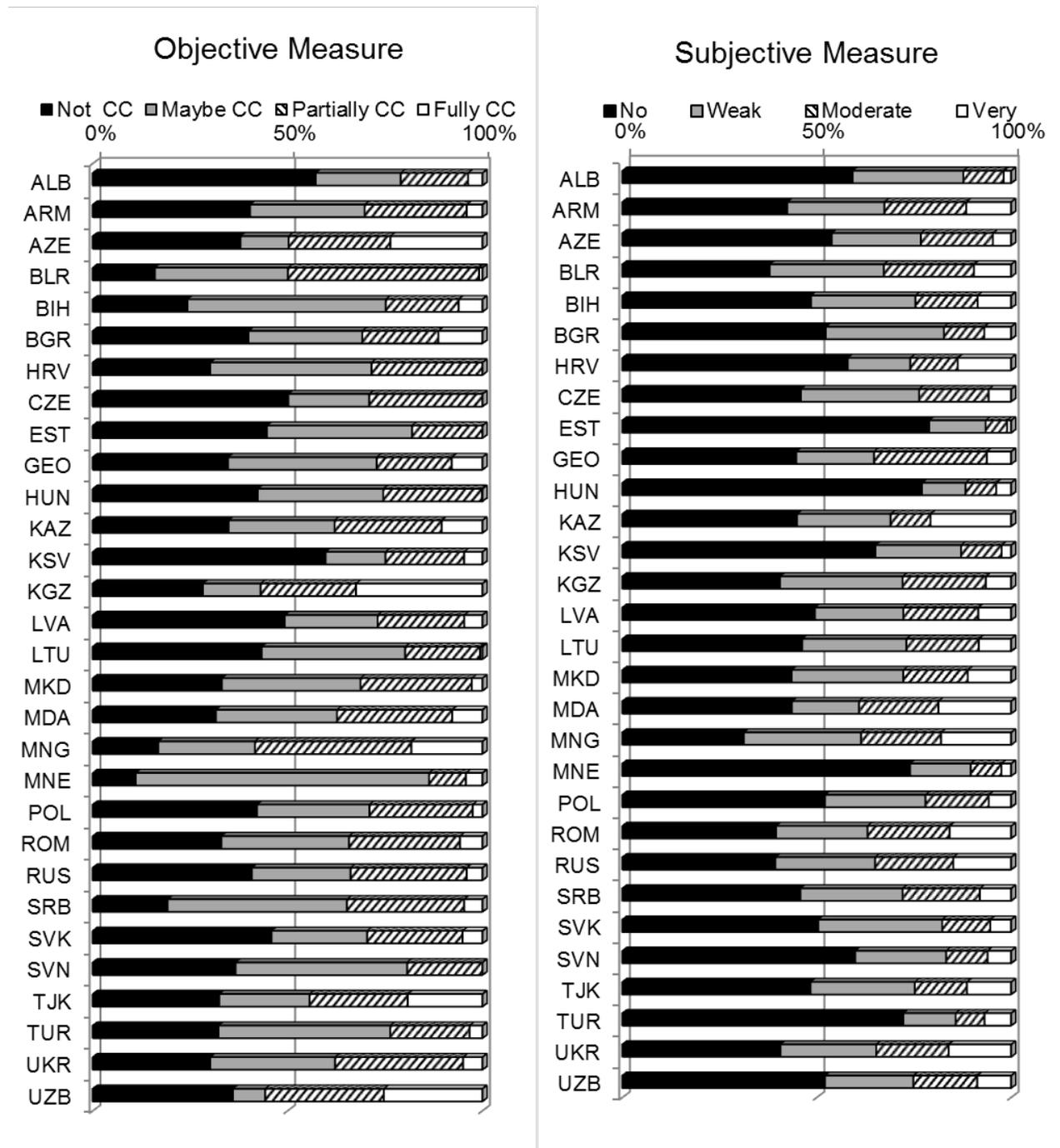
Figure 1. Growth of export and GDP in emerging and developing countries and advanced economies



Note: The gray area represents the years of the great trade collapse (2008-09).

Source: IMF.

Figure 2. Comparison of objective and subjective measures of constraints in access to credit in the BEEPS 2009 database



Note: CC = credit constrained. Worldbank country abbreviations.

Source: BEEPS dataset.

Figure 3. Share of firms by extent of objective measures of credit constraints and private credit-to-GDP ratio in BEEPS countries (2007)

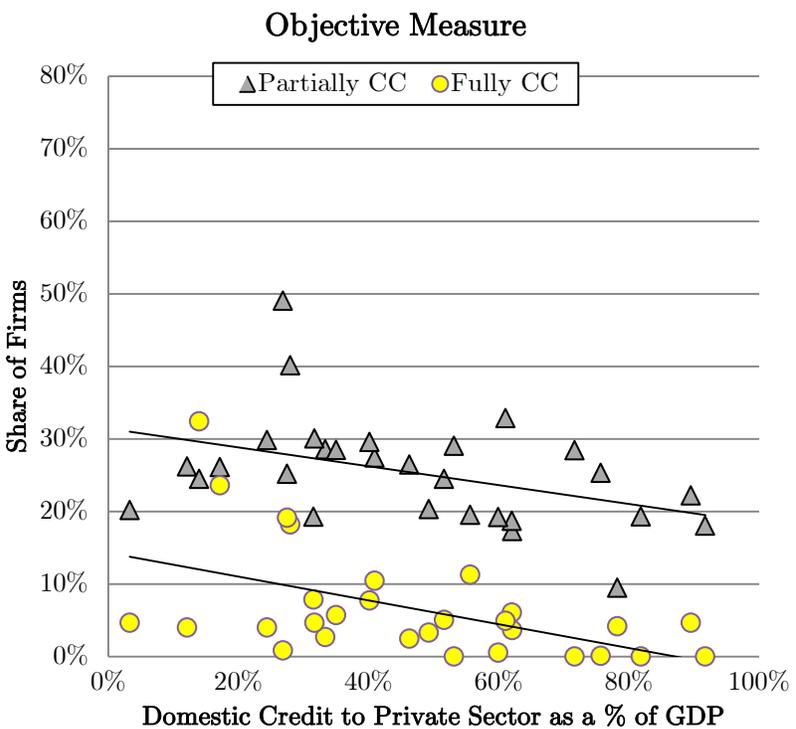
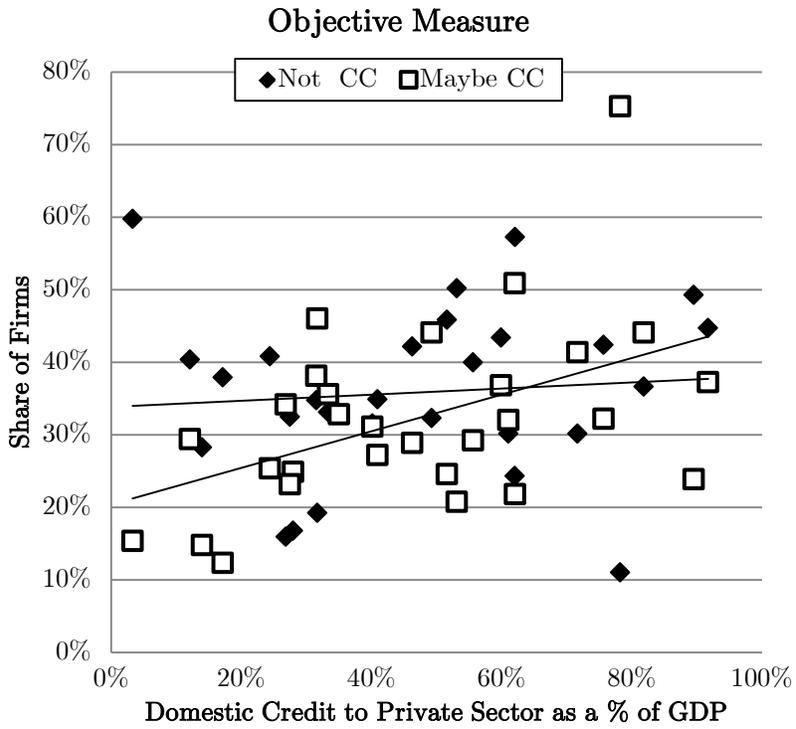
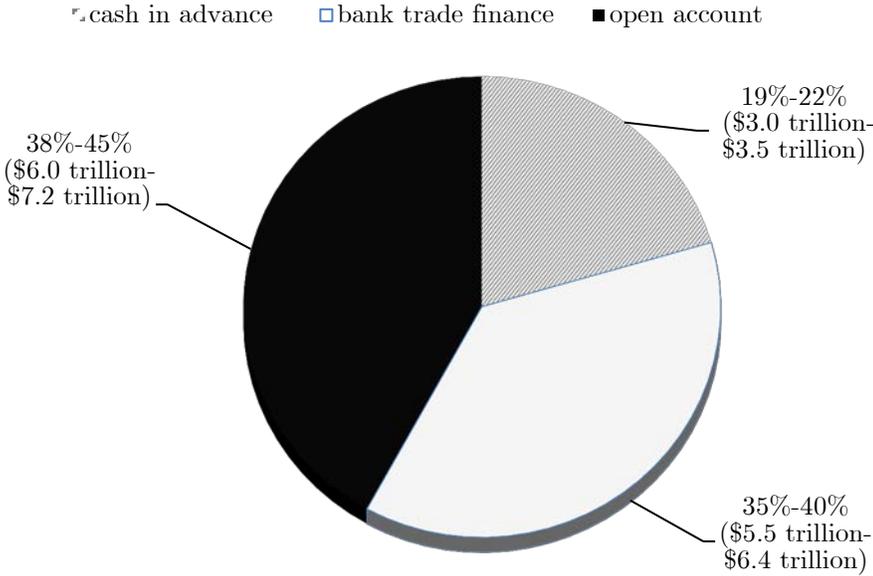
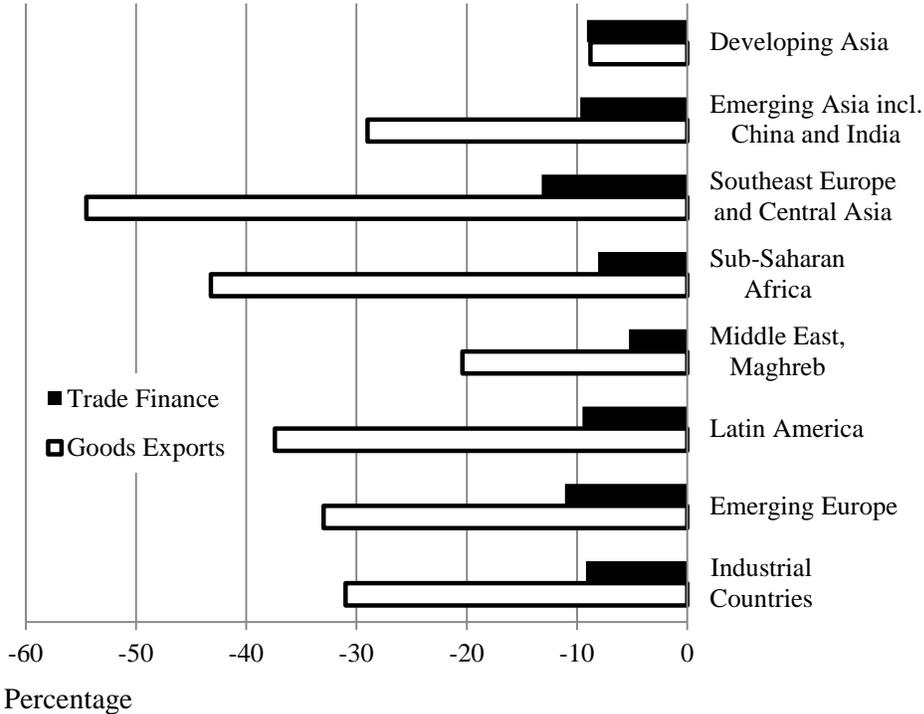


Figure 2. Trade finance arrangements in 2009 (by market share)



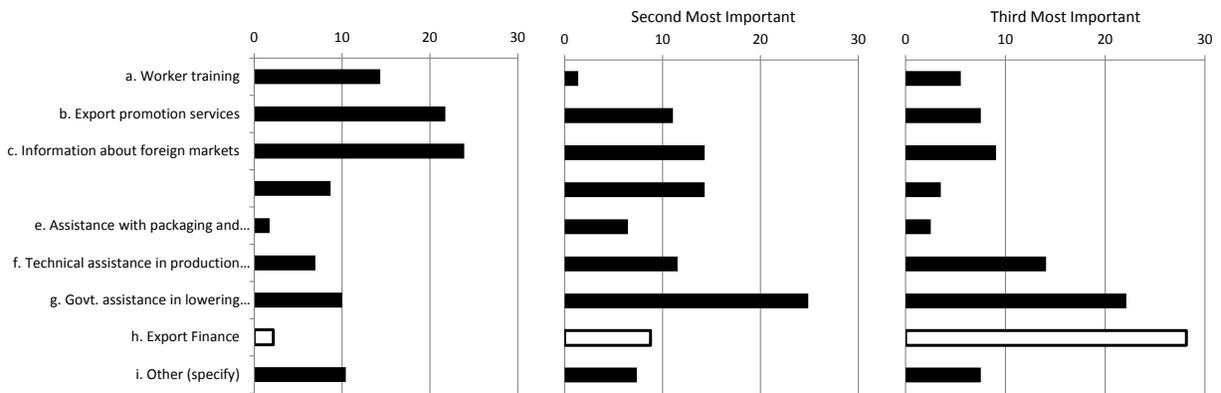
Source: Chauffour and Malouche (2011).

Figure 5. Changes in merchandise exports and trade finance (by groups of countries)



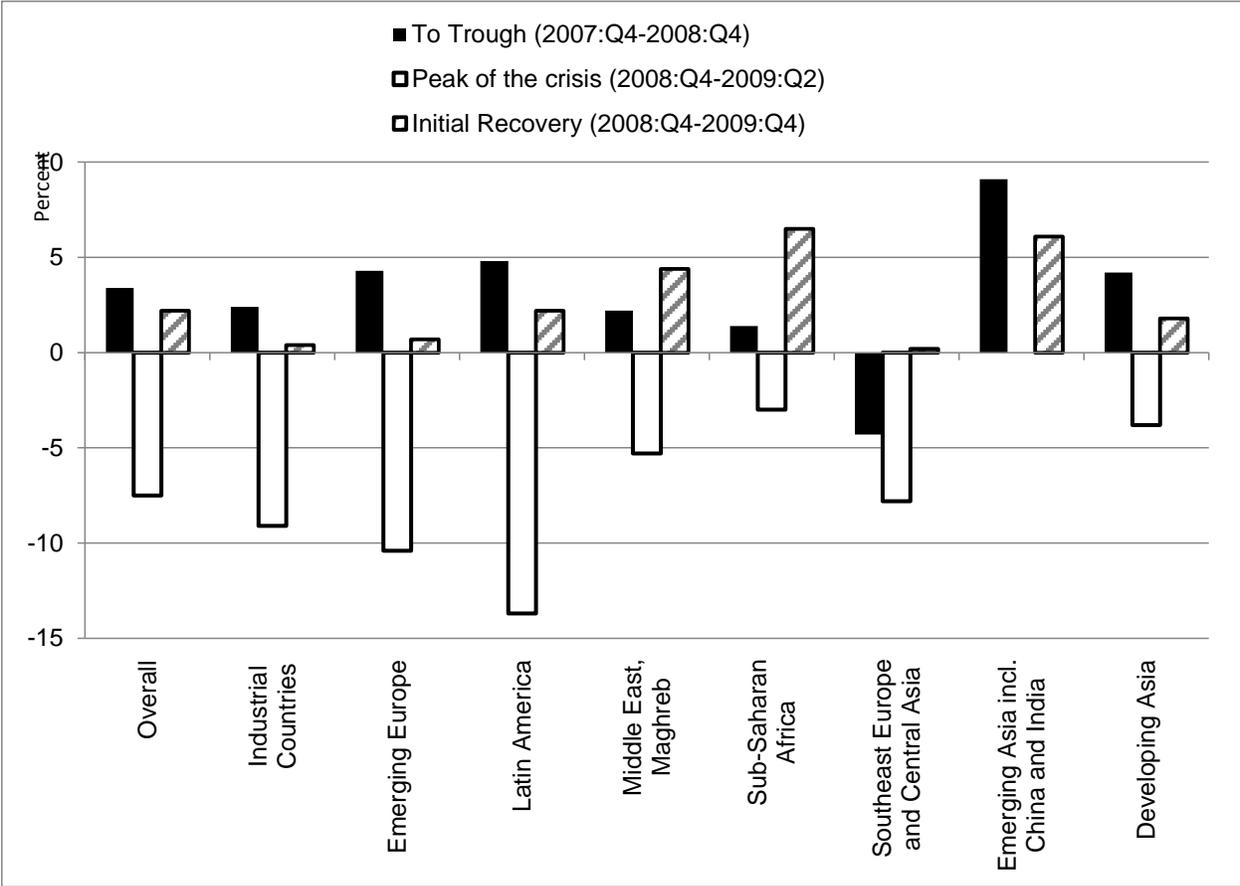
Source: Authors' calculations based on Asmundson et al. (2011).

Figure 6. Top three business services that respondents suggest may help increase or facilitate a foreign market in Jordan



Source: WBES for Jordan (2006).

Figure 3. Changes in trade finance (by groups of countries)



Source: Authors' calculations based on Asmundson et al. (2011).

Table 1. Summary of the main empirical studies on the relationship between finance and international trade

Study	Sample (Country, firms, sectors)	Financial measure	Control for demand	Control for endogeneity/reverse causality	Margin of trade examined
Aggregate and industry-level views					
Beck (2002)	A 30-year panel of 65 countries, manufacturing exports	Private credit		The legal origin of countries to extract the exogenous component of financial development	Real manufactured exports, imports, and trade balance; manufactured exports and imports relative to total merchandise exports and imports, respectively
Besedeš, Kim, and Lugovsky (2011)	Product-level data on exports to the United States and 12 European Union members between 1989 and 2008; 10-digit Harmonized System, or 8-digit Common Nomenclature. Export relationships: Exporter-product-importer; 8, 12, 78 growth rates, respectively	Country financial development, external financial dependence, and asset tangibility	Calendar-year fixed effects		Intensive (export growth)
Bricongne, Fontagne, Gaulier, Taglioni, and Vicard (2012)	A cross section of French exporters (100,000) by source country (52), 2000-09	Credit constraints proxied by payment incidents reported to lenders in the previous year	Sectorial foreign demand on each market	Sectorial net imports excluding France	Intensive (the difference between positive and negative growth rates)
Berman and Martin (2012)	Exporter-importer country pairs in 27 ISIC 3-digit industries between 1976 and 2002, augmented with commodity industries	Country-level outstanding short-term credit in U.S. dollars	Log GDP of importers		Intensive (log bilateral exports)
Chor and Manova (2012)	A source country-sector-month panel of U.S. imports, 2006-09, 21 NAICS-3 manufacturing sectors	Interbank lending rate by exporting country, external finance dependence, trade credit intensity	Industry-month fixed effects		Intensive (log of industry exports to the United States)
Do and Levchenko (2007)	A panel of 96 countries, 30 years and 28 sectors	External financial dependence		Financial development is shown to depend on exporting sectors demand for external finance	Intensive
Iacovone and Zavacka (2009)	23 crises in 21 countries, 4-digit ISIC Rev. 2, 1980-2006	Industry-level bank finance, trade credit and tangibility	Importers GDP growth weighted by export shares	Difference-in-differences approach with country-specific and industry-specific time-varying shocks, in addition to other tests	Country-industry export growth

Manova (in press)	A panel of 107 countries and 27 sectors at the 4-digit SITC Rev. 2 industry, 1985-95	External finance dependence and asset tangibility	Importer-sector fixed effects	Exploit variables that do not respond to variation in export demand in the same way as private credit might: interaction of private credit with asset tangibility, contract repudiation, accounting standards, and expropriation risk	Extensive (number of firms, number of products, number of destinations) and intensive (volume of exports); in logs
Ronci (2004)	A panel of 10 countries for 10 years that are centered on a banking crisis year	Global Development Finance country-level outstanding short-term credit in U.S. dollars		World GDP and domestic credit as instruments	Log of exports and imports by country
Firm-level views					
Alvarez and Lopez (2012)	A plant-level unbalanced panel from ENIA/INE Survey, manufacturing, about 37,000 pooled observations, 1990-2000	Country-level measures of financial development (domestic and bank credit) interacted with measures of external financial dependence and asset tangibility		Lagged plant-level variables	Extensive
Amiti and Weinstein (2011)	A cross section of Japanese manufacturing firms (540-860 depending on the year), 80 percent of all Japanese merchandise exports over this period, 1986-2010	Lagged log change in market-to-book value of bank	Firm industry-time fixed effects	Bank fixed effects	Intensive (log firm-level exports and export-to-domestic sales ratio)
Behrens, Corcos, and Mion (2011)	A cross section of Belgian manufacturing firms (average 23,600 firms/year), 2006-09	Debt ratio, external finance dependence at the firm level	Destination country's growth rate of GDP.	Lagged covariates	Extensive and intensive, export and import
Berman and Hericourt (2010)	A cross country (9 developing countries) of firms (5,000) in main producing sectors, 1998-2004	^a Liquidity ratio ^b Leverage ratio Country-level measures of financial development	Country-industry-year dummy variables	Lagged variables, and breakdown of industries by external financial dependence	Extensive and intensive
Bellone, Musso, Nesta, and Schiavo (2010)	An unbalanced panel of over 25,000 French manufacturing enterprises followed over the period 1993-2005 obtained matching the Enquête Annuelle d'Entreprises to the DIANE (Bureau van Dijk) database	Liquidity ratio Leverage ratio ^a Score A and Score B		Analysis of the effect of exporting on financial constraints, they find none	Extensive and intensive

Contessi and de Nicola (2013)	A three years panel of BEEPs WBES, 2002/3, 2005, 2007/8	Survey based measure of difficulties in accessing credit	A country-level measure of export demand shock	Instrumental variables	Intensive and extensive
Coulibaly, Sapriza, and Zlate (2013)	A cross-country of 6 developing countries ^f and cross section of publicly traded nonfinancial firms (7,200), 2008:Q3–2009:Q1	^g Leverage ratio ^h Liquidity ratio External and ⁱ Internal finance ^j Trade credit ^k Asset tangibility	An indicator of foreign demand shock	Lagged covariates	Intensive
Eck, Engemann, and Schnitzer (2012)	A cross section of 1,196 German firms in 2004 in the BEEPs	Reported (at least moderate) difficulties in access to credit, measures of cash-in-advance and supplier and customer credit		Argue that it is not a concern	Intensive and extensive
Feenstra, Li, and Yu (2011)	A cross section of more than 160,000 Chinese manufacturing firms, 2000-08	Interest payment, solo and interacted with export status and multinational status, tangible assets		Instrumented using total factor productivity and interactions with total factor productivity	Extensive
Greenaway, Guariglia, and Kneller (2007)	A panel of British manufacturing firms (9,292), 1993-2003	^l Liquidity ratio ^m Leverage ratio ⁿ QuiScore			Extensive and intensive
Kappoor, Ranjan, and Raychaudhuri (2012)	A panel of publicly traded firms in the Prowess database between 1990 and 2006, up to 30,000 pooled observations	Several measures of firm-level financial dependence and use (see the paper's appendix)		Difference-in-differences based on exogenous policy changes (introduction and removal of priority lending)	Intensive (level and growth)
Minetti and Zhu (2011)	A cross section of small- and medium-sized Italian manufacturing firms (4,680), 2000	Survey variables, liquidity ratio, leverage ratio	Industry dummy	Exploit the segmentation of the banking system in local areas, in conjunction with the banking regulations to identify exogenous restrictions on the local supply of banking services, used as instrument	Extensive and intensive
Muûls, 2008	A cross section of 9,000 Belgian manufacturing firms, 1999-2005	Coface credit score		The credit score is independent of export performance	Extensive (export decision probability and export destination dummy) and intensive (log of number of destinations and log of mean value per destination)

Paravisini, Rappoport, Schnabl, and Wolfenzon (2011)	A cross section of 6,169 Peruvian firms with at least one export registered, 2007-09	^o Credit supply from banks	Product-destination dummies	Exploit the external funding shock to matched banks	Intensive (log change of exports of product-destination market) and extensive (number of entries to product-destination market)
Zia (2008)	Combines three datasets: (i) all firm-loan pairs registered in the subsidy program, (ii) universe of corporate bank loans outstanding, and (iii) corporate and financial accounts, to match 978 firms	Exploits changes in eligibility rather than financial measure, controls for working capital and subsidized loans amounts		Exploits the exogenous nature of the discontinuation of subsidized credit to a specific sector	Intensive (changes in export sales)

Quantitative evidence

Caggese and Cunat (2013)	Capitalia survey of small- and medium-sized Italian enterprises, 1995-2003	Three self-declared responses about financing constraints aggregated into a single variable	Calibration	Calibration	Match entry, exit, and exporters size distribution
Kohn, Leibovici, and Szkup (2012)	Chilean plant-level data from the Chilean Annual Manufacturing Survey (ENIA) for the years 1995-2007 Chilean WBES for 2006 and 2010	Analysis of working capital paid using external, loans requiring collateral Collateral per \$ borrowed and self-reported measures of difficulties to access finance	Calibration	Calibration	Exit, export growth, export intensity, firm size distribution

^aRatio of cash flow over total assets. ^bRatio of total debt over total assets. ^cThe growth rate is computed as the midpoint growth rate: the monthly export flows by a French firm to a given destination of all XN8 products in a same HS2 sector. ^dThis is measured as the fraction of total capital expenditure not financed by internal cash flows from operations and reflects firms' requirements for outside capital. Median value across firms in each NAICS 3-digit category. ^e This is calculated as the ratio of the change in accounts payable over the change in total assets and indicates how much credit firms receive in lieu of having to make up-front or spot payments. Median value across firms in each NAICS 3-digit category. ^f China, India, Indonesia, Malaysia, Taiwan, and Thailand. ^g Stock of short-term debt normalized by total assets. ⁱ Quick ratio (the sum of cash, cash equivalents, and net receivables divided by current liabilities) and working capital (the difference between current assets and current liabilities normalized by total assets). ^j Total external finance and retained earnings in 2007 (each normalized by total assets). ^k An alternative source of financing: trade credit received from suppliers in 2007. ^l This is constructed as the share of net plant, property, and equipment in total book-value assets. ^m Current assets less current liabilities. ⁿ Ratio of short-term debt to current assets. ^o A measure of a firm's riskiness, which is based on information about firms' credit ratings and measures the likelihood of company failure in the 12 months following the date of calculation. ^p This is measured by foreign financing, share of foreign liabilities in the bank's balance sheet. ^q The liquidity ratio is defined as a firm's current assets minus its short-term debt over total assets; the leverage ratio as a firm's short-term debt over current assets. Score A and Score B are two indexes that collapse information derived from seven variables: size (total assets), profitability (return on total assets), liquidity (current assets over current liabilities), cash flow-generating ability, solvency (own funds over total liabilities), trade credit over total assets, and repaying ability (financial debt over cash flow).

Table 2. Summary of the estimated relationships between different measures of access to credit and different margins of trade

Measure of Access to Credit or Financial Vulnerability	Extensive margin			Intensive margin	
	(i) Export status	(ii) No. of destinations	(iii) No. of products	(iv) Log exports or export growth	(v) Exports-to-domestic sales ratio
Subjective measures of financial constraints					
	Minetti and Zhu (2011): + Eck et al. (2012): +	Minetti and Zhu (2011): +			Minetti and Zhu (2011): + Eck et al. (2012): +
Interacted with external financial vulnerability	Minetti and Zhu (2011): +				Minetti and Zhu (2011): +
Interacted with balance-sheet measures	Eck et al. (2012): + Contessi and de Nicola (2013): +				Eck et al. (2012): + Contessi and de Nicola (2013): n.s.
Balance-sheet measures					
Firm's balance sheet	Berman and Hericourt (2010): + Greenaway et al. (2007): n.s. but evidence that export improves financial health Bellone et al. (2010): + Coulibaly et al.: + Feenstra, Li, and Yu (2011): + Muûls (2008): + Behrens et al. (in press): + (by status, destination and product considered jointly)	Muûls (2008): +	Muûls (2008): n.s.	Behrens et al. (in press): + on export but n.s. on import, during the GTC Bricongne et al. (2012): +(product and destination considered jointly) Feenstra et al. (2011): + Kapoor et al. (2012):+ Muûls (2008): + but n.s. at the destination level Zia (2008)	Bellone et al. (2010): n.s. Berman and Hericourt (2010): n.s or + and small Coulibaly et al. (2013): +
Matched banks' balance sheet or matched loans		Paravisini et al. (2012): n.s. (by product and destination considered jointly)		Paravisini et al. (2012) by product and destination: +	Amiti and Weinstein (2011): +

Interacted with country financial development	Berman and Hericourt (2010): +	Berman and Hericourt (2010): n.s.
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Measures of external financial vulnerability

Manova (2013): +	Manova (2013): +	Manova (2013): +	Chor and Manova (2012): + Iacovone and Zavacka (2009): + Manova (2013): +
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Country-level financial development

Berman and Martin: + Ronci (2004): +	Beck (2002): +
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Interacted with measures of industry-level external financial vulnerability

Alvarez and Lopéz (2012): + for large and foreign-owned firms

Besedeš et al. (2011): +
Do and Levchenko (2007): +^a

n.s.: = Nonsignificant; + = positive and significant.

^aDo and Levchenko (2007) show that the direction of causality goes from export to the level of financial development.

¹ One explanation for such high rates is that the illiquidity of the goods reduces the risk of moral hazard, providing suppliers with trade credit when bank credit would not be extended.

² With this instrument, the issuing bank states its commitment to pay the beneficiary (seller) a given amount of money on behalf of the buyer as long as the seller complies with the terms and conditions specified by the sale contract. On the one hand, this allows the importer to use the borrowed funds for purposes other than paying the exporter; on the other hand, the letter of credit ensures that the exporter will be paid in a timely manner. This instrument is particularly suitable for international contracts that are difficult to enforce and entail more risk. A similar purpose is achieved by bill avalisation, whereby the buyer's bank guarantees payment to the seller in case the buyer does not pay. Other examples of documentary credit are advance payment guarantees, custom bonds that allow postponement of tax payments until after the goods are sold, and custom bonds for temporary transit that waive payment of custom duties if goods are imported with the intent of being exported.

³ A similar point is raised by Hale (2012) in her discussion of information flows and the relationship between banking and trade.

⁴ The other constraints are telecommunications, electricity, transportation, access to land, tax rates, tax administration, customs and trade regulations, labor regulations, skills and education of available workers, business licensing and operating permits, economic and regulatory policy uncertainty, macroeconomic instability (inflation, exchange rate), corruption, crime, theft and disorder, anticompetitive or informal practices, and legal system or conflict resolution.

⁵ These studies report an average multiplier between 1.7 and 2.8, implying that every euro spent on public guarantees creates between 1.7 and 2.8 euros' worth of exports.

⁶ Specifically, they estimate a gravity model of trade nested in a production model for three sectors (durable manufacturing, nondurable manufacturing, and nonmanufacturing).