

Out of sight, out of mind?

Global chains, export, and credit allocation in bad times

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Abstract

We investigate whether globally active firms are more likely to be credit constrained by banks during a financial crisis. Using data on 15,000 businesses from seven European countries, we find that firms with a stable involvement in global value chains were 25% less likely to be rationed by banks during the 2009 financial crisis. This contrasts with the stronger likelihood of credit rationing of firms engaging in plain vanilla export activities. Matching the firm-level information with bank-level data, we obtain that banks insulated global chain participants from the credit crunch, not only accounting for the beneficial effects of global supply chain participation, but also to minimize negative spillovers on their own activities abroad.

Keywords: Banks; global value chains; firm export; financial crises.

JEL codes: F10; G20; D22.

1 Introduction

The impact of finance on firms' international activities has attracted growing interest in recent years. To internationalize their activities (e.g., export abroad and participate in global supply chains), firms must invest resources to identify foreign partners, set up distribution networks, and tailor products to match foreign regulations (Baldwin and Krugman, 1989; Dixit, 1989). Most of these expenses have to be sustained up front so that firms need enough liquidity at hand (Manova, 2013). Because of this reliance on external finance, one would be tempted to conclude that international activities are disproportionately exposed to credit crises. And yet, the effects of aggregate credit contractions on internationally active firms are far from being clear-cut. Levchenko et al. (2010), for example, examine the U.S. decline in international trade following the Great Financial Crisis and conclude that the decline was far larger than

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in previous downturns not caused by financial disruptions. On the other hand, while agreeing that the decline in trade was sizeable, Alessandria et al. (2010) highlight that, relative to the large drop in production, the decline in trade was not unusual.

In this paper, we revisit the nexus between finance and firms' internationalization, possibly shedding new light on the above, unsettled debate. While the high reliance of firms' international activities on external finance is well established, a fundamental aspect that the literature appears to neglect is that the main providers of credit, banks, are concentrated financial institutions which routinely make sophisticated lending decisions. For instance, there is large evidence that in bad times banks do not contract credit uniformly across the board but carefully choose how to allocate their scarce liquidity across sectors, regions and segments of firms, protecting some of their clients to the expense of others (De Haas and Van Horen, 2013; De Jonghe et al., 2020; Asea and Blomberg, 1998).

These observations lead naturally to fundamental questions. How does firms' global status affect banks' credit allocation decisions during a credit crunch? Do banks treat internationally active clients differently from domestic-oriented ones? And, for a given degree of firms' internationalization, does the mode of internationalization matter? Answering these questions can yield new insights into the dynamics of credit crises and help policy makers design suitable interventions in response to the crises. In particular, if banks tend to protect internationally active firms, then, in spite of their inherent reliance on external financing, such firms could not necessarily suffer the most during credit crunches.

This paper addresses these questions combining information from five databases: the EU-EFIGE Bruegel- UniCredit survey, the BvD-Amadeus database, the Bureau van Dijk Orbis data set, Moody's Analytics BankFocus, and the BIS Consolidated Banking Statistics. Our main source of information consists of the EU-EFIGE Bruegel- UniCredit survey which targeted almost 15,000 manufacturing firms in seven European countries (Austria, France, Germany, Hungary, Italy, Spain, and the United Kingdom) at the peak of the Great Financial Crisis (2009). The EFIGE database provides rich information on firms' access to credit, as measured by a precise indicator of bank credit rationing. It also provides detailed information on firms' modes of internationalization, including whether a business participates in a global value chain, purchasing and/or selling intermediate products to other firms abroad, or in plain vanilla export activities. Further, we have information on a broad range of firm characteristics that are traditionally viewed as determinants of access to credit and of firms' internationalization. We complement the EFIGE data with balance-sheet information drawn from the BvD-Amadeus database, the most comprehensive source of financial information for European firms. Further, we have access to information on the international activities of banking institutions drawn from the BIS Consolidated Banking Statistics and, most importantly, detailed information from the BankFocus database on the international presence (subsidiaries per country) of the banks lending to the firms in our sample. We hand-match the BankFocus data on bank subsidiaries per country with the EFIGE firm data exploiting information from the Orbis database regarding the banks with which firms do business, as well as EFIGE information on the specific countries in which firms' supply chain partners are located.

Endogeneity issues plug any analysis of the linkages between credit and firms' internationalization. Credit rationing could affect firms' internationalization decisions and, at the same time, internationalization decisions could influence banks' credit allocation and, hence, rationing (reverse causality). Moreover, unobservable firm characteristics can jointly deter-

mine credit provision and internationalization. Building on an established body of studies on the drivers of firms' supply chain participation and internationalization, we address these endogeneity issues by exploiting detailed information on firms' access to information technology. As shown, e.g., by Fort (2017) and Brynjofsson and Hitt (2000), firms with easier access to information technology infrastructures are facilitated in their ability to connect with other businesses and, hence, participate in supply chains. Moreover, Freund and Weinhold (2002) show that firms' ability to establish international trade linkages is strongly affected by their access to information technology infrastructures. Our data provide details on whether firms have access to broadband connections and the purposes for which they view such connections as essential (namely, for e-commerce activity or for the management of purchases/sales firm networks). We can further interact this information with regional measures of the quality of local IT infrastructures (broadband access; Eurostat data). There is ample evidence that the quality of IT infrastructures differs greatly across European regions and this significantly affects firms' ability to establish supply chain links and international trade connections.

Our results reveal striking effects of firms' internationalization status on the exposure to bank credit rationing during the 2009 credit crunch. We find that firms engaging in relatively unsophisticated export activities were more likely to suffer from bank credit rationing. This result aligns with the view that in bad times banks are inclined to retrench credit from risky activities. Export is in fact a risky activity that entails operations in foreign markets and, hence, is exposed to significant volatility in sales and profits. However, the most striking result is that, when the internationalization of a firm took the form of a stable participation in a global supply chain, the firm was less likely to suffer from bank credit rationing. That is, banks turned out to ration credit less to firms that were involved in global supply chains than to those that were not. The economic magnitude of the effects is sizable. In 2009, the participation of a firm in a global supply chain reduced the probability that the firm suffered from bank credit rationing by 2.2 percentage points, which amounts to about 25% of the average probability of rationing in the sample in 2009. On the other hand, a mere status of exporter increased the probability of bank credit rationing by 1.7 percentage points, approximately 20% of the average probability of rationing in the sample.

To dissect the scenarios in which the above effects are more pronounced, we next slice our data based on a variety of characteristics of the firms and of their internationalization. The alleviating effect of global supply chain participation on bank credit rationing is more significant, statistically and economically, for firms with a more stable supply chain participation and for supply chains with a European span than for supply chains that extend to far away countries.¹ These results suggest that the alleviating effect of supply chain participation on rationing manifests itself when the participation is perceived to be more structural and less uncertain by banks. The alleviating effect of global supply chain participation also appears to be stronger for businesses that are relatively younger and smaller and for those that inherently rely more on external financing. This points to a significant relevance of the effects, which occur especially for firms traditionally perceived to be vulnerable to bank credit constraints.

We surmise that our findings could reflect two complementary mechanisms. Banks could be inclined to protect global supply chain participants because they attribute value to this participation ("signaling" mechanism). Supply chain participants could be more promising

¹The findings do not appear to be driven by firms' position in supply chains, although we find some evidence that downstream firms are better protected from credit rationing.

businesses with more stable prospects and more ambitious goals. In the words of a major Italian banker, from banks’ point of view “the weaknesses of small enterprises are attenuated in supply chains, thanks to the strengthening of their knowledge and of their professional, managerial, and organizational competencies” (Rotondi, 2013, p.VI). Anecdotal evidence drawn from alternative databases suggests that banks attribute significant importance to supply chain participation in their lending decisions. For example, in a survey carried out by a major European banking group (UniCredit, 2012), no less than one third of the surveyed firms argue that their banks view supply chain participation as a pivotal dimension when making lending decisions. A second interpretation of our findings instead relates to the nature of banks as large institutions with a broad scope of operations. Banks could protect supply chain participants because they internalize the negative consequences that the denial of credit to their internationally active clients might have on other foreign entities with which the banks do business (“spillover” mechanism). To fix ideas, consider for instance a large German corporation operating in a global supply chain with Polish partners and suppose that its German bank has a broad network which also involves operations in Poland. If the bank anticipates that, if denied credit, its German client could terminate its business with the Polish counterparts, the bank could fear negative repercussions on its own activities in Poland. It could then be reluctant to deny credit to the client and choose instead to penalize other clients with no international ramifications. Again in the words of an Italian banker, the expansion of global value chains “pushes to modify the bank lending activity towards a model that we could define as a value-chain bank (...), that is a bank with interest and concerns in the firms connected along the supply chain” (Rotondi, 2013, p. VII).

We obtain evidence that both mechanisms may play a role in our findings. Regarding the first channel, the alleviating effect of global supply chain participation on bank credit rationing is stronger when firms engage in productivity-enhancing activities within the supply chain, such as R&D collaborations as well as projects aimed at expanding firms’ distribution network. Banks could view these activities as signals that the supply chain participation is value-enhancing for their client and thus could be particularly reluctant to penalize the client. Regarding the second channel, we uncover that the alleviating effect of supply chain participation arises more evident for banks that have an international scope, as captured by the availability of a broad international bank network. We next merge our data with information from the Bank for International Settlement Cross Border Statistics and from the Orbis database to construct proxies for banks’ engagement in the geographical areas where client firms entertain supply chain linkages. In particular, we hand-match bank-level data on the number of subsidiaries per country of each lending bank with information on the location of firms’ supply chain partners. We find evidence that the alleviating effect of supply chain participation on bank rationing is stronger when banks conduct business (that is, have more subsidiaries) in the same countries in which firms entertain supply chain links.²

The paper speaks to two strands of literature. The first investigates the implications of credit for international activities. We relate to the studies that use firm-level data to investigate these implications (Manova, 2013; Minetti and Zhu, 2011; Paravisini et al., 2015), but in our setting we reverse the research question. In fact, we are interested in the influence of firms’ internationalization status and modes on bank credit decisions rather than the opposite

²In the paper, we also conduct test to verify that this finding is not primarily driven by the knowledge of globally active banks about exported products.

effect. In this sense, our paper is close in spirit to Do and Levchenko (2007), who analyze the effect of international trade on a country’s level of financial development in an aggregate perspective and show that financial development is affected by the external finance needs of exported goods.³ The second related literature investigates the allocation of credit, especially during crises. As noted, there is growing evidence that banks make sophisticated decisions about their credit extension, although not necessarily these decisions are welfare-enhancing (Giannetti and Saidi, 2019; De Jonghe et al., 2020). To the best of our knowledge, we still have very limited evidence about how firms’ internationalization plays a role in credit allocation. Our results suggest that banks engage in a careful “cherry picking” by protecting internationally active businesses that reap benefits from their global chain participation. We will discuss the links to prior literature in greater detail when framing our hypotheses.

The remainder of the paper is organized as follows. Section 2 lays out testable hypotheses. Section 3 describes the data and the econometric approach. Section 4 discusses the main empirical results. In Section 5, we turn to dissect the mechanisms underlying our main findings. In Section 6, we discuss the implications of our results for the effects of bank lending contractions. Section 7 concludes. Details on the data and on a theoretical background model are in the online Appendix.

2 Testable hypotheses

Firms’ internationalization has long been recognized as an important venue for firms to grow (Minetti et al., 2015). Firms exporting their products and services are found to be significantly larger, more productive and efficient than their competitors operating only on the domestic market (Bernard et al., 2007; Wagner, 2007; Blaum et al., 2018). Beyond export, firms may decide to participate in international markets also by joining a global value chain. This internationalization mode is inherently more structural and long-term oriented than the mere export of goods, and may yield additional benefits to firms (Bernard et al., 2018b; 2019; Antràs and Chor, 2021). Trade relationships with large counterparts involved in a GVC provide a valuable opportunity for firms to learn about technologies, as well as organizational and managerial practices. Moreover, when supply chain relationships entail some involvement in strategic stages of production, firms may exploit new channels for innovating and penetrating markets (Brancati et al., 2017).

Firms’ foreign activities (both export and GVC participation) are typically perceived by financiers as characterized by a considerable level of uncertainty and risk (Manova, 2013). First, information on foreign markets is hard to obtain for firms and difficult to verify for creditors. Second, the enforceability of contracts in international transactions is limited: purchases and sales are made in foreign countries that can have different laws and regulations. Third, exporters and importers need more working capital financing than firms engaged in domestic transactions because of the time lags associated with international transactions, thus increasing their refinancing risk (Amiti and Weinstein, 2011).

Due to the larger information asymmetries and risk associated with international activities, one could conjecture that firms involved in global value chains and/or in exporting their products are more likely to be credit rationed than their domestically oriented counterparts,

³The paper also broadly relates to a growing literature on the higher or lower resilience of internationally active firms to financial crises, e.g., multinationals (Manova et al., 2015).

especially during periods of credit crunch. Yet, concentrated creditors, such as banks, make complex decisions about the allocation of their credit capacity. In particular, banks could deliberately choose to partially insulate firms participating in global value chains in periods of tight credit. Two main mechanisms may be in place. First, banks may positively value the firm's network. The participation in a global value chain can represent a good signal for banks, as firms involved in this kind of network have higher chances to survive and grow (Biais and Gollier, 1997; McMillan and Woodruff 1999). Second, banks could internalize the negative spillovers associated with the denial of credit to internationalized firms. Financial institutions with large exposures in foreign countries may be less likely to cut credit to firms operating in foreign markets (Favara and Giannetti, 2017). This may be even more true when banks have customers positioned at different stages of the same global value chain. In this case, lenders could anticipate that liquidity provision will contain the effects of costly defaults on outstanding loans, preserving banks' future business (Giannetti and Saidi, 2019).

The "signaling" mechanism: banks value the firm's global chain network. The increasing participation of firms in global value chains has significantly affected banking activities, in terms of risk assessment and services provision. First, in evaluating firms' creditworthiness, financial intermediaries have started to shift their focus from the single borrower to its whole supply chain (Rotondi, 2013). Direct, albeit anecdotal, evidence on this practice comes from the aforementioned survey conducted in 2010 by the major banking group UniCredit, which explicitly asked firms whether their bank attributes importance to firms' collaborations with other firms within networks. Approximately one third of the surveyed firms answered affirmatively to this question. Consistent with this, UniCredit has introduced a "supply chain rating" to better measure the repayment probability of borrowers involved in global value chains (UniCredit, 2012). This rating is built on information about the amount and frequency of transactions, payment terms, and financial instruments employed along the value chain, and may be particularly useful to predict the future performance of the borrower. Most importantly, this rating may improve the borrower's credit risk and credit availability, when some conditions about the governance and organizational design of the supply chain are satisfied (Proto and Cabigiosu, 2015). Second, firms' involvement in global value chains has improved the consultancy services offered by banks to internationalized firms (Rotondi, 2013). The French banking group BNP Paribas, for instance, has opened new branches in China and India to assist companies that want to expand their activities in those regions. Deutsche Bank and Credit Agricole, in turn, have developed innovative technologies to improve the economics of their borrowers' supply chains.

Despite this anecdotal evidence, we are not aware of studies investigating the impact of firms' participation in global supply chains on bank credit availability. Raz and Gloor (2007), for a sample of software start-ups, find that firms with larger informal business networks have higher chances to survive to external shocks. Similarly, by using a data set of new ventures in the open source software industry, Stam and Elfring (2008) demonstrate that firms' networks positively affect firms' performance. These studies provide evidence on the positive effects of firms' business networks on firms' survival and performance, which in turn could influence bank lending decisions. Another strand of research studies the signaling role of trade credit. As sellers have private information on buyers, the use of trade credit by the latter may translate into a signal on firms' quality to financial intermediaries, thus mitigating adverse selection and credit rationing (Biais and Gollier, 1997; Burkart and Ellingsen, 2004).

This is particularly likely when firms are involved in supply chains, where the use of trade credit in commercial transactions is quite common.

Hypothesis 1 (Banks value the firm's network). Although firms' internationalization activities are characterized by larger information asymmetries and risk, that get exacerbated during periods of credit crunch, banks may positively value firms' participation in global value chains and contract credit less to value chain participants.

The "spillover" mechanism: banks internalize the global spillovers of credit rationing. The European financial landscape has profoundly changed in the last thirty years. Since the approval of the Second Banking Directive and the Single Banking License in 1989, cross-border financial flows have grown considerably, and the banking sector has consolidated through a wave of cross-border mergers and acquisitions (Allen, 2011). In 2010, major European banking groups held a significant share of their total assets abroad (Duijm and Schoenmaker, 2021): 87% for Standard Chartered, which is particularly exposed to the Asia-Pacific region (18% in Hong Kong, 7% in India, 11% in Korea, and 14% in Singapore); 86% for Raiffeisen Zentralbank Osterreich, whose main foreign assets are concentrated in developing European countries; 74% for BNP Paribas and 59% for UniCredit, which are mainly exposed to Central Europe; 69% for Banco Santander, that has a significant exposure in Latin America (15% in Brazil and 5% in Mexico); 60% for Deutsche Bank, whose foreign assets are mainly concentrated in Central Europe and the United States (22%).

Due to their relevance, banks' foreign claims may affect lending decisions in bad times. Banks with high exposure in a foreign country may anticipate that, by providing liquidity to domestic borrowers operating, directly or indirectly, in that country they can limit costly defaults on outstanding loans in that country and preserve future business.⁴ The literature has shown that banks take into account feedback effects in their lending decisions. Using differences in US local housing markets during the 2007-2010 housing crisis, Favara and Giannetti (2017) find that lenders with a high share of collateralized debt in their portfolios internalize the negative effects of liquidation decisions on collateral values and are induced to renegotiate their debt to avoid price-default spirals. Giannetti and Saidi (2019) indicate that lenders with a high market share in an industry grant disproportionately more credit than other banks to firms in that industry during periods of distress in comparison to normal times. Hasan et al. (2020) extend the work of Giannetti and Saidi by analyzing a sample of more than 7,000 loans from 1993 to 2008, and present evidence on the association between banks' industry market shares and liquidity provision during tranquil periods.

Hypothesis 2 (Banks internalize the global spillovers of credit rationing). Banks with a high exposure in a foreign country may extend more credit to borrowers involved in GVCs operating in that country to preserve their own business in the country.

⁴Banks operating in foreign markets may also have an information advantage and be better positioned to overcome information asymmetries. In the analysis, we will try to disentangle the role of banks' knowledge.

3 Data and empirical strategy

3.1 Data sources

To perform our empirical investigation, we draw information from five main sources: the EU-EFIGE Bruegel- UniCredit survey, the BvD-Amadeus database, the Bureau van Dijk Orbis data set, Moody’s Analytics BankFocus, and the BIS Cross Border Banking Statistics. The EU-EFIGE survey, coordinated by the Bruegel Institute and supported by the Directorate General Research of the European Commission, collects information on a representative sample of manufacturing firms with more than 10 employees in seven European countries (Austria, France, Germany, Hungary, Italy, Spain, and the United Kingdom). The survey was conducted in early 2010 and spans the 2007-2009 period.⁵ One of its goals was to study firms’ behavior and performance during the Great Financial Crisis. To ensure statistical representativeness, the data set was designed to fulfill two main criteria. First, the availability of an adequately large target sample of firms: 3,000 firms for each large country (France, Germany, Italy, Spain, and the United Kingdom) and 500 firms for each small country (Austria and Hungary), for a total of almost 15,000 firms. Second, the sample was stratified to ensure representativeness of the collected data for every country, especially focusing on the composition by sectors, regions and size classes. The survey questionnaire comprises six broad areas: firm ownership and governance; workforce; exports, imports, and internationalization; investments, innovation, and R&D; financial conditions and bank-firm relationships; market structure and competition. Importantly, the survey also includes specific questions on firms’ behavior during the crisis. To all the surveyed firms, we attach balance-sheet information for the years 2007-2009 provided by the BvD-Amadeus database, the most comprehensive and widely used source of financial information for public and private firms in Europe.

We complement the two main firm-level databases with data from the BIS Cross Border Banking Statistics and, especially, detailed information from the BankFocus database on the subsidiaries per country of the lending banks of the firms in our sample. The hand-matching of the BankFocus data with the EFIGE data is made possible by information from the Orbis database on the banks with which firms do business, as well as specific information in the EFIGE survey on the countries in which firms’ supply chain partners are located.

Table A1 describes all the variables employed in the empirical analysis. Table 1 displays summary statistics. At the mean, the surveyed firms have been in business for 34 years. More than 60% of them have fewer than 50 employees, while about 4% have more than 500 employees. The average (median) size of the firms, 72 (26) employees, suggests that the firms in our sample are small and medium-sized, but, for example, larger than the firms covered by the U.S. National Survey on Small Business Finance (25 employees on average). 70% of the businesses are family owned and 22% are part of a group. The majority of firms (almost 80%) are located in Germany, France, Italy and Spain, while 14% are located in the United Kingdom, 3.3% in Hungary and 3% in Austria.

⁵The data collection was carried out by a professional contractor (GfK, the fourth largest market research company in the world).

3.2 Measurement

3.2.1 Bank credit rationing

The large majority of the firms in our sample heavily rely on bank credit as a form of external financing: for more than 50% of the firms, financial debt consists only of bank debt, and on average only little more than 18% of financial debt consists of corporate bonds and other forms of non-bank debt. The detailed information provided by the EU-EFIGE survey allows us to directly measure the bank credit rationing status of the surveyed firms. To construct our main dependent variable, we rely on the following survey question: *During the last year (2009), did the firm apply for more credit? (i) yes, applied for it and it was successful; (ii) yes, applied for it and was not successful; (iii) no, did not apply for it.* Following a broad body of studies (e.g., Angelini and Generale, 2008; Minetti and Zhu, 2011; Jappelli, 1999; Ferri et al., 2019), our measure of bank credit rationing (*Rationing*) is a dummy variable taking the value of one if the firm responded (ii) to this question, that is, if the firm applied for more credit without success.⁶

As shown in Table 1, 8.7% of the surveyed firms were credit rationed during the crisis. Credit rationed firms are on average younger, more indebted, less liquid, profitable and productive. Figure 1a draws the distribution of credit rationed firms across European regions and reveals that rationed firms are not clustered in few regions. The incidence of bank credit rationing ranges from 12.3% in Italy and 12.5% in Spain, to 3.8% in France and 6.3% in Germany. For comparison, the incidence for Italy is roughly in the ballpark of the average of the "strong credit rationing" and "weak credit rationing" measures observed by Minetti and Zhu (2011) for the Italian manufacturers covered by another major survey (Capitalia) in 2000 (11%). The higher incidence of credit rationing in our setting plausibly reflects the occurrence of the credit crunch in 2009. Although Spanish and Italian firms are more likely to be rationed overall, we still find that some French and German regions have a relatively high share of credit rationed companies.

In Figure 2, we display the dynamics of credit growth in the countries under analysis. The figure clearly shows the significant drop of credit occurred in 2009.

3.2.2 Firm export and global value chains

Firm export. The EU-EFIGE survey provides information about whether a firm exported or not in 2008 and about the percentage of foreign sales, conditional on the firm exporting. The questionnaire asks: *Has the firm sold abroad some or all of its own products/services in 2008?; What percentage of the 2008 annual turnover did the export activities represent?.* In our sample, 58% of firms exported in 2008, with foreign sales accounting for 32% of their turnover on average. Figure 1b shows that the propensity to export is particularly high in Italy, Austria, and the United Kingdom, with a percentage of exporters as high as 69%, 63%, and 61.3%, respectively. These figures are in line with those of prior studies. For the United Kingdom, Greenaway and Kneller (2004) report that 66% of firms exported in 1995, while Greenaway et al. (2007) document that in a panel of 9,292 manufacturing firms observed

⁶Similar definitions of financially constrained firms have been also adopted by Angelini and Generale (2008), who employed the Survey on Italian Manufacturing Firms (SIMF), by Minetti et al. (2019), who relied on the Unicredit Survey on small and medium-sized enterprises, and by Jappelli (1990) and Duca and Rosenthal (1993), who employed the Survey on Consumer Finances.

over the period 1993-2003, almost 70% of the firms exported in at least one year. Using data from the Capitalia Survey on Italian Manufacturing Firms, we calculated that nearly 68.5% of Italian firms exported in 2000. Table 1 indicates that exporters are on average larger and more productive than non-exporters. Moreover, they are more likely to belong to a business group. The table also suggests that exporters are more likely to be credit rationed by banks than non-exporters.

Global value chains. By relying on the information in the EU-EFIGE survey, we define firms involved in a global value chain as firms that import intermediate goods and/or services and export intermediate or final goods (Bernard et al., 2007; 2018a; Antrás and Chor, 2021).⁷ Our definition of global value chain participation is in line with the taxonomy used by World Bank (2016) and captures the most globalized businesses, that simultaneously deal with foreign counterparts on the buying and selling sides. Our analysis may thus pick a "deep" form of globalization, and to some extent overestimate the impact of firms' globalization.

In our sample, 32.7% of firms participate in global value chains. These figures are in line with those found by Blaum et al. (2018) for French enterprises and Brancati et al. (2020) for Italian small and medium-sized enterprises.⁸ Figure 1c reveals that the percentage of firms participating in global supply chains is particularly high in Austria (41.3%) and the United Kingdom (39.38%). The distribution of global chain participants by sector is in Figure 3. Pharmaceutical, chemical, and textiles are the industries most involved in global value chains while food products are those with the most domestic-oriented firms. Table 1 further suggests that firms participating in global value chains are on average larger and more productive, and more frequently belong to a business group. Pairwise correlations do not highlight differences in the incidence of credit rationing between global supply chains participants and non-participants.

Using aggregate data from Eurostat, Figure 2 shows a significant contraction of export and of the import content of export in each of the seven countries under study in the year 2009.

3.2.3 Control variables

To mitigate the risk that omitted variables drive both firms' internationalization and credit rationing, we control for a large set of possible confounding effects.

First, to account for the fact that young and small firms lack transparent information about their businesses and therefore are more likely to be credit restricted (Petersen and Rajan, 1994; Guiso and Minetti, 2010), we include firm size (*Size*, expressed as the logarithm of the number of employees) and age (*Age*, measured as the number of years from the firm inception). Second, as the firm's financial and economic position may significantly affect bank credit availability, we insert the firm's level of indebtedness (*Debt Ratio*, computed as total debt over total assets), profitability (*ROA*, return on assets), and productivity (*Labour Productivity*, computed as value added per employee). While a firm's indebtedness might increase its credit risk and the extent of financing constraints (Jensen and Meckling, 1976),

⁷In addition to the question presented in the previous subsection, we consider the following questions of the survey: *In 2008 has the firm purchased from abroad any services for its domestic production?*; *In 2008 has the firm purchased from abroad raw material or any other intermediate goods for its domestic production?*

⁸For example, Brancati et al. (2020) report an incidence of global value chain participation of 29%. In our sample, the percentage of Italian firms in global value chains is 32%.

a firm’s profitability and productivity should be positively associated with the availability of bank credit. Another financial indicator we account for in the empirical model is the tangibility of the firm’s assets (*Asset Tangibility*, defined as tangible fixed assets over total assets). This is plausibly a good proxy for the pledgeability of collateral guarantees by the borrowing firm, which we expect to reduce the probability of experiencing credit constraints (Almeida and Campello, 2007).⁹

We also account for the organizational and ownership structure of the firm. To account for the possibility that participation in business groups affects the probability of being rationed by banks, we control for the firm participation in a group (*Group*, a dummy variable equal to one if the firm belongs to a business group, and zero otherwise). Moreover, in line with the studies showing that family firms tend to be less credit rationed during a crisis (D’Aurizio et al., 2015), we include a measure of the firm’s ownership structure (*Family Firm*, a dummy variable equal to one if the firm is family owned, and zero otherwise). We finally saturate the empirical model with a comprehensive array of fixed effects: sector fixed effects according to the two-digit NACE classification and regional fixed effects (at the NUTS-2 level), based on the region where the firm is located. While our database is cross-sectional, and hence does not allow for the inclusion of firm fixed effects, it is worth recalling that the key internationalization variables of interest in our analysis, especially firms’ participation in global value chains, are inherently very persistent variables.¹⁰

3.3 Empirical model and instruments

The goal of this paper is to study whether firms’ internationalization status affects bank credit rationing. The probability that firm i is credit rationed can be written as

$$P(\text{Rationing}_i = 1) = \Phi(\alpha_1 + INT_i\beta_1 + Z_i\gamma_1) \quad (1)$$

where Rationing_i represents the bank credit rationing indicator described in section 3.2.1; INT_i denotes our measure of firms’ internationalization status, as presented in section 3.2.2; and Z_i is a vector of exogenous covariates, listed in section 3.2.3, as well as detailed fixed effects at the region and industry levels. As our dependent variable is a dummy taking values zero and one, the non-instrumented estimates of equation (1) are obtained by maximum likelihood probit regressions.¹¹

The reader will be concerned that firms’ decisions to export and to participate in global value chains are endogenous to their exposure to credit rationing. Although our specification controls for a rich set of factors that may affect credit rationing, including firm-level characteristics as well as industry and region fixed effects, omitted variables can be correlated with firms’ internationalization activities and also affect credit availability. There can also be concerns of reverse causality. Firms with greater financing constraints may decide to participate in supply chains in order to obtain trade credit from their suppliers (Minetti et al., 2019). And, as documented by prior literature, firms’ decision to export significantly depends on its

⁹As our dependent variables refer to 2009, all the balance-sheet indicators are computed as average values over the years 2007-2009. Estimation results are robust to the inclusion of balance-sheet information taken in 2007.

¹⁰For example, Brancati et al. (2020) show for Italy that approximately 5% of firms switch from participating to not participating in supply chains across years.

¹¹In all the regressions, standard errors are heteroskedasticity robust, clustered at the regional level.

credit availability (Manova, 2013). The information in the EFIGE survey partially helps us to deal with the reverse causality issue. In fact, we observe credit rationing in 2009, and import and export activities in 2008. In spite of these considerations, to address the endogeneity problems, throughout the analysis we rely on an instrumental variable approach (while reporting the non-instrumented estimates in the Appendix). Since both credit rationing and firms' internationalization decisions are binary variables, we estimate a bivariate probit model that comprises equation (1) and the following probit equation for firms' internationalization activities:

$$P(INT_i = 1) = \Phi(IV_i\delta_1 + Z_i\lambda_1) \quad (2)$$

where IV_i represents our set of instruments, and Z_i is the vector of exogenous covariates as well as the controls for differences across regions and industries included in equation (1).¹²

To construct the instruments, we need exogenous factors that could affect firms' decisions to participate in a global value chain or to export. A growing literature has documented that firms' access to information technology is associated with a decrease in vertical integration and an increase in international trade. By using detailed data on 31 countries and 14 industries from 1995 to 1999, Freund and Weinhold (2002) find that internet development abroad facilitates service export to the United States. In a subsequent study, Freund and Weinhold (2004) confirm that internet stimulates international trade, by showing that a 10 percentage point increase in the growth of web hosts in a country leads to a 0.2 percentage point increase in export growth. As internet reduces market-specific entry costs, suppliers can more easily gather information about new markets and advertise to numerous buyers at once. Regarding firms' participation in global value chains, Brynjofsson and Hitt (2000) document that access to IT is associated with a decrease in vertical integration because it lowers the costs of coordinating externally with buyers and suppliers. This result is supported by Fort (2017), who employs data on firms' decisions to contract for manufacturing services from domestic or foreign suppliers and documents that a firm's adoption of communication technology between 2002 and 2007 is associated with a 3.1 point increase in its probability of production fragmentation. In line with these studies, the critical role of access to IT in promoting firms' participation in global value chains and export is also confirmed by anecdotal evidence (see, e.g., AIP-II Sole 24 ore, 2008, for a number of case studies referring to Italian firms).

Based on these studies, we construct our instruments for firms' export and global supply chain participation by considering firms' access to a broadband connection, the use of online purchasing and sales, and the reliance on IT systems for managing the sales/purchase network, interacted with a regional indicator of broadband connection diffusion. The regional indicator (at the NUTS-2 level) of broadband access for the year 2008 is provided by the Eurostat database on households' broadband access, while the firm level IT variables are drawn from the EFIGE survey. The relevant survey questions read: *Has the firm access to a broadband connection? (i) yes; (ii) no; In addition to the standard software/e-mailing system does the firm use IT systems/solutions for...? (i) internal information management; (ii) e-commerce (online purchasing/online sales); (iii) management of the sales/purchase network (suppliers' orders, customer service).* Hence, our instrument for firm export is constructed

¹²Equations (1) and (2) constitute a recursive bivariate probit model. The effect of firms' internationalization on the probability of being credit restricted can be identified under the assumption that the set of instruments IV_i are excluded from equation (1). Although INT_i enters equation (1) as an endogenous variable, we can estimate equations (1) and (2) using a standard bivariate probit software (Greene, 2002).

as the interaction between the firm’s reliance on a broadband connection for e-commerce and the regional indicator of broadband access. Similarly, the instrument for the firm’s participation in a global value chain is computed as the interaction between the firm’s reliance on a broadband connection for the management of the sales/purchase network of suppliers and customers and the regional indicator of broadband access.

For our instruments to be valid, they need to be correlated with our measures of firms’ internationalization status, whereas they must not correlate with unobservable variables that could also explain firms’ credit availability. We have no reason to be concerned about the fulfillment of the exclusion restriction. We will nonetheless come back to this point later in the analysis (section 4.3).

4 Main results

This section presents the baseline findings and discusses preliminary insights on the underlying mechanisms (4.1). It then elaborates on the identification strategy (4.2) and on the relevance of the effects (4.3).

4.1 Baseline findings

Tables 2 and 3 report the baseline estimates for the impact on bank credit rationing of the participation in a global value chain or of the status of exporter. As noted, we treat firms’ internationalization status as endogenous and use as instruments the firm-level indicators of IT access detailed above. Since both credit rationing and firms’ internationalization activities (GVC participation and export) are binary variables, we estimate a bivariate probit model as detailed in equations (1) and (2).

As shown in Table 2, column 1, we detect a negative and statistically significant effect of GVC participation on credit rationing.¹³ The marginal effect for the variable *Global chain* participant is -0.023, statistically significant at 95%, implying that a firm involved in a GVC is 2.3 percentage points less likely to be credit rationed than a firm that does not participate in a global supply chain. This estimated impact is economically sizeable, amounting to about 25% of the average probability of rationing in the sample in the year 2009. By contrast, as shown in column (5), the marginal effect of export is estimated to be 0.017, statistically significant at 99%, suggesting that an exporter is 1.7 percentage points more likely than a non-exporter to be rationed by banks (approximately 20% of the average probability of rationing).

The instruments appear to be reassuringly strong. The bottom of columns (1) and (5) report the estimated coefficients on the instruments from the probit equation of GVC participation and export (to save space, the first-stage coefficients on firm controls and on region and industry dummies are not reported). We find that the higher the IT access of a firm, the higher the probability that the firm participates in global value chains and exports its production abroad. The Kleibergen-Paap Wald F-statistic from the first stage suggests that we do not face an issue of weak instruments. It is important to stress here that the literature on weak instruments is less developed with regard to diagnostics for nonlinear IV models (see, e.g., Mikusheva, 2013, for a survey). Thus, the often used cutoff values for the first-stage F-statistics are derived using a linear model under the assumption that the model is

¹³The non-instrumented probit estimates of Table 2 are reported in Table A2.

homoskedastic (Stock and Yogo, 2005).

To gain additional insights into the impact of GVC participation on credit rationing, in columns (2)-(3) of Table 2, we partition firms involved in global value chains depending on the type of products/services imported from abroad. In particular, we distinguish between global chain participants importing services and global chain participants importing intermediate goods. The bivariate probit estimations suggest that both the firms importing services and those importing intermediate goods are characterized by a lower probability of experiencing credit restrictions. The marginal effects imply that firms involved in global supply chains are 4.1 and 3.7 percentage points less likely to experience credit restrictions when they import services and intermediate goods, respectively.

The attenuating effect of GVC participation on the probability of being credit rationed appears to be striking, especially when compared with the opposite finding for the exporter status. As discussed in section 2 when framing our hypotheses, we interpret this finding as suggesting that banks tend to protect firms in global value chains when curtailing credit in bad times. We will later perform tests on the mechanisms possibly motivating this attitude of banks.

The estimated coefficients for the firm level controls are in line with expectations. More indebted firms turn out to be more likely to be rationed by banks. Conversely, more profitable businesses feature a lower probability of experiencing credit constraints. Somewhat more surprisingly, firm size appears to be positively associated with credit rationing.

Firms' participation in global value chains can vary in a number of dimensions, including the degree of stability of the participation, the firms's position in the chain, and the density of the inter-firm linkages along the chain. In Table 2, column (4), and Table 3, Panel A, we refine the tests and consider the stability of the firm's participation, the firm's position in the global value chain, and the ultimate impact on credit rationing. A natural, relevant question is whether banks' possible protection of global chain participants in bad times is confirmed when we restrict attention to stable participants. Put differently, does firms' global experience shape the relationship between supply chain participation and credit rationing? Consistent with the observation that global supply chain participation is a stable characteristic of a firm, almost 90% of the global supply chain participants are regular participants.¹⁴ The findings suggest that participating in a global value chain significantly reduces the probability of experiencing credit rationing also when we focus on firms that were regularly involved in supply chains before 2008 (these businesses are 2 percentage points less likely to be credit restricted). These findings suggest that banks protect businesses whose global supply chain participation constitutes a structural, long-term engagement.¹⁵

In Panel A of Table 3, we distinguish between relatively upstream and downstream firms.¹⁶

¹⁴The EFIGE survey asks: *Before 2008, has the firm exported any of its products? (i) regularly/always; (ii) sometimes; (iii) never.; Before 2008, did the firm purchase any services from abroad? (i) regularly/always; (ii) sometimes; (iii) never.; Before 2008, has the firm purchased any intermediate goods from abroad? (i) regularly/always; (ii) sometimes; (iii) never.*

¹⁵To further investigate that our results are not driven by fringe participants in global value chains or firms with marginal export activity, we reestimate the baseline regressions by exploiting information on the turnover accounted for by import/export activities. As shown in Table A3, we obtain that dropping GVC participants with a ratio (import+export)/turnover lower than 5% or 3% leaves the baseline results essentially unchanged. Similarly, dropping firms with a ratio export/turnover below 5% or 3% does not alter the findings.

¹⁶Observe that in our setting we define relatively upstream firms as those that both import and export intermediate goods. We cannot observe the suppliers of such firms, which would be even more upstream in the

Column (1) carries over the marginal effects of the baseline regression of Table 2. The estimates in columns (2)-(3) suggest that firms participating in global value chains are less likely to experience credit restrictions, regardless of their position in the chain. The marginal effects of both upstream and downstream participation are negative and statistically significant at 99%.

Finally, in Panel B of Table 3 we investigate whether the baseline effects depend on the density of inter-firm linkages along supply chains. The survey does not ask firms information on this point. This is not surprising, as survey respondents might not be aware of the whole structure of the global value chains they belong to. To gain insights on this point, we then consider sector-level information from Eurostat on the import content of export by two-digit sectors (a frequently used proxy for the density of supply chain networks in sectoral studies on global value chains). We normalize this measure by the GDP of the country of origin of the firm.¹⁷ The estimates in Panel B of Table 3 suggest that the protection offered by banks to global value chain participants is stronger in sectors characterized by stronger production fragmentation (import content of export above the median). This complements the finding in column (4) of Table 2 for the stability of global chains, pointing to a protection offered by banks when supply chains are dense and stable.

4.2 More on the identification strategy

We have no reasons to expect that our instrumental variables influence the probability of credit rationing through channels alternative to firms' internationalization activities. Further, our variables are constructed based on a detailed question to the surveyed firms about the goals of IT usage, beyond standard e-mail systems. By construction, this excludes IT uses for financial purposes. Nonetheless, to further assuage concerns about the fulfillment of the exclusion restriction, we verified that firms' access to broadband connections is unlikely to drive credit availability.

In our sample, firms are asked whether one of the reasons why they rely on their main bank is that the bank is an efficient user of internet. Only little more than 15% of the survey respondents declare that this is one of the reasons. Further, when we re-estimate our baseline regressions of Table 2 after dropping this small portion of firms, the results (available upon request) carry through. Another element that corroborates this point is that the large majority of firms in our sample are small and medium-sized and tend to rely on personal lending relationships with loan officers instead of impersonal contacts with financial institutions. Based on this argument, we next study whether the effects estimated differ depending on features of the lending technology used by the main bank, that is, the length of the credit relationship with the firm and the type of information typically used by the bank in its lending relationship (Table 4). In Panel A, we consider the number of years that a firm has been operating with its current main bank. The marginal effects for the bivariate probit model indicate that our baseline results, that is an attenuating impact of GVC participation on credit rationing, are confirmed when focusing on global chain participants with a lending relationship longer than 5 years. These firms are 4 percentage points less likely to experience credit restrictions than firms not involved in global supply chains. It thus appears that banks' propensity to protect global supply chain participants from the credit crunch is confirmed for

supply chain.

¹⁷As a robustness, we also experimented with scaling by the total import content of export of the country.

firms more likely to engage in personal relationships with their loan officers.¹⁸ Importantly, these are the businesses for which the type of lending technology of the bank (personal, repeated interactions with the borrowing firm over the course of several years) likely makes firms’ access to internet entirely irrelevant for the availability of credit. As shown in Table A4, the results of Panel A are fully robust to interacting the global chain indicator with the dummy for relationship lending (instead of partitioning the sample) and instrumenting both the global chain indicator and the relationship lending dummy. In particular, to instrument the relationship lending dummy, we restrict attention to the subsample of Italian businesses and employ as instruments the indicators of the 1936 Italian banking regulation (see, e.g., Guiso et al., 2004, and the Appendix for more details on these instruments).

To further probe the above point, in columns (3) and (4) of Table 4 we next restrict attention to the firms that declare that typically most of the information acquisition of loan officers occurs through personal interviews and meetings with the firm’s management. Again, the estimates show that personally interviewed firms that participate in a global value chain are characterized by a smaller probability of experiencing credit restrictions (see column 3). Finally, in Panel B of Table 4, we run our baseline regressions including also bank fixed effects on the subsample of firms for which we know the name of the main bank. The results are qualitatively similar.

To conclude this robustness analysis, we resorted to information provided by the aforementioned Capitalia survey, which roughly covers the Italian subsample of the EFIGE survey. In the Capitalia survey, firms declare that they visit their loan officer every 15 days and more than 50% of the firms visit loan officers every 5 days. In addition, the average firm is located only 4 kilometers away from the bank branch. All these pieces of evidence point to the significant relevance of personal interactions, and a negligible relevance of internet access, for banks’ material decisions regarding credit extension.

4.3 Do the effects matter?

The impact on credit rationing of a firm’s internationalization, i.e. its participation in global value chains and its export status, may vary depending on characteristics of the firm. Investigating for what segments of firms our results are stronger can also help understand whether the effects bite especially for the businesses more vulnerable to bank credit rationing and, hence, are indeed relevant. In Table 5, we exploit the richness of our databases to explore this point.

Panel A re-estimates the baseline regressions of Table 2 for the subsamples of firms with less (more) than 25 years, the median age of our firms. The marginal effects of the bivariate probit regressions in columns (1) and (3) suggest that the participation in global value chains mitigates the probability of experiencing credit rationing only for younger firms. Among young businesses, those involved in global supply chains are 2.9 percentage points less likely to be credit rationed. Conversely, older firms that are involved in GVCs are not significantly different from businesses not participating in GVCs, in terms of credit availability.¹⁹

Panel B splits our sample based on the firm size (number of employees). In particular,

¹⁸Similarly, for export, the baseline results are confirmed for the subsample of firms with long lending relationships.

¹⁹Different results are obtained for firm export. In this case, firms with more than 25 years are more likely to experience credit restrictions when they sell their products or services abroad.

we partition firms using the threshold of 50 employees adopted by the European Commission to define small businesses. The regressions in columns (1) and (3) indicate that firms' participation in global supply chains reduces the probability of being credit rationed by banks only for small businesses. Among firms with less than 50 employees, those involved in global value chains are 5.3 percentage points less likely to be credit restricted. On the other hand, we detect no significant impact of global value chain participation on credit rationing for the subsample of medium and large enterprises. Similar results are found with respect to firm export: our baseline finding of a positive impact of firm export on credit rationing appears to be driven by the subsample of small businesses (plausibly the riskiest exporters). These firms, when export, are more likely to experience credit restrictions (column 2). Conversely, large exporters are not significantly different from non-exporters in terms of credit availability (column 4).

While firm age and size are typically viewed as indicators of firm vulnerability to credit constraints, they represent indirect proxies. The EU-EFIGE survey provides however direct, self-reported measures of firms' reliance on external financing. In Panel C, we re-estimate our baseline regressions subdividing the sample based on whether a firm declares that it is highly reliant on external financing or not. The estimates suggest that, if anything, the effects are more significant for firms more reliant on external financing (column 1). The survey also contains information on firms' typical usage of bank financing. In Panel D, we then also verify whether the effects are stronger for firms whose external debt consists entirely of bank debt. The results show that such firms are indeed those for which our baseline effects are more pronounced. Overall, consistent with the estimates of Panels A-B, the findings in Panels C-D point again to a relevance of the effects for the businesses more likely to be vulnerable to a bank credit denial (i.e., more reliant on external finance and, among external financing sources, more reliant on bank funding).

5 Mechanisms

As discussed in section 2, we envisage two main mechanisms that could drive the effect of firms' global engagement on bank credit rationing. First, banks could view global supply chain participation as a signal of the quality and prospects of their client firms ("signaling" mechanism). Second, banks could internalize the negative consequences of their credit denial on other activities they conduct abroad ("spillover" mechanism). In Tables 6 and 7, we investigate these two mechanisms. It is important to highlight up front that we do not view these mechanisms as alternative but as possible, complementary drivers of our main results. Whenever relevant, we compare the findings for global value chains with those for export.

5.1 Supply chain participation as a signal

In Table 6, we study the "signaling" mechanism by exploiting information on the types of activities conducted by a firm within global supply chains. To the extent that global chain participation is a signal of quality and prospects, we would expect our main results to be stronger when this participation is associated with productivity-enhancing activities. In Panel A of Table 6, we treat R&D collaborations within the supply chain as a proxy for such activities (Rotondi, 2013). The results suggest that the negative effect of global chain participation on rationing occurs for the subsample of businesses that engage in R&D collaborations (see

column 1). By contrast, although the estimated coefficient remains negative, we detect a less significant alleviating effect of global supply participation not entailing R&D collaborations. In Panel B, we exploit an alternative proxy based on the implementation of activities aimed at expanding the firms' global network. Again, our results are confirmed for the subsample of businesses engaged in such activities while they lose significance for less sophisticated participations.²⁰ These findings are in line with the view that banks especially insulate from a credit crunch global supply chain participants that are more ambitious and promising.

Another way to disentangle banks' view of global chain participation as a positive signal is to consider the nature of the information acquired by banks during the lending process. We focus here on the request of collateral guarantees by the lender.²¹ We expect the signaling role of GVC participation to be more pronounced when a bank does not rely mechanically on the posting of collateral for its decision to provide credit. The estimation results suggest that being involved in a global value chain mitigates the probability of experiencing credit limits only for firms that do not provide collateral guarantees to their lenders. The marginal effects for the bivariate probit model reported in columns (3) and (4) of Panel D are both negative, although only the latter is statistically significant. This is in line with the interpretation that, for borrowers that do not pledge collateral, the signal conveyed by global supply chain participation is probably more relevant.²²

5.2 Internalizing the spillover effects of credit rationing

In Table 7, we turn to test the "spillover" mechanism, that is, banks protect supply chain participants because they internalize the negative consequences that a denial of credit can have on their own foreign business. Figure 4 provides illustrative evidence on the diffusion of banks across geographical areas. The figure displays the allocation of foreign assets portfolios of the banking systems of six countries under study broken down by destination market. Spanish and Italian banks feature the largest involvement in EU 15 countries, while Austrian banks are especially exposed to non-EU 15 European countries. UK banks are particularly active across the Atlantic, e.g., in the United States.

5.2.1 Preliminary analysis

To gain preliminary insights on the second mechanism, in Panel A we distinguish between firms borrowing from banks with a local scope (domestic local banks or domestic national banks without an international network) and firms borrowing from banks with a global scope (domestic national banks with an international network or foreign banks).²³ The estimates

²⁰Observe that the measures of R&D collaborations and activities for global expansions appear to capture different aspects (their correlation is positive but very low, 0.016).

²¹We classify firms by relying on the following question of the EFIGE survey: *Which type of information does the bank normally use/ask to assess your firm's credit worthiness? (i) collateral; ...; (iii) interviews with management on firm's policy and prospects; ...*

²²Opposite results are found for firm export (see Table A5). In this case, our baseline findings seem to be driven by the subsample of firms that typically pledge collateral to their main bank: the marginal effects for the bivariate probit model indicate that exporters are 2.1 percentage points more likely to be credit rationed than non-exporters when they are requested to provide collateral. This is consistent with the view that for borrowers that are requested to pledge collateral, export is probably a stronger signal of riskiness.

²³To classify our sample firms, we rely on two questions of the EFIGE survey: *What type of bank/credit institution does the firm use? (i) domestic local banks; (ii) domestic national banks; (iii) foreign banks.; Which*

suggest that the participation in global value chains mitigates the probability of experiencing credit constraints for both subgroups of firms. However, the effects appear to be significantly more pronounced in the case of banks with an international scope, consistent with the hypothesis that these banks are more concerned about international spillovers of their credit denial to global chain participants.²⁴

A second piece of preliminary evidence comes from investigating the geographical location of the firm’s supply chain customers and suppliers. By exploiting information provided by the EFIGE survey, in Panel B of Table 7 we classify firms as importing or exporting their products and services in three main geographical areas: Europe, Asia and the Americas. Column (3) in the panel reports the marginal effects of the baseline regression presented in section 4.1.²⁵ The estimates in Panel B indicate that global chain participants with chain partners located in Europe are less likely to experience credit restrictions, while global chain participants doing business with customers and suppliers located in Asia (mainly India and China) are more exposed to bank credit rationing. As explained below, this can point to a tendency of banks to especially protect firms whose global chains span European markets, in which banks themselves have larger ramifications. Interestingly, this contrasts with the findings for the geographical destination of firm export, displayed in Table A5. The estimates suggest that our baseline findings for export are especially driven by firms exporting their products and services to Asia.²⁶ This may reflect the fact that exporting to far-away markets, such as the Asian ones, may be particularly risky for banks, and hence be more exposed to credit rationing in difficult times.

5.2.2 Finer tests

To perform finer tests on our second mechanism, we next match our main data with data on the areas of operation of internationally active banks. To this end, we exploit the information from our database on the regions of origin and destination of products.

In Panels C and D of Table 7, relying on BIS data on the locational activities of internationally active banks, we split our sample based on whether the banks of the country hold a participation in the region of origin/destination of the firms which exceeds a threshold percentage of the total foreign lending portfolio of the banks. Recall that the results in Panel B suggest that our findings are especially driven by global chains with a European span. Therefore, in Panels C and D of Table 7, we focus on EU-based supply chains.²⁷ We choose a threshold of 60% for the relevance of the countries in the bank portfolio, but perform sensitivity analyses with thresholds in the 50%-70% range. Observe that this threshold effectively partitions our sample into two subgroups of countries of approximately equal number. For other non-15 EU countries, with the same logic, we choose 10% as a threshold. The

factors are key in the choice of a main bank? ...; (v) the bank has an extensive international network;

²⁴When looking at the results for firm export, the positive impact of export on credit rationing is confirmed only for the subsample of firms borrowing from domestic local banks or from domestic national banks without an international network.

²⁵As it is usually the case, in the first stage we insert the instrument interacted with the destination market.

²⁶In particular, the probit estimates suggest that firms exporting in Asia are 5.1 percentage points more likely to experience credit constraints than other firms. Conversely, firms exporting in Europe are not significantly different from non-exporters in terms of credit availability.

²⁷Specifically, we interact our measure of supply chain participation with the dummy for EU based participation.

coefficients estimated in columns (1)-(4) show that our results for EU-based supply chains are especially strong for the subsample of countries whose banks are more exposed to the origin/destination area. While suggestive, this supports the hypothesis that, by protecting global supply chain participants, banks also protect their own interests in the countries where their clients operate.

In Table 8, we turn to a more refined test. In conducting this test, we suffer a loss of observations due to data availability. Moody’s Analytics BankFocus provides detailed information on banks’ international presence (subsidiaries per country). For each bank, in order to measure the relative importance of a country for the bank’s operations, we normalize the subsidiaries in the country by the total number of subsidiaries of the bank. We next hand-match the constructed indicator of bank presence in a country with the EFIGE data exploiting information from the Bureau van Dijk Orbis database regarding the banks with which firms do business, as well as EFIGE information on the specific countries in which firms’ supply chain partners are located. Figure 5 displays the distribution of bank subsidiaries across countries as well as the same distribution weighted by the intensity of firm supply linkages with the countries. In Table 8, we next re-estimate the baseline regressions of Table 2 after partitioning our sample based on how much the country with which firm has supply chain linkages matters for the firm’s lending banks. The results provide strong evidence that the attenuating effect of global chain participation on bank credit rationing occurs when banks have a relative strong presence in the countries where firms have supply chain links. Conversely, no such effect emerges when banks do not have a relevant presence in the countries.

5.2.3 Is it knowledge?

The reader could wonder whether the findings in Tables 7 and 8 mostly reflect banks’ superior knowledge about exported products rather than banks’ interest in preserving their own activities abroad. Clearly, we do not view the two mechanisms as alternative but possibly as reinforcing each other. Nonetheless, it is useful to try and tease out the possible contribution of banks’ knowledge. A first observation is that our results show that internationally active firms are significantly less exposed to bank rationing than domestically oriented ones. For this finding to be driven by banks’ knowledge, one should be probably conjecture that such knowledge is stronger for internationally active businesses than for domestically oriented ones. To further rule out this possibility, in Table 9 we perform two types of tests. First, we look at the nature of banks. We would expect foreign banks to be potentially more knowledgeable about exported products than about domestically sold ones. When we rerun the regressions of Table 8 by dropping firms whose main bank is foreign, we obtain virtually unchanged results (Panel A). We interpret this as suggesting that our estimates are not purely knowledge-driven.²⁸

In Panel B, we consider instead the nature of exported products. We would expect bank knowledge mechanisms to be more relevant for goods that are not well-known either because they are not sold in domestic market or because they are inherently informationally opaque. In columns (5)-(6), we use the indicators of product information complexity constructed by Nunn (2007) (the conservative and non-conservative sectoral fraction of inputs not sold

²⁸Interestingly, the negative impact of global chain participation on rationing appears to be confirmed for the upper quartile of the joint exposure of firms and banks to the country, while the sign for the third quartile switches from negative to positive. This might reflect somewhat weaker attenuating effect of global chain participation effect when the global mechanism is removed.

on exchange). When we restrict attention to products that are informationally relatively transparent, the baseline results carry through. This again suggests that banks' knowledge is not the primary driver of our findings. The test in column (7) of Panel B, further confirms this conclusion. In that column, we restrict the attention to export products that are also sold domestically.²⁹ Again, we continue to estimate an attenuating effect of GVC participation on bank rationing.

In conclusion, the results in Table 9 suggest that banks' protection of global firms can reflect banks' interest in preserving their business abroad rather than mostly banks' knowledge of exported products.

6 Some implications for lending contractions

We conclude the analysis with a discussion of the implications of our results for the effects of bank lending contractions (such as that occurred during the Great Financial Crisis). In the Appendix A1, we present a stylized, illustrative model of a capital constrained representative bank that grants loans to two categories of firms: globally active and domestically oriented. There are three key ingredients of the illustrative framework. First, banks choose how to allocate their scarce lending capacity between the two segments of firms. Second, banks derive (unmodelled) higher returns from extending loans to globally active firms (L_G) than to domestically oriented ones (L_D), due, for example, to the mechanisms studied in Section 5. Third, globally active firms rely more than domestically oriented ones on external (bank) financing in covering the expenses of their production input. The simple model yields the following implications for the effects of a shock to banks' net worth (NW)

$$\frac{\partial Y_D}{\partial NW} = \frac{A}{\psi} f_{L_D} \frac{\mathcal{R}_G''(\cdot)}{\mathcal{R}_G''(L_G) + \mathcal{R}_D''(\cdot)}; \quad \frac{\partial Y_G}{\partial NW} = \frac{A}{\psi} g_{L_G} \frac{\mathcal{R}_D''(\cdot)}{\mathcal{R}_G''(L_G) + \mathcal{R}_D''(\cdot)} \quad (3)$$

where Y_D and Y_G are the total volumes of operations of domestically oriented and globally active firms, respectively; A denotes firms' TFP; ψ is banks' capital requirement; f_{L_D} and g_{L_G} denote the responses of the input demand of domestically oriented and globally active firms to changes in external bank financing, respectively; and $\mathcal{R}_D(\cdot)$ and $\mathcal{R}_G(\cdot)$ are banks' expected returns per unit of loan extended to domestically oriented and globally active firms. Positing for simplicity $\mathcal{R}_G(\cdot) = \omega \mathcal{R}_D(\cdot)$ ($\omega > 1$) and $g(\cdot) = \theta f(\cdot)$ ($\theta > 1$), after simple algebra we obtain

$$\underbrace{\frac{\partial Y_G}{\partial NW} / \frac{\partial Y_D}{\partial NW}}_{\approx 1.6} = \underbrace{\theta}_{\approx 2 \text{ (Minetti and Zhu, 2011)}} \times \underbrace{\frac{1}{\omega}}_{\approx 0.8 \text{ (this paper)}}. \quad (4)$$

In the back-of-the-envelope calculation in (4), to gauge θ , we use the estimates in Minetti and Zhu (2011). According to their estimates, the reduction of foreign activities of an internationalized firm credit rationed by banks is twice as large as the reduction of domestic activities of a domestically oriented, credit rationed firm (38% versus 19%). In conjunction with our estimate of $\omega \simeq 1.25$, this suggests that a bank lending contraction could reduce the foreign

²⁹The EFIGE survey specifically asks: *The main product line you sell to foreign markets... (i) is also the main product line in your domestic market; (ii) is also sold in your domestic market but it is not the main product line; (iii) is not sold in your domestic market.*

activities of internationalized firms by approximately 60% more than the sales of domestically-oriented firms. Put differently, the mitigating effect of supply chain participation uncovered in our analysis could imply a (relatively) smaller drop of import-export up to 40%.

7 Conclusions

This paper has studied how firms' globalization influences credit decisions of banks. In the context of a large credit crunch, such as that occurred during the Great Financial Crisis, we have found that banks especially protected firms with a stable participation in global supply chains. This protection did not extend, however, to firms with a less structural form of internationalization such as simple export activities. The results also reveal that two mechanisms contribute to driving the main findings. First, banks view global supply chain participation as a signal of value-enhancing activities of their clients. Second, banks protect global supply chain participants with the goal of minimizing negative spillovers on their own activities abroad. This second hypothesis confirms recent results that banks are relatively sophisticated credit providers, accounting for the broader consequences of their lending decisions (Giannetti and Saidi, 2019). More work is clearly needed to ascertain the relevance of these mechanisms.

An important question that remains unanswered in our setting is to what extent our findings reflect a "zero-sum game". In other words, do banks protect global supply chain participants to the expense of other clients? Or do our results reflect a more lenient attitude of banks when contracting credit in bad times? Answering these questions may lead to new policy implications for addressing credit crunches. We leave this and other relevant questions to future research.

The results yield relevant policy implications. An intense policy debate has developed in recent years on the extent to which internationalized economies could be more or less resilient to financial crises. Our findings unveil an alternative mechanism through which a globally interconnected business sector may be more resilient to a credit crunch, based on the credit allocation decisions of the banking sector. From the view point of the policy maker, promoting firms' participation in global supply chains could then turn out to be desirable not only in a long run perspective of firms' growth, but also in a cyclical perspective to better insulate the economy from the consequences of a credit crisis. This would be especially the case in countries characterized by a bank-centered financial sector.

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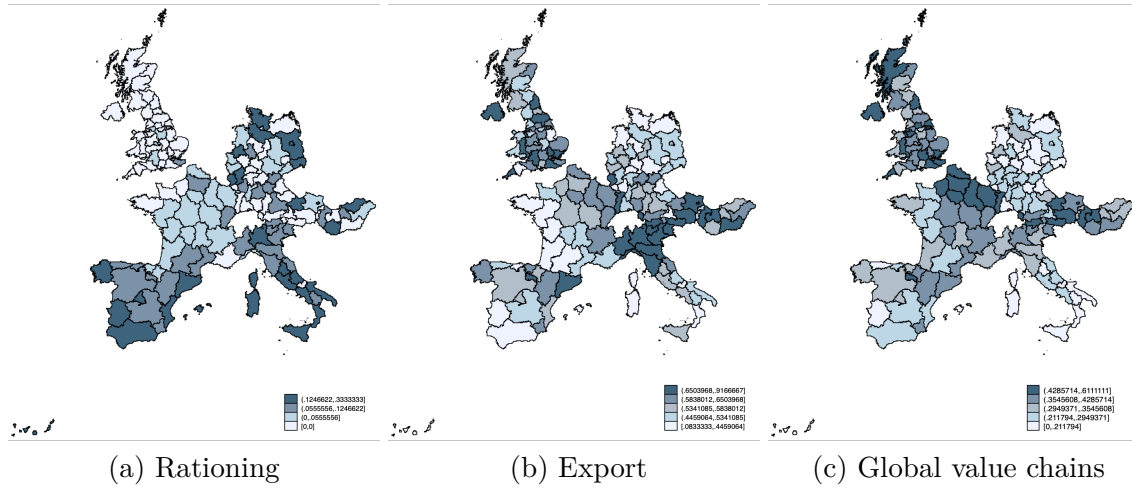
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Figure 1

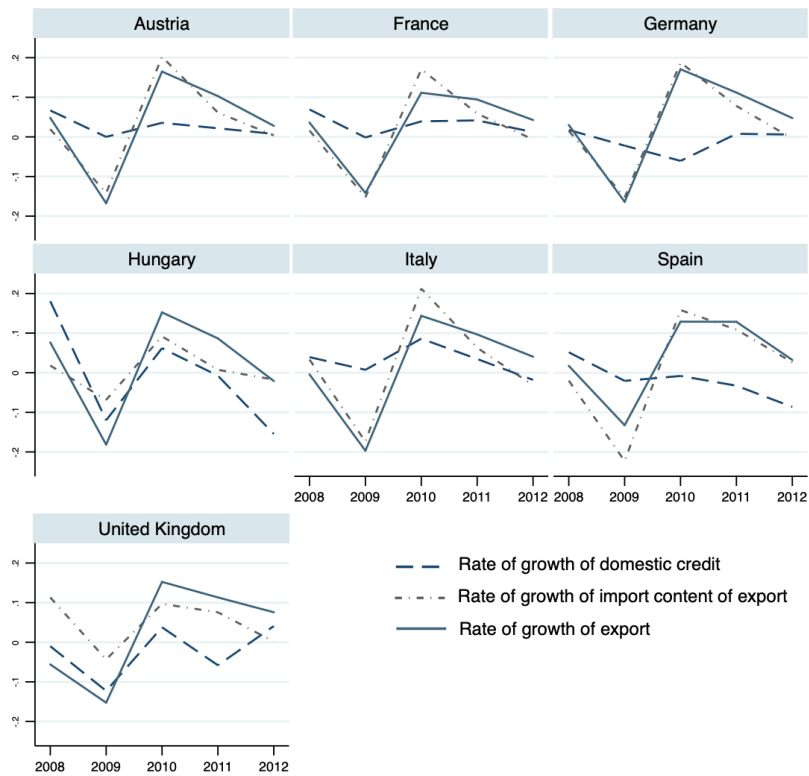
Credit rationing, export, and global value chains participation across European regions (NUTS-2)



Notes: The figures show the percentage of credit rationing, export, and global chains participation for the firms in our sample.

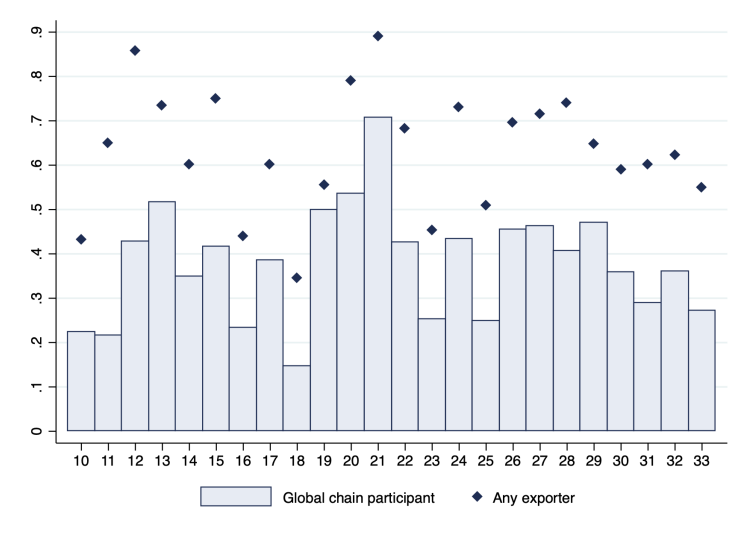
Figure 2

Credit aggregates, export, and import content of export during the Great Financial Crisis



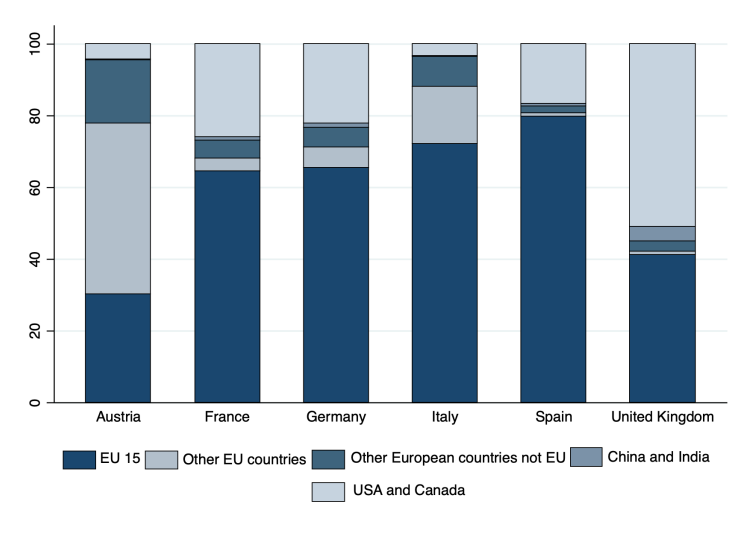
Notes: The figure displays the growth rate of domestic credit, export, and import content of export in the countries under analysis. Our calculations from World Bank data.

Figure 3
Distribution of global chain participants and exporters by sector



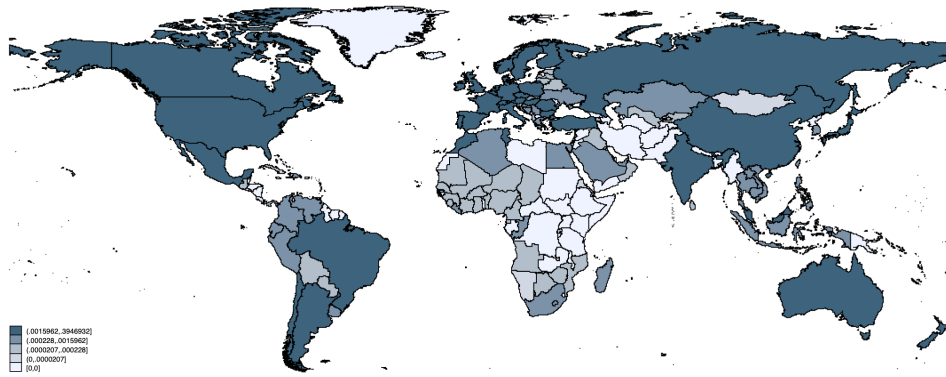
Notes: The figure shows the sectoral share of global chain participants and exporters. The x-axis reports the two-digit NACE codes for the manufacturing sectors: 10 Food products, 11 Beverages, 12 Tobacco products, 13 Textiles, 14 Wearing apparel, 15 Leather and related products, 16 Wood, except furniture, 17 Paper and paper products, 18 Printing and reproduction of recorded media, 19 Coke and refined petroleum products, 20 Chemicals and chemical products, 21 Pharmaceutical products, 22 Rubber and plastic products, 23 Other non-metallic mineral products, 24 Manufacture of basic metals, 25 Fabricated metal products, 26 Computer, electronic and optical products, 27 Electrical equipment, 28 Machinery and equipment, 29 Motor vehicles, 30 Other transport equipment, 31 Furniture, 32 Other manufacturing, 33 Repair and installation of machinery and equipment.

Figure 4
Banks' presence in world regions

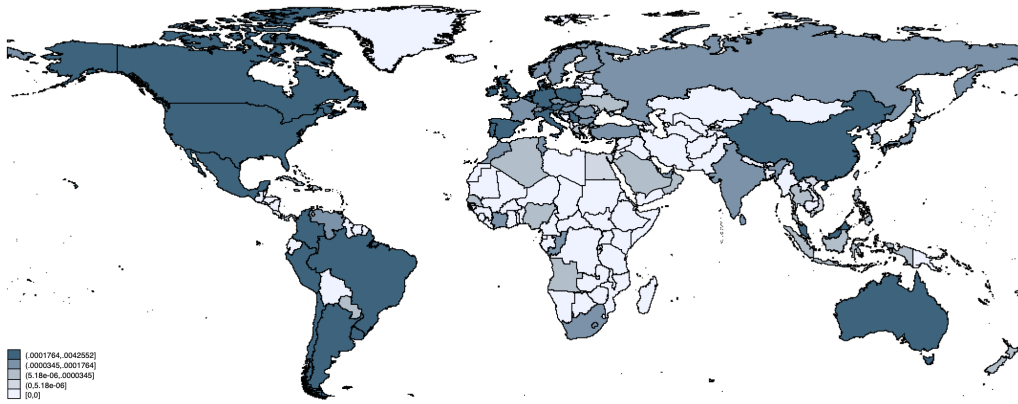


Notes: The figure shows the share of banks' foreign loan portfolios in world regions by banks' country of origin. Our calculations from Bank for International Settlement data.

Figure 5
Presence of banks and firms across world countries



(a) Banks' presence in foreign countries



(b) Joint bank presence and firms' activities in foreign countries

Notes: Panel (a) of this figure displays the share of banks' subsidiaries in foreign countries relative to their total number of subsidiaries. Panel (b) shows the same share weighted by the share of exporters to that country that are banks' clients.

Table 1. Summary statistics

	All firms			GVC participation					Export status				
	Obs	Mean	Std. Dev.	GVC participation		No-GVC participation		t-test	Exporting firms		Non-exporting firms		t-test
				Mean	Obs	Mean	Obs		Mean	Obs	Mean	Obs	
<i>Credit rationing</i>													
Rationing	6,749	0.087	0.282	0.088	2,304	0.086	4,445	-0.268	0.093	4,111	0.077	2,638	-2.353
<i>Foreign activity</i>													
Global chain participant	14,758	0.327	0.469						0.564	8,560			
Any exporter	14,758	0.580	0.494			0.376	9,930						
Global chain participant: services	14,758	0.079	0.269	0.241	4,828				0.136	8,560			
Global chain participant: intermediate goods	14,758	0.306	0.461	0.935	4,828				0.527	8,560			
Regular global chain participants	14,758	0.288	0.453	0.880	4,828				0.496	8,560			
Regular exporters	14,758	0.418	0.493	0.779	4,828	0.243	9,930	-72.790	0.721	8,560			
Relatively downstream	14,758	0.112	0.316	0.344	4,828				0.194	8,560			
Relatively upstream	14,762	0.215	0.411	0.656	4,828				0.370	8,560			
Global chain participant: Europe	14,758	0.307	0.461	0.939	4,828				0.530	8,560			
Global chain participant: Asia	14,758	0.127	0.333	0.388	4,828				0.219	8,560			
Global chain participant: America	14,758	0.103	0.304	0.314	4,828				0.177	8,560			
Global chain participant: good sold in domestic mkt.	14,758	0.279	0.449	0.853	4,828				0.481	8,560			
<i>Control variables</i>													
Age	14,725	34.53	30.63	37.58	4,811	33.06	9,913	-8.182	36.33	8,532	32.06	6192	-8.475
Number of employees	11,442	71.64	142.96	114.57	3,944	49.05	7,497	-19.865	91.06	6,858	42.66	4583	-20.156
Debt ratio	13,873	0.652	0.274	0.632	4,622	0.662	9,250	6.105	0.643	8,145	0.665	5727	4.659
ROA	10,849	0.046	0.140	0.042	3,841	0.048	7,007	1.980	0.044	6,632	0.049	4216	2.036
Asset tangibility	13,788	0.255	0.195	0.238	4,589	0.263	9,198	7.317	0.244	8,093	0.270	5694	7.676
Labour productivity	9,645	52.25	43.61	56.24	3,469	50.01	6,175	-6.585	55.12	5,987	47.53	3657	-8.779
Family firm	14,727	0.704	0.457	0.650	4,815	0.730	9,911	9.744	0.684	8,540	0.731	6186	6.173
Group	14,759	0.221	0.415	0.350	4,828	0.158	9,930	-24.639	0.279	8,560	0.141	6198	-20.891
<i>Instrumental variables</i>													
IT access (sales/purchase network)	14,695	22.236	26.254	25.877	4,804	20.470	9,890	-11.557	23.863	8,525	19.992	6169	-8.869
IT access (e-commerce)	14,695	11.946	22.875	14.090	4,804	10.906	9,890	-7.656	12.951	8,525	10.559	6169	-6.334
<i>Countries</i>													
Austria	14,759	0.030	0.171	0.038	4,828	0.026	9,930	-3.684	0.033	8,560	0.026	6198	-2.190
France	14,759	0.201	0.401	0.236	4,828	0.185	9,930	-6.986	0.187	8,560	0.222	6198	5.207
Germany	14,759	0.199	0.399	0.136	4,828	0.230	9,930	14.425	0.170	8,560	0.238	6198	10.004
Italy	14,759	0.205	0.403	0.201	4,828	0.206	9,930	0.741	0.244	8,560	0.151	6198	-14.318
Hungary	14,759	0.033	0.179	0.039	4,828	0.030	9,930	-2.848	0.035	8,560	0.031	6198	-1.218
Spain	14,759	0.192	0.394	0.182	4,828	0.197	9,930	2.228	0.184	8,560	0.203	6198	2.848
UK	14,759	0.140	0.347	0.169	4,828	0.126	9,930	-6.695	0.148	8,560	0.129	6198	-3.303

Notes: This table reports summary statistics for the main variables used in the analysis.

Table 2. Baseline results: firms' internationalization and likelihood of rationing

Dep. Variables	Global value chain participation				Export activity
	Biv Probit	Biv Probit	Biv Probit	Biv Probit	Biv Probit
	Rationing	Rationing	Rationing	Rationing	Rationing
	(1)	(2)	(3)	(4)	(5)
Global chain participant	-0.023** (0.011)				
Global chain participant: services		-0.041*** (0.002)			
Global chain participant: intermediate goods			-0.037** (0.015)		
Regular global chain participant				-0.023** (0.010)	
Any exporter					0.017*** (0.002)
Age (ln)	0.003 (0.002)	0.000 (0.001)	0.003 (0.003)	0.004* (0.002)	0.001 (0.001)
Number of employees (ln)	0.009** (0.004)	0.029*** (0.004)	0.010** (0.005)	0.009** (0.004)	0.002* (0.001)
Debt ratio	0.058*** (0.019)	0.013*** (0.002)	0.069*** (0.009)	0.049*** (0.017)	0.028* (0.016)
ROA	-0.049* (0.029)	-0.061** (0.029)	-0.058* (0.030)	-0.045* (0.027)	-0.025* (0.013)
Asset tangibility	-0.001 (0.005)	0.004 (0.020)	-0.001 (0.020)	-0.005 (0.006)	-0.002 (0.002)
Labour productivity (ln)	-0.001 (0.003)	-0.003 (0.007)	-0.001 (0.001)	0.000 (0.003)	-0.002 (0.002)
Family firm	-0.001 (0.003)	0.003 (0.004)	-0.001 (0.002)	-0.002 (0.003)	-0.001 (0.001)
Group	0.010* (0.005)	0.028*** (0.007)	0.012** (0.005)	0.010* (0.005)	0.004 (0.003)
<i>Instrumental variables</i>					
IT access (sales/purchase network)	0.002*** (0.001)	0.002** (0.001)	0.002*** (0.001)	0.003*** (0.001)	
IT access (e-commerce)					0.003** (0.001)
+ sectoral and regional dummies	Yes	Yes	Yes	Yes	Yes
Observations	5,061	5,061	5,061	4,811	5,061
F instruments	10.85	23.89	5.68	11.20	4.35

Notes: This table reports the effects of firms' internationalization on credit rationing. All the columns report the marginal effects and all the regressions include industry and regional fixed effects. The measures for firms' global chain participation are instrumented using a proxy of firms' reliance on IT systems for managing the sales/purchase network interacted with a regional indicator of broadband access. The measure for firms' export status is instrumented using a proxy of firms' reliance on IT systems for e-commerce interacted with a regional indicator of broadband access. In column (4) we exclude from the regressions firms that are not regular participant to global value chains. See Table A1 and Section 3.2.3 for details on the control variables. The table also reports the Kleibergen-Paap Wald F-statistic from the first stage. In parentheses are standard errors that are robust to heteroskedasticity and clustered at the regional level. *Significant at 10%; **significant at 5%; ***significant at 1%.

Table 3. Baseline results: Characteristics of global value chains and rationing

Dep. Variables	Panel A: Position in the global value chain			Panel B: Density of inter-firm linkages	
	Biv Probit	Biv Probit	Biv Probit	Import content of export / GDP < 1.8%	Import content of export / GDP ≥ 1.8%
	Rationing	Rationing	Rationing	Biv Probit Rationing	Biv Probit Rationing
	(1)	(2)	(3)	(4)	(5)
Global chain participant	-0.023** (0.011)			-0.022 (0.064)	-0.034*** (0.009)
Relatively downstream		-0.077*** (0.001)			
Relatively upstream			-0.057*** (0.014)		
<i>Instrumental variables</i>					
IT access (sales/purchase network)	0.002*** (0.001)	0.000 (0.001)	0.001 (0.001)	0.003 (0.002)	0.002** (0.001)
+ control variables	Yes	Yes	Yes	Yes	Yes
+ sectoral and regional dummies	Yes	Yes	Yes	Yes	Yes
Observations	5,061	5,061	5,061	2,094	2,967

Notes: This table reports the effects of the characteristics of global value chains and export on credit rationing. All the columns report the marginal effects and all the regressions include industry and regional fixed effects. The measures for firms' global chain participation are instrumented using a proxy of firms' reliance on IT systems for managing the sales/purchase network interacted with a regional indicator of broadband access. The measures for firms' export status are instrumented using a proxy of firms' reliance on IT systems for e-commerce interacted with a regional indicator of broadband access. In Panel A we study the effect of the position in the global chain; in Panel B we study the effect of the density of inter-firm linkages along supply chains on credit rationing. See Table A1 and Section 3.2.3 for details on the control variables. In parentheses are standard errors that are robust to heteroskedasticity and clustered at the regional level. *Significant at 10%; **significant at 5%; ***significant at 1%.

Table 4. More on the identification strategy

Dep. Variables	Panel A: Relationship lending measures				Panel B: Bank fixed effects	
	Lending relationship longer than 5 years		Information acquisition through personal interviews		Biv Probit Rationing	Biv Probit Rationing
	Biv Probit Rationing	Biv Probit Rationing	Biv Probit Rationing	Biv Probit Rationing		
	(1)	(2)	(3)	(4)	(3)	(4)
Global chain participant	-0.040*** (0.011)		-0.014* (0.007)		-0.063*** (0.004)	
Any exporter		0.012*** (0.002)		0.006 (0.005)		-0.010 (0.139)
<i>Instrumental variables</i>						
IT access (sales/purchase network)	0.002*** (0.001)		0.003** (0.001)		0.000 (0.001)	
IT access (e-commerce)		0.004** (0.002)		0.002 (0.002)		0.004** (0.002)
+ control variables	Yes	Yes	Yes	Yes	Yes	Yes
+ sectoral and regional dummies	Yes	Yes	Yes	Yes	Yes	Yes
+ bank fixed effects	No	No	No	No	Yes	Yes
Observations	3,882	3,882	2,613	2,613	2,229	2,229

Notes: This table reports some additional robustness checks on the identification strategy. In Panel A, we report the estimation results of firms' internationalization on credit rationing for the sub-sample of firms with a lending relationship longer than 5 years and for the subsample of firms that declare that most of the information acquisition of loan officers occurs through personal interviews. In Panel B, we report the results of our baseline regressions with the inclusion of bank fixed effects. All the columns report the marginal effects and all the regressions include industry and regional fixed effects. The measure for firms' global chain participation is instrumented using a proxy of firms' reliance on IT systems for managing the sales/purchase network interacted with a regional indicator of broadband access. The measure for firms' export status is instrumented using a proxy of firms' reliance on IT systems for e-commerce interacted with a regional indicator of broadband access. See Table A1 and Section 3.2.3 for details on the control variables. The table also reports the Kleibergen-Paap Wald F-statistic from the first stage. In parentheses are standard errors that are robust to heteroskedasticity and clustered at the regional level. *Significant at 10%; **significant at 5%; ***significant at 1%.

Table 5. The relevance of the effects

Dep. Variables	Panel A: Firm age				Panel B: Firm size			
	Age < 25 years		Age ≥ 25 years (median)		Small firms (num. of employees ≤ 50)		Medium and large firms	
	Biv Probit	Biv Probit	Biv Probit	Biv Probit	Biv Probit	Biv Probit	Biv Probit	Biv Probit
	Rationing	Rationing	Rationing	Rationing	Rationing	Rationing	Rationing	Rationing
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Global chain participant	-0.029** (0.011)		-0.003 (0.015)		-0.053** (0.025)		0.001 (0.001)	
Any exporter		0.007 (0.005)		0.002*** (0.000)		0.016*** (0.004)		-0.001 (0.002)
<i>Instrumental variables</i>								
IT access (sales/purchase network)	0.004*** (0.001)		0.001 (0.001)		0.002*** (0.001)		0.003 (0.002)	
IT access (e-commerce)		0.003 (0.002)		0.004** (0.002)		0.006** (0.002)		-0.001 (0.002)
+ control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
+ sectoral and regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,506	2,506	2,555	2,555	3,851	3,851	1,210	1,210
Dep. Variables	Panel C: External financial dependence				Panel D: Reliance on bank financing			
	Firms highly dependent from external finance		Firms lowly dependent from external finance		Firms with only bank debt as source of financial debt		Firms with other forms of financial debt besides bank debt	
	Biv Probit	Biv Probit	Biv Probit	Biv Probit	Biv Probit	Biv Probit	Biv Probit	Biv Probit
	Rationing	Rationing	Rationing	Rationing	Rationing	Rationing	Rationing	Rationing
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Global chain participant	-0.061*** (0.015)		0.071 (0.150)		-0.051** (0.022)		-0.001 (0.003)	
Any exporter		0.004 (0.010)		0.055*** (0.003)		0.013 (0.009)		0.001 (0.000)
<i>Instrumental variables</i>								
IT access (sales/purchase network)	0.001 (0.001)		0.005* (0.003)		0.001 (0.001)		0.005*** (0.002)	
IT access (e-commerce)		0.003* (0.002)		0.003* (0.002)		0.003 (0.002)		0.005** (0.002)
+ control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
+ sectoral and regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,707	3,707	1,354	1,354	3,588	3,588	1,471	1,471

Notes: This table reports the effects of the characteristics of firms on the relationship between firms' internationalization and credit rationing. All the columns report the marginal effects and all the regressions include industry and regional fixed effects. The measures for firms' global chain participation are instrumented using a proxy of firms' reliance on IT systems for managing the sales/purchase network interacted with a regional indicator of broadband access. The measures for firms' export status are instrumented using a proxy of firms' reliance on IT systems for e-commerce interacted with a regional indicator of broadband access. In Panel A we study the effect of firms' age; in Panel B we study the effect of firms' size; in Panel C we study the effect of firms' external financial dependence; in Panel D we study the effect of the density of firms' reliance on bank financing. See Table A1 and Section 3.2.3 for details on the control variables. In parentheses are standard errors that are robust to heteroskedasticity and clustered at the regional level. *Significant at 10%; **significant at 5%; ***significant at 1%.

Table 6. Mechanisms: global chain participation as a signal

Dep. Variables	Panel A: R&D collaborations		Panel B: Expanding global network		Panel C: Use of collateral for lending decisions	
	R&D from other firms	No R&D from other firms	Expanding the distribution network	No Expanding the distribution network	Collateral	No collateral
	Biv Probit Rationing	Biv Probit Rationing	Biv Probit Rationing	Biv Probit Rationing	Biv Probit Rationing	Biv Probit Rationing
	(1)	(2)	(3)	(4)	(5)	(6)
Global chain participant	-0.002*** (0.001)	-0.020 (0.025)	-0.051** (0.023)	-0.018 (0.030)	-0.011 (0.021)	-0.005** (0.002)
<i>Instrumental variables</i>						
IT access (sales/purchase network)	0.001 (0.003)	0.003*** (0.001)	0.001 (0.001)	0.003*** (0.001)	0.003*** (0.001)	0.002 (0.001)
+ control variables	Yes	Yes	Yes	Yes	Yes	Yes
+ sectoral and regional dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	545	4,516	2,066	2,995	2,603	2,443

Notes: This table studies the first mechanism that could drive the effect of firms' global engagement on bank credit rationing; banks could view global supply chain participation as a signal of the quality and prospects of their client firms. All the columns report the marginal effects and all the regressions include industry and regional fixed effects. The measures for firms' global chain participation are instrumented using a proxy of firms' reliance on IT systems for managing the sales/purchase network interacted with a regional indicator of broadband access. In Panel A we study the effect of R&D collaborations within the supply chain; in Panel B we study the effect of the implementation of activities aimed at expanding the firms' global network; in Panel C we study the effect of the request of collateral guarantees by the lender. See Table A1 and Section 3.2.3 for details on the control variables. In parentheses are standard errors that are robust to heteroskedasticity and clustered at the regional level. *Significant at 10%; **significant at 5%; ***significant at 1%.

Table 7. Mechanisms: internalizing the spillover effects of credit rationing

Dep. Variables	Panel A: Nature of the bank		Panel B: Origin and destination markets			
	Local banks & Domestic without int network	National with int network & Foreign banks	Full sample	Europe	Asia	America
	Biv Probit Rationing	Biv Probit Rationing	Biv Probit Rationing	Biv Probit Rationing	Biv Probit Rationing	Biv Probit Rationing
	(1)	(2)	(3)	(4)	(5)	(6)
Global chain participant	-0.025** (0.012)	-0.051*** (0.016)	-0.023** (0.011)			
Global chain participant: Europe				-0.022** (0.011)		
Global chain participant: Asia					0.003** (0.001)	
Global chain participant: America						0.002 (0.002)
<i>Instrumental variables</i>						
IT access (sales/purchase network)	0.002*** (0.001)	0.001 (0.002)	0.002*** (0.001)			
IT access (sales/purchase network) * Origin/Destination in Europe				0.002*** (0.000)		
IT access (sales/purchase network) * Origin/Destination in Asia					0.003*** (0.001)	
IT access (sales/purchase network) * Origin/Destination in America						0.004*** (0.001)
+ control variables	Yes	Yes	Yes	Yes	Yes	Yes
+ sectoral and regional dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,658	1,193	5,061	5,061	5,061	5,061
Dep. Variables	Panel C: Exposure of banks to EU15 countries		Panel D: Exposure of banks to Other EU countries			
	Exposure > 60%	Exposure ≤ 60%	Exposure > 10%	Exposure ≤ 10%		
	Biv Probit Rationing	Biv Probit Rationing	Biv Probit Rationing	Biv Probit Rationing		
	(1)	(2)	(3)	(4)		
Global chain participant	-0.034*** (0.012)	-0.008 (0.006)	-0.128*** (0.004)	-0.027** (0.013)		
<i>Instrumental variables</i>						
IT access (sales/purchase network)	0.002 (0.002)	0.003*** (0.001)	0.003*** (0.001)	0.002 (0.002)		
+ control variables	Yes	Yes	Yes	Yes		
+ sectoral and regional dummies	Yes	Yes	Yes	Yes		
Observations	1,102	3,704	1,831	2,901		

Notes: This table studies the second mechanism that could drive the effect of firms' global engagement on bank credit rationing: banks could protect supply chain participants because they internalize the negative consequences that a denial of credit can have on their own foreign business. All the columns report the marginal effects and all the regressions include industry and regional fixed effects. The measures for firms' global chain participation are instrumented using a proxy of firms' reliance on IT systems for managing the sales/purchase network interacted with a regional indicator of broadband access. In Panel A we study the effect of the nature of the bank; in Panel B we study the effect of origin and destination markets; in Panel C we study the exposure to EU15 countries of the banks located in the country of origin of the firm; in Panel D we study the exposure to Other EU countries of the banks located in the country of origin of the firm. See Table A1 and Section 3.2.3 for details on the control variables. In parentheses are standard errors that are robust to heteroskedasticity and clustered at the regional level. *Significant at 10%; **significant at 5%; ***significant at 1%.

Table 8. Mechanisms: internalizing the spillover effects of credit rationing (cont.)

Dep. Variables	Bank not present in the main destination countries	Share of bank subsidiaries in the main destination countries < 1.4%	Share of bank subsidiaries in the main destination countries > 1.4% < 4.8%	Share of bank subsidiaries in the main destination countries > 4.8%
	Biv Probit Rationing (1)	Biv Probit Rationing (2)	Biv Probit Rationing (3)	Biv Probit Rationing (4)
Global chain participant	0.002*** (0.000)	0.012*** (0.001)	-0.008* (0.005)	-0.010*** (0.001)
<i>Instrumental variables</i>				
IT access (sales/purchase network)	-0.002 (0.002)	0.001 (0.001)	0.010* (0.006)	-0.000 (0.002)
+ control variables	Yes	Yes	Yes	Yes
+ sectoral and regional dummies	Yes	Yes	Yes	Yes
Observations	880	163	236	510

Notes: This table reports the effects of firms' internationalization and areas of operation of internationally active banks on credit rationing. All the columns report the marginal effects and all the regressions include industry and regional fixed effects. The measures for firms' global chain participation are instrumented using a proxy of firms' reliance on IT systems for managing the sales/purchase network interacted with a regional indicator of broadband access. See Table A1 and Section 3.2.3 for details on the control variables. The table also reports the Kleibergen-Paap Wald F-statistic from the first stage. In parentheses are standard errors that are robust to heteroskedasticity and clustered at the regional level. *Significant at 10%; **significant at 5%; ***significant at 1%.

Table 9. Mechanisms: the role of banks' knowledge

Dep. Variables	Panel A: Nature of banks-excluding firms with a foreign main bank				Panel B: Nature of product exported		
	Bank not present in the main destination countries	Share of bank subsidiaries in the main destination countries < 1.2%	Share of bank subsidiaries in the main destination countries > 1.2% < 4.5%	Share of bank subsidiaries in the main destination countries > 4.5%	Excluding opaque products		Excluding products not sold domestically
	Biv Probit Rationing	Biv Probit Rationing	Biv Probit Rationing	Biv Probit Rationing	Sectoral fraction of inputs not sold on exchange	Sectoral fraction of inputs not sold on exchange (conservative)	Biv Probit Rationing
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Global chain participant	0.090*** (0.006)	0.821*** (0.005)	0.257*** (0.015)	-0.080*** (0.008)	-0.034** (0.014)	-0.021** (0.009)	
Global chain participant: good sold in domestic market							-0.023** (0.009)
<i>Instrumental variables</i>							
IT access (sales/purchase network)	-0.003* (0.002)	0.003 (0.012)	0.003 (0.006)	-0.002 (0.002)	0.002*** (0.001)	0.001 (0.002)	0.002** (0.001)
+ control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
+ sectoral and regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	829	132	209	456	3,095	1,094	4,811
Panel C: Banks specialization							
Dep. Variables	Bank specialization in the sector of the company		Bank specialization in the contiguous sector				
	Concentration < median	Concentration > median	Concentration < median	Concentration > median			
	Biv Probit Rationing	Biv Probit Rationing	Biv Probit Rationing	Biv Probit Rationing			
Global chain participant	-0.061*** (0.005)	-0.014 (0.016)	0.080*** (0.004)	-0.032** (0.016)			
<i>Instrumental variables</i>							
IT access (sales/purchase network)	0.000 (0.002)	0.001 (0.002)	0.002 (0.002)	-0.001 (0.002)			
+ control variables	Yes	Yes	Yes	Yes			
+ sectoral and regional dummies	Yes	Yes	Yes	Yes			
Observations	825	843	825	843			

Notes: This table studies how the banks' knowledge could drive the effect of firms' global engagement on bank credit rationing. All the columns report the marginal effects and all the regressions include industry and regional fixed effects. The measures for firms' global chain participation are instrumented using a proxy of firms' reliance on IT systems for managing the sales/purchase network interacted with a regional indicator of broadband access. In Panel A we study the effect of the nature of banks-excluding firms with a foreign main bank; in Panel B we study the effect of the nature of product exported; in Panel C we consider the bank specialization in the sector of the company and in the contiguous sector. See Table A1 and Section 3.2.3 for details on the control variables. In parentheses are standard errors that are robust to heteroskedasticity and clustered at the regional level. *Significant at 10%; **significant at 5%; ***significant at 1%.

Appendix

A1. A stylized illustrative model.

In what follows we investigate a stylized model of a representative bank that allocates its limited lending capacity between two categories of firms: globally active (G) and domestically oriented (D). The lending capacity of the bank is determined by its net worth (NW) through a standard capital constraint, which states that the total lending of the bank cannot exceed a multiple $1/\psi$ of the bank's net worth (where ψ denotes the capital adequacy ratio). As in a broad literature, we take the initial net worth of the bank (NW) as given. The bank's objective is to maximize its future net worth NW' , given by the gross returns on loans to the two firm categories, $\mathcal{R}(L_D)$ and $\mathcal{R}(L_G)$, net of the cost of deposits, $(1+r)D$ (where r denotes the net deposit rate and D is the deposit stock). The bank's constraints are given by a standard budget constraint and by the aforementioned capital constraint:

$$\begin{aligned} \max_{L_D, L_G, D} \quad & NW' = \mathcal{R}(L_D) + \mathcal{R}(L_G) - (1+r)D \\ \text{s.t.} \quad & L_D + L_G = D + NW \\ & NW \geq \psi(L_D + L_G). \end{aligned}$$

As noted in the main text, we posit that the bank derives higher returns from lending to globally active firms, e.g., $\mathcal{R}(L_G) = \omega\mathcal{R}(L_D)$, with $\omega > 1$. On firms' side, we assume that all firms produce using a unique input (e.g., labor, Lab). In order to hire labor, firms need to rely to some extent on bank loans. We model this dependence in reduced form, by letting $Lab_D = f(L_D)$ and $Lab_G = g(L_G)$, with $f_{L_D} > 0$ and $g_{L_G} > 0$. To capture the higher relevance of external finance for globally active firms, we posit that the impact of bank loans on the labor used by globally active firms exceeds the impact of bank loans on the labor used by domestically oriented firms. For example, $g(L_G) = \theta f(L_D)$, where $\theta > 1$. Formally, the domestic activities of domestically oriented firms and the foreign activities of globally active firms are given by

$$\begin{aligned} Y_D &= ALab_D = Af(L_D) \\ Y_G &= ALab_G = Ag(L_G) = A\theta f(L_D) \end{aligned}$$

where A denotes the TFP common to all firms. After simple algebra, the bank's optimization problem becomes:

$$\begin{aligned} \max_{L_D, L_G, D} \quad & N' = \mathcal{R}(L_D) + \mathcal{R}(L_G) - (1+r)(L_D + L_G - NW) \\ \text{s.t.} \quad & \frac{NW}{\psi} = L_D + L_G \\ & \mathcal{R}'_D\left(\frac{NW}{\psi} - L_G\right) = \mathcal{R}'_G(L_G). \end{aligned}$$

From the above,

$$\begin{aligned} \frac{\partial Y_D}{\partial NW} &= f'(L_D) \frac{\mathcal{R}''_G(\cdot)}{\psi [\mathcal{R}''_G(L_G) + \mathcal{R}''_D(\cdot)]} = \frac{1}{\psi} f'(L_D) \frac{\mathcal{R}''_G(\cdot)}{[\mathcal{R}''_G(L_G) + \mathcal{R}''_D(\cdot)]}, \\ \frac{\partial Y_G}{\partial NW} &= g'(L_G) \frac{\mathcal{R}''_D(\cdot)}{\psi [\mathcal{R}''_G(L_G) + \mathcal{R}''_D(\cdot)]} = \frac{1}{\psi} g'(L_G) \frac{\mathcal{R}''_D(\cdot)}{[\mathcal{R}''_G(L_G) + \mathcal{R}''_D(\cdot)]}. \end{aligned}$$

Using the functional specifications detailed above, we obtain

$$\begin{aligned}\frac{\partial Y_D}{\partial NW} &= \frac{A}{\psi} f'(L_D) \frac{\omega}{1 + \omega} \\ \frac{\partial Y_G}{\partial NW} &= \frac{A}{\psi} \theta f'(L_D) \frac{1}{1 + \omega}\end{aligned}$$

from which we derive the formula for $\frac{\partial Y_G}{\partial NW} / \frac{\partial Y_D}{\partial NW}$ in (4).

A2. IV strategy for relationship length.

In Table A4, in the spirit of Guiso et al. (2004) and Herrera and Minetti (2007), we propose an IV approach for the subsample of Italian firms by instrumenting the relationship lending dummy with variation in the tightness of the 1936 Italian banking regulation across local banking markets (at the provincial level).

The instrumental variables rely on identifying exogenous restrictions on the local banking system that affect firms' opportunity and availability of borrowing from a main bank on a relational basis but do not directly affect banks' decisions about credit rationing. To this end we exploit the 1936 Banking Law which subjected the Italian banking system to strict regulation of entry and branch opening in provinces, freezing the size and bank-composition of the local credit markets until the beginning of the 1990s. The rationale for using this regulatory event to instrument relationship length is the theoretical and empirical evidence showing that the likelihood of close bank-firm relationships depends on the concentration, size and organizational structure of local credit markets (see, e.g., Boot and Thakor, 2000; Hauswald and Marquez, 2006).

The 1936 Banking Law imposed strict limits on the ability of different types of banking institutions to open new branches. Specifically, each bank type was attributed a geographical area of competence based on its presence in 1936, and its ability to grow and lend was restricted to that area. In particular, national banks could open branches only in the main cities; cooperative and local commercial banks could open branches within the boundaries of the province; savings banks could expand within the boundaries of the region. Guiso et al. (2004) demonstrate that the geographical distribution of bank branches in 1936 was broadly uncorrelated with the geography of economic development, and that it deeply impacted local credit markets in the decades that followed. Entry into the local markets was liberalized only during the 1990s.

In Table A4, we use as instruments three indicators that Guiso et al. (2004) employ to characterize the local structure of the banking system in 1936: (i) the share of bank branches owned by local banks over total banks in the province in 1936, (ii) the number of popular bank branches in the province per 100,000 inhabitants in 1936, and (iii) the number of bank branches in the province per 100,000 inhabitants in 1936.

Table A1. Data sources and variable definitions

This table describes the definitions of the variables used in the paper. Three main data sources are used in the empirical analysis: (i) the EU-EFIGE Bruegel-UniCredit survey (EFIGE), which cover three-year period 2007-2009; (ii) the BvD-Amadeus database (BvD); (iii) the BIS Cross Border Banking Statistics. We also use some data from the European Statistics Office (Eurostat).

Variable	Definition and source (in parentheses)
<i>Credit rationing</i>	
Rationing	Dummy variable equal to one if the firm unsuccessfully applied for credit, and zero otherwise. (EFIGE)
<i>Foreign activity</i>	
Global chain participant	Dummy variable equal to one if the firm participates in a global value chain, and zero otherwise. We define firms involved in a global value chain as firms that import intermediate goods and/or services and export intermediate or final goods. (EFIGE)
Any exporter	Dummy variable equal to one if the firm is an exporter, zero otherwise. We define firms as being exporters if they sold abroad some or all of its own products/services in 2008. (EFIGE)
Global chain participant: services	Dummy variable equal to one if the firm participates in a global value chain (services), and zero otherwise. We define firms involved in a global value chain as firms that import services and export intermediate or final goods. (EFIGE)
Global chain participant: intermediate goods	Dummy variable equal to one if the firm participates in a global value chain (intermediate goods), and zero otherwise. We define firms involved in a global value chain as firms that import intermediate goods and export intermediate or final goods. (EFIGE)
Regular global chain participants	Dummy variable equal to one if the firm participates regularly in a global value chain, and zero otherwise. We define firms involved in a global value chain as firms that import intermediate goods and/or services and export intermediate or final goods. (EFIGE)
Regular exporters	Dummy variable equal to one if the firm is a regular exporter, zero otherwise. We define firms as being exporters if they sold abroad some or all of its own products/services in 2008. (EFIGE)
Relatively downstream	Position in the global chain: the firm acquires intermediate goods and/or services abroad and exports final products. (EFIGE)
Relatively upstream	Position in the global chain: the firm acquires intermediate goods and/or services abroad and exports intermediate goods. (EFIGE)
Global chain participant: Europe	Dummy variable equal to one if the firm participates in a global value chain in Europe, and zero otherwise. We define firms involved in a global value chain as firms that import intermediate goods and/or services and export intermediate or final goods in Europe. (EFIGE)
Global chain participant: Asia	Dummy variable equal to one if the firm participates in a global value chain in Asia, and zero otherwise. We define firms involved in a global value chain as firms that import intermediate goods and/or services and export intermediate or final goods in Asia. (EFIGE)
Global chain participant: America	Dummy variable equal to one if the firm participates in a global value chain in America, and zero otherwise. We define firms involved in a global value chain as firms that import intermediate goods and/or services and export intermediate or final goods in America. (EFIGE)
Global chain participant: good sold in domestic mkt.	Dummy variable equal to one if the firm participates in a global value chain (goods sold in a domestic market), and zero otherwise. We define firms involved in a global value chain as firms that import intermediate goods and/or services and export intermediate or final goods sold also in the domestic market. (EFIGE)
<i>Control variables</i>	
Age (ln)	Logarithm of the number of years since inception. (EFIGE)
Number of employees (ln)	Logarithm of the number of workers employed in the firm. (EFIGE)
Debt ratio	Total debt over total assets. (BvD)
ROA	EBIT over total assets. (BvD)
Asset tangibility	Tangible fixed assets over total assets. (BvD)
Labour productivity	Value added (EBITDA plus labour costs) over the number of employees. (BvD)
Family firm	The survey asks each firm to report the characteristics of the main shareholder of the firm. Family is a dummy that takes the value of one if the main shareholder is a family or an individual. (EFIGE)
Group	Dummy variable equal to 1 if the firm belongs to a business group, and zero otherwise. (EFIGE)
Regional dummies	Region where the firm is located (at the NUTS2 level). (BvD)
Sectoral dummies	Activity sector of the firm (NACE rev2 code). (BvD)
<i>Instrumental variables</i>	
IT access (sales/purchase network)	Triple interaction among a dummy variable equal to one if the firm declares to have access to a broadband connection (zero otherwise), a dummy variable equal to one if the firm declares the reliance on IT systems for managing the sales/purchase network (zero otherwise), and a regional indicator of broadband connection diffusion (households' broadband access). (EFIGE and Eurostat)
IT access (e-commerce)	Triple interaction among a dummy variable equal to one if the firm declares to have access to a broadband connection (zero otherwise), a dummy variable equal to one if the firm declares the reliance on IT systems for the e-commerce (zero otherwise), and a regional indicator of broadband connection diffusion (households' broadband access). (EFIGE and Eurostat)

Table A2. Baseline results: firms' internationalization and likelihood of rationing (Probit model)

Dep. Variables	Global value chain vs Export		Services vs Intermediate goods	
	Rationing	Rationing	Rationing	Rationing
	(1)	(2)	(3)	(4)
Global chain participant	0.012 (0.011)			
Any exporter		0.022** (0.009)		
Global chain participant: services			-0.007 (0.013)	
Global chain participant: intermediate goods				0.020* (0.011)
+ control variables	Yes	Yes	Yes	Yes
+ sectoral and regional dummies	Yes	Yes	Yes	Yes
Observations	4,618	4,618	4,618	4,618
Pseudo R2	0.117	0.118	0.116	0.118

Notes: This table reports the effects of firms' internationalization on credit rationing. All the columns report the marginal effects and all the regressions include industry and regional fixed effects. See Table A1 and Section 3.2.3 for details on the control variables. The table also reports the Kleibergen-Paap Wald F-statistic from the first stage. In parentheses are standard errors that are robust to heteroskedasticity and clustered at the regional level. *Significant at 10%; **significant at 5%; ***significant at 1%.

Table A3. Baseline results: excluding fringe global chain participants or exporters

Dep. Variables	Biv Probit	Biv Probit	Biv Probit	Biv Probit
	Rationing	Rationing	Rationing	Rationing
	(1)	(2)	(3)	(4)
Global chain participant with more than 5% of (export + import)/turnover	-0.046*** (0.014)			
Global chain participant with more than 3% of (export + import)/turnover		-0.044*** (0.014)		
Any exporter with more than 5% of export / turnover			0.013*** (0.005)	
Any exporter with more than 3% of export / turnover				0.014*** (0.004)
	<i>Instrumental variables</i>			
IT access (sales/purchase network)	0.002** (0.001)	0.002*** (0.001)		
IT access (e-commerce)			0.003** (0.001)	0.003** (0.001)
+ control variables	Yes	Yes	Yes	Yes
+ sectoral and regional dummies	Yes	Yes	Yes	Yes
Observations	5,061	5,061	5,061	5,061

Notes: This table reports the effects of the intensive margin and export on credit rationing. All the columns report the marginal effects and all the regressions include industry and regional fixed effects. The measures for firms' global chain participation are instrumented using a proxy of firms' reliance on IT systems for managing the sales/purchase network interacted with a regional indicator of broadband access. The measures for firms' export status are instrumented using a proxy of firms' reliance on IT systems for e-commerce interacted with a regional indicator of broadband access. See Table A1 and Section 3.2.3 for details on the control variables. In parentheses are standard errors that are robust to heteroskedasticity and clustered at the regional level. *Significant at 10%; **significant at 5%; ***significant at 1%.

Table A4. Instrumenting the dummy for relationship lending

Dep. Variables	Subsample of Italian firms			
	Probit	Probit	Probit	Probit
	Rationing	Global chain participant	Rel. Length > 5 years	Global chain participant * Rel. Length > 5 years
	(1)	(2)	(3)	(4)
Global chain participant (pred.)	-0.234 (0.205)			
Relationship length > 5 years (pred.)	-0.123 (0.179)			
Global chain participant * Rel. Length > 5 years (pred.)	-0.110* (0.064)			
<i>Instrumental variables</i>				
IT access (sales/purchase network)		0.001* (0.000)		-0.044*** (0.002)
IT access (sales/purchase network) * Rel. length > 5 years				0.046*** (0.002)
Popular banks in 1936			-0.041* (0.022)	
Local banks in 1936			-0.185** (0.091)	
Branches over population in 1936			0.004** (0.002)	
+ control variables	Yes	Yes	Yes	Yes
+ sectoral and regional dummies	Yes	Yes	Yes	Yes
Observations	1,743	2,815	1,743	1,745

Notes: This table reports the effects of firms' internationalization on credit rationing for the firms with a lending relationship longer than 5 years. All the columns report the marginal effects and all the regressions include industry and regional fixed effects. The measure for firms' global chain participation is instrumented using a proxy of firms' reliance on IT systems for managing the sales/purchase network interacted with a regional indicator of broadband access. The measure for firms' lending relationship is instrumented using the indicators of the 1936 Italian banking regulation (see, e.g., Guiso et al., 2004, and the Appendix for more details on these instruments). See Table A1 and Section 3.2.3 for details on the control variables. In parentheses are standard errors that are robust to heteroskedasticity and clustered at the regional level. *Significant at 10%; **significant at 5%; ***significant at 1%.

Table A5. Mechanisms: export

Dep. Variables	Panel A: Destination market and rationing				Panel B: Use of collateral for lending decisions	
	Full sample	Europe	Asia	America	Collateral	No collateral
	Biv Probit Rationing	Biv Probit Rationing	Biv Probit Rationing	Biv Probit Rationing	Biv Probit Rationing	Biv Probit Rationing
	(1)	(2)	(3)	(4)	(5)	(6)
Any exporter	0.017*** (0.002)				0.021*** (0.002)	-0.001 (0.002)
Exporter in Europe		0.001 (0.001)				
Exporter in Asia			0.001 (0.001)			
Exporter in America				-0.001*** (0.000)		
<i>Instrumental variables</i>						
IT access (e-commerce)	0.003** (0.001)				0.002 (0.002)	0.006*** (0.002)
IT access (e-commerce) * Destination in Europe		0.001*** (0.001)				
IT access (e-commerce) * Destination in Asia			0.002*** (0.001)			
IT access (e-commerce) * Destination in America				0.001*** (0.000)		
+ control variables	Yes	Yes	Yes	Yes	Yes	Yes
+ sectoral and regional dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,061	5,061	5,061	5,061	2,603	2,443

Notes: This table studies how destination markets (Panel A) and the use of collateral for lending decisions (Panel B) could drive the effect of firms' export status on bank credit rationing. All the columns report the marginal effects and all the regressions include industry and regional fixed effects. The measures for firms' export status are instrumented using a proxy of firms' reliance on IT systems for managing the e-commerce interacted with a regional indicator of broadband access. See Table A1 and Section 3.2.3 for details on the control variables. In parentheses are standard errors that are robust to heteroskedasticity and clustered at the regional level. *Significant at 10%; **significant at 5%; ***significant at 1%.