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Financial Constraints, Firms' Supply Chains and Internationalization

Raoul Minetti*
Michigan State University

Pierluigi Murro
Lumsa University

Zeno Rotondi
UniCredit

Susan Chun Zhu
Michigan State University

Abstract

Using a unique sample of small and medium-sized Italian firms, we investigate the effect of financial constraints on firms' participation in domestic and international supply chains. We find that firms more exposed to bank credit rationing and with weaker relationships with banks are more likely to participate in supply chains to overcome liquidity shortages. This benefit of supply chains is especially strong when firms forge ties with international trading partners and when they establish long-term relationships with large suppliers. To control for possible endogeneity of firms' access to credit, we construct instruments capturing exogenous shocks to the structure of the Italian local banking markets.

JEL Codes: F10, G20, L23

Keywords: Credit; Global Value Chains; Internationalization

*Corresponding author. Email: minetti@msu.edu . Phone: +1-517-355-7349. Address: MSU Department of Economics, Marshall-Adams Hall, 486 W Circle Dr. Rm 110, East Lansing, MI 48824. We wish to thank Stephen Brown, Paolo Giordani, Andrea Presbitero, Michele Ruta, and seminar and conference participants at Birmingham Business School (Second Global Value Chains Workshop), Brunel University, Deakin University, Economic and Social Research Institute (Dublin), IMF (Washington, D.C.), Italian Ministry of Economic Development (Research Unit, Rome), Luiss University, Michigan State University, Midwest Trade Meetings (Rochester), Oakland University, Monash University (Melbourne), Rieti-MoFiR-Hitotsubashi-JFC International Workshop on Banking and Financial Research (Tokyo), University of Bologna, University of Rome (Lumsa), for helpful comments and conversations. All remaining errors are ours.

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Abstract

Using a unique sample of small and medium-sized Italian firms, we investigate the effect of financial constraints on firms' participation in domestic and international supply chains. We find that firms more exposed to bank credit rationing and with weaker relationships with banks are more likely to participate in supply chains to overcome liquidity shortages. This benefit of supply chains is especially strong when firms forge ties with international trading partners and when they establish long-term relationships with large suppliers. To control for possible endogeneity of firms' access to credit, we construct instruments capturing exogenous shocks to the structure of the Italian local banking markets.

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1 Introduction

The Great Recession has sparked an intense debate on the impact of financial factors on firms' domestic and international activities. By now, a large body of empirical literature has established that financial frictions have important effects on firms' production, investment and export decisions (see, e.g., Hubbard, 1998, Brunnermeier, Eisenbach and Sannikov, 2012, and Manova, 2015, for reviews). By contrast, perhaps because of a dearth of data, we still have limited understanding of whether financial factors can also shape the organization of firms' domestic and international activities. The goal of this paper is to help shed light on this issue, focusing on a key dimension of the organization of production: firms' participation in domestic and international supply chains.

Firms' production is increasingly structured along domestic and global supply chains. A supply chain identifies the whole range of activities (design, production, distribution, and marketing) that different businesses carry out to bring a good or a service from its initial conception to the final use by consumers (Antràs and Chor, 2013). The division of labor along a supply chain can boost firm efficiency and competitiveness, allowing the various phases of design, production and marketing to be performed by the firms, and in the locations,

with the strongest comparative advantage. It is estimated that about 60 percent of global trade consists of trade in intermediate products that are incorporated at various stages in the process of production of final goods and services (UNCTAD, 2013).[1] And the average length of supply chains has increased from the mid-nineties (see, e.g., OECD, 2013). Given this importance of supply chains, establishing whether financial factors play a role in their development can advance our understanding of the interaction between the financial sector and the real economy.

This paper investigates whether firms' access to the credit market is a determinant of their choice of participating in supply chains. If so, do financial constraints hinder or incentivize firms' participation in supply chains? The answer to these questions is far from being obvious a priori. On the one hand, supply chains are not only a way of organizing production but also a channel through which firms can borrow liquidity one from the other. In a supply chain, suppliers can extend trade credit to customers by allowing them to purchase goods or services with a delayed payment. Indeed, it is often argued that trading partners can be willing to provide liquidity even when financial intermediaries such as banks are unwilling to do so (Biais and Gollier, 1997).[2] Thus, a firm can try to broaden its sources of liquidity by choosing to participate in a supply chain and establish trade linkages with other firms, rather than produce in-house all the various components of a good or service. Moreover, the participation in a supply chain can allow a firm to unlock liquidity that would otherwise be tied up in assets and processes necessary for producing in-house all the product components (Manova, 2015). On the other hand, the participation in a supply chain can entail up-front costs, including expenses for reorganizing production processes, as well as search, informational, and contractual costs for interacting with trading partners (Grossman and Helpman, 2002). Given the need to finance these up-front costs, liquidity constraints might hinder a firm's participation in a supply chain. Because of these conflicting mechanisms, the overall effect of financial constraints on firms' participation in domestic and international supply chains is ultimately an empirical question.

In this paper, we address this question using a unique, rich survey of over 7,000 Italian firms conducted by the banking group UniCredit for the year 2010. The survey data we use are an ideal testing ground for our purposes. The small and medium size of the firms in the sample, together with the characteristics of the Italian financial system, imply that the firms strongly rely on bank credit as a source of financing. The survey asks the firms several precise questions about their access to bank credit, including whether the firms are rationed by banks, and the strength (duration and number) of their relationships with banks. The

[1] The expansion of global value chains has been a salient aspect of the world economy in recent years (OECD, 2012). Businesses from developing countries, especially East Asia, have been a major player in this expansion.

[2] For example, trading partners could have an informational advantage over banks due to industry expertise.

data also provide rich information on firms' participation in supply chains, including whether the firms produce in-house all the components of final products or instead specialize in some production tasks, purchasing or selling intermediate products to other firms. In addition, the survey contains rich details on the supply chains, such as the characteristics of suppliers and customers and the nature of their linkages. We find that firms that are more exposed to bank credit rationing and have weaker (shorter and more fragmented) relationships with banks are more likely to participate in supply chains. For instance, our estimates imply that a firm rationed by banks is 4.7 percentage points more likely than a non-rationed firm to participate in a supply chain, a sizeable difference considering that 53% of the firms in our sample participate in supply chains.[3] We also uncover evidence that firms with difficult access to bank credit are more inclined to establish long-term subcontracting relationships with large suppliers, that is, suppliers that are likely to be rich in cash and willing to provide trade credit to repeated buyers. These findings support the hypothesis that firms with limited access to bank credit view the participation in supply chains as a way of expanding their sources of liquidity. On the other hand, we find that liquidity-constrained firms are less inclined to participate in supply chains in which they are more exposed to hold up and rent extraction in trade credit transactions. Finally, when we differentiate supply chains based on the location of firms' trading partners, we obtain that liquidity-constrained firms are more eager to participate in global supply chains with trading partners located in Western Europe than in domestic supply chains. This suggests that sophisticated foreign trading partners located in countries with highly developed financial systems could especially be perceived as a potential source of liquidity.

The reader could be concerned that the estimated effects of bank credit rationing and credit relationships on firms' participation in supply chains suffer from endogeneity problems. That is, although we control for a battery of relevant characteristics of firms and their local environment, unobserved factors could drive both firms' access to bank credit and their participation in supply chains. And reverse causality could also be an issue: for instance, the participation in supply chains might send a positive signal to banks, facilitating the extension of loans. To control for possible endogeneity of firms' access to credit and firms' relationships with banks, we then construct instruments capturing exogenous shocks to the structure of the Italian banking system. For this purpose, we exploit the merger between two Italian banking groups occurred in 2007, using measures of the relative presence of the merged banks in the local (provincial) credit markets as a proxy for the intensity of the merger shock on firms' access to bank credit and firm-bank relationships. A broad literature contends that a bank merger can significantly affect the availability of credit to firms (see, e.g., Sapienza, 2002, Walter, 2004, and references therein). On the positive side, a merger allows local branches

[3] As we shall see, the participation in supply chains of the firms in our sample is very similar to that reported by other analyses of small and medium-sized Italian firms.

of the merged banks to share information and exploit economies of scale. On the negative side, it can partially disrupt existing links between firms and banks. Based on the historical experience of the Italian banking system, we expect that the local branch presence of the banks at the moment of the merger was driven by previous bank regulation as well as historical ties of the banks with local communities. Thus, we expect that this relative presence was not correlated with economic conditions relevant for firms' decision to participate in supply chains.

The remainder of the paper unfolds as follows. Section 2 discusses the relationship with prior literature. In Section 3, we provide details on the institutional background, including the participation of Italian firms in supply chains and characteristics of the Italian financial system. Section 4 discusses the theoretical predictions. In Section 5, we describe empirical methodology, data, and measurement of the variables. Section 6 presents the main results, while Section 7 contains additional tests. Section 8 concludes.

2 Prior Literature

This paper is especially related to the literature on global value chains.[4] A broad body of studies have investigated theoretically how global value chains influence the volume and pattern of international trade (see, e.g., Yi, 2003; Grossman and Rossi-Hansberg, 2008). Antràs and Chor (2013) study how the sequential structure of production affects the contractual relationships among final-good producers and suppliers. From an empirical viewpoint, we still have little hard evidence on the determinants of firms' decision to participate in supply chains. Most papers are based on case studies or focus on specific industries (see, e.g., Gereffi, 1999; Sturgeon and Kawakami, 2010; Kannegiesser, 2008). An exception is Alfaro, Antràs, Chor and Conconi (2015) who examine the determinants of a firm's propensity to integrate upstream versus downstream inputs and find that the elasticity of demand faced by parent firms influences the average upstreamness and downstreamness of its integrated inputs.[5] Overall, financial factors are frequently mentioned in case studies and policy analyses as a primary determinant of firms' decision to participate in supply chains, but hard evidence about this argument remains scant (see Manova, 2015, for a detailed review). Manova and Yu (2015) find that Chinese firms adopt different export modes depending on their leverage and liquidity. In particular, Chinese firms with higher leverage and lower liquidity concentrate on less profitable stages of global supply chains, privileging "processing trade" (such as processing with imports) over "ordinary trade". Our paper can contribute to fill this gap by exploiting survey data that provide direct, precise information on supply chain participation

[4] In the paper, with some abuse of terminology, we will refer to "supply chains" and "value chains" interchangeably.

[5] Baldwin and Lopez-Gonzales (2015) offer a global view of the cross-border flows of intermediate products.

decisions, credit rationing, and bank-firm relationships.

The paper is also related to the literature on trade credit as a source of external finance. Rajan and Zingales (1995) estimate that in a sample of U.S. nonfinancial firms, trade credit accounts for 15 percent of firms' assets. Extant theories suggest that firms resort to trade credit when they are subject to rationing in bank and bond markets, in spite of trade credit being an expensive form of funding (see, e.g., Biais and Gollier, 1997; Burkart and Ellingsen, 2004). For example, Cunat (2007) demonstrates that, by granting trade credit, suppliers can provide liquidity insurance to their customers. There is also an established empirical literature on trade credit (see, e.g., Petersen and Rajan, 1997, Burkart, Ellingsen and Giannetti, 2011, and Garcia-Appendini and Montoriol-Garriga, 2013). We can contribute to this literature by investigating how the interaction between bank credit and trade credit can orient the organization of production, by influencing firms' decision to participate in domestic and global supply chains. Finally, it is worth recalling that a strand of literature emphasizes the role of trade credit as a commitment device rather than as an alternative form of external finance. This view can yield interesting predictions in the context of supply chains, as shown by Kim and Shin (2012 and 2013) and Kalemli-Ozcan, Kim, Shin and Sorensen (2013). Later in the analysis, we will return to this point and how one can possibly separate such predictions from our hypotheses.

3 Institutional Background

Small and medium-sized firms account for a large share of economic activity in industrialized countries and are very important in the Italian business sector.[6] In 2013, for example, firms with less than 20 employees accounted for 41 percent of the value added and 40 percent of the employment of all Italian businesses; firms with less than 50 employees accounted for 52 percent of the total value added and 53 percent of the total employment (Italian National Statistics Office, ISTAT, 2013). Italian firms have engaged in an intense reorganization of production in the last two decades or so, increasing their participation in domestic and global value chains (De Nardis, 2010). Accetturo et al. (2013) document that in recent years the share of total turnover made up by sales of produced-to-order goods to foreign firms has been higher in Italy than in Germany and Spain. Considering the manufacturing sector only, Breda and Cappariello (2012) obtain that in 2007 in Italy and Germany the import content of production amounted to around 30%, despite the high share of low-tech sectors in Italy (traditionally, the least internationally fragmented). Cappariello and Felettigh (2015) show that in 2011 in Italy, Germany, France and Spain almost 40% of gross exports involved the

[6] In 2013, for example, in the United Kingdom firms with less than 50 employees accounted for about 48 percent of total employment. In manufacturing, in Spain firms with less than 50 employees accounted for 44 percent of total employment (Eurostat, 2014).

participation in global value chains (among these countries, Italy is the one for which the foreign content of exports started at the lowest level and has grown at the fastest pace since 1999). Netting out intra-euro area trade flows, Amador, Cappariello and Stehrer (2014) find that in 2011 the main contributors to the euro area's foreign content of gross exports were Germany (36.4%), France (14.4%) and Italy (12.7%).

Small and medium-sized Italian firms have exhibited a high speed of adjustment in the process of reorganization of production. In the 1990s, a large share of such firms integrated the whole process of production of goods and services within the firm boundary. In the last two decades, many small and medium-sized firms have faced the choice whether to keep the whole process of production within the firm boundary or instead participate in supply chains, specializing in one or more segments of the production process and purchasing or selling intermediate products to other firms. For businesses operating in foreign markets, this choice has also involved the decision whether to carry out greenfield foreign direct investment, in order to produce in-house all the components of the products, or instead offshore the production of some components to foreign trading partners, joining global value chains (Ferragina and Quintieri, 2002). Many firms have outsourced activities to other businesses located in the Italian territory (frequently, in distant areas of the country) or to business located abroad. In manufacturing industries, some small and medium-sized businesses have quickly switched from producing goods to producing inputs and machineries for the production of the goods (Ferri and Ventura, 2007). In some cases, firms have chosen to concentrate on specific tasks of design, marketing or distribution. When firms have joined supply chains, they have faced the choice among different types of inter-firm agreements, ranging from informal links to contractual arrangements such as subcontracting and network contracts.

Turning to the characteristics of the Italian financial system, this can be described as a bank-based system. The capitalization of the stock market is low relative to other advanced economies: in 2010 the ratio between the stock market capitalization and the GDP was 15.4%, compared with 117.5% in the United States (World Bank, 2012). Specialized financial intermediaries, such as private equity and credit funds, have a limited presence, so that for small and medium-sized firms the sources of external finance alternative to banks are very scarce. The central role of banks in the financing of businesses makes the Italian financial system close to that of other countries of continental Europe, such as France and Germany, and to Japan. An important feature of the Italian banking system is its delimitation within local areas. These areas roughly coincide with Italian provinces (Sapienza, 2002; Guiso, Sapienza and Zingales, 2003), local entities defined by the Italian law that are similar in size to U.S. counties. There were tight regulatory restrictions on lending and branching in provinces until the nineties, so that firms' access to bank credit is still highly heterogeneous

across provinces.[7] In Italy, a large presence of local bank branches is crucial for firms' access to bank credit because distance matters in the provision of loans (Petersen and Rajan, 2002; Guiso, Sapienza and Zingales, 2004) and it is particularly difficult for firms (especially small and medium-sized businesses) to borrow in a market other than the local (provincial) one. Indeed, distant lenders face pronounced informational disadvantages that can lead to a higher loan default rate for banks entering a new provincial market without having a branch in the province (Bofondi and Gobbi, 2006).

4 Theoretical Predictions

Supply chains constitute a channel through which firms can obtain liquidity. When a supplier extends trade credit to a customer in a supply chain, the delayed payment will appear as accounts receivable on the supplier's balance sheet and as accounts payable on the customer's balance sheet. Accounts receivable and payable thus form a chain of financial claims and obligations within the supply chain (Kim and Shin, 2012). It is frequently maintained that trading partners can be willing to supply liquidity even when banks are unwilling to grant loans, for instance because trading partners have better industry knowledge and, hence, informational advantages over banks (Biais and Gollier, 1997). Furthermore, the participation in a supply chain may allow a firm to unlock liquidity that would otherwise be tied up in the various assets and processes necessary for producing all the product components (Manova, 2015). A financially constrained firm could have limited ability to keep liquidity invested in the various assets and, hence, could especially benefit from this mechanism. However, there are up-front costs to be sustained for joining a supply chain, such as expenses for searching and interacting with trading partners (Grossman and Helpman, 2002). These up-front costs might be harder to cover for liquidity-constrained firms. Therefore, ex ante it is ambiguous whether firms more exposed to financial frictions are more or less likely to participate in supply chains.

Hypothesis 1. Firms more exposed to bank credit rationing and with weaker (e.g., shorter and more fragmented) relationships with banks have more incentives to participate in supply chains. However, liquidity-constrained firms might find it more difficult to cover costs for joining supply chains.

The incentive of a firm to participate in a supply chain to broaden its sources of liquidity is likely to be especially strong when its trading partners are rich in cash. Furthermore, this incentive is likely to be stronger when the firm has tighter relationships with its trading

[7] Between 1936 (the year of introduction of the banking regulation) and 1985, in Italy the number of bank branches grew by 87% versus 1228% in the United States.

partners and when it is less exposed to hold up and rent extraction by its trading partners (see, e.g., Cunat, 2007; Biais and Gollier, 2007).

Hypothesis 2. Firms with more difficult access to bank credit are more likely to forge ties with cash-rich trading partners and to establish long-term relationships with their trading partners in supply chains. Liquidity-constrained firms are instead less inclined to participate in supply chains in which their trading partners have stronger bargaining power in trade credit transactions.

Besides these two hypotheses, our data will also allow us to investigate other important aspects of the link between credit access and participation in supply chains. One such aspect regards the influence that different kinds of liquidity needs may have on the link between access to bank credit and supply chain participation. We will especially explore the role of working capital requirements. In addition, the data will allow us to differentiate across different geographical origins of firms' trading partners. Thus, we will be able to test whether financial constraints can affect not only firms' participation in supply chains but also their choice of joining a global network of trading partners.

5 Data and Empirical Strategy

In this section, we discuss the empirical methodology, the data used in the analysis, and the measurement of the variables.

5.1 Empirical model

We study how firms' access to credit may influence firms' decision to participate in a supply chain. The probability that firm i participates in a supply chain can be written as

$$\mathrm{P}(SupplyChain_i = 1|R_i, Z_i) = \Phi\left(\alpha_1 + R_i\beta_1 + Z_i\gamma_1\right), \tag{1}$$

where $\Phi(\cdot)$ is the standard normal cdf, R_i measures firm i's access to bank credit (e.g., whether the firm is credit rationed by banks or not, and the strength of credit relationships as proxied by the number of banks from which the firm borrows and by the length of the relationship with the main bank); and Z_i is a vector of controls for firm characteristics that may affect firm i's supply chain participation decision, as well as controls for differences across regions and industries.

One might be concerned that a firm's access to bank credit may be endogenous. It is possible that some omitted variable could be correlated with a firm's access to credit and also affect its decision to participate in supply chains. Note that our empirical specification controls for a rich set of factors that may affect supply chain participation decisions, including

firm-level characteristics and industry and region fixed effects. This should minimize the risk of omitting factors correlated with both credit access and supply chain participation decisions. Furthermore, there is a possibility of reverse causality: for example, supply chain participation could send a good signal to banks, thus reducing the probability that a firm is rationed by banks. To assuage concerns of endogeneity, we complement Probit estimates with an instrumental variable approach.

To construct the instruments, we aim at capturing exogenous shocks to the structure of the Italian local (provincial) credit markets which could have affected firms' access to credit as well as firms' incentives and ability to establish credit relationships with banks. A broad literature finds that bank mergers can constitute important shocks to firms' access to bank credit and to firm-bank relationships (see, e.g., Walter, 2004, Sapienza, 2002, and references therein). Building on this literature, to construct the instruments we exploit the merger occurred in 2007 between two Italian banking groups (UniCredit and Capitalia, which in turn comprised Banca di Roma, Banco di Sicilia and Bipop-Carire). While the banks involved in the merger operated in the whole Italian territory, their presence differed quite significantly across provinces at the time of the merger. We then expect that the impact of the merger on firms' access to bank credit depended on the importance of the merged banks relative to other banks in the local (provincial) credit market at the time of the merger. For instance, in a province with a large share of branches of the merged banks, firms should have benefited from increasing economies to scale and enhanced synergies more than in a province with a scarce branch presence of the merged banks.

For our instruments to be valid, they must be correlated with our proxies for credit rationing and for the strength of credit relationships, while they must not be correlated with unobservable variables (economic and institutional features of the provinces) which could also correlate with firms' decision to participate in supply chains. Regarding the first aspect, two elements are worth mentioning. First, Italian firms strongly rely on banks for obtaining external funds, as discussed above. This is even more true for the firms in our sample, which are small and medium-sized and, thus, have very limited alternative sources of funds. Second, the relevant credit market for Italian firms is the provincial one, also as a result of the historical evolution of the Italian local credit markets which remained segmented for several decades due to the banking regulation introduced in 1936 (Guiso, Sapienza and Zingales, 2003).

We have strong reasons to believe that at the time of the merger the relative presence of the two banking groups in the provinces was not correlated with economic features of the provinces. In fact, this presence was the result of the historical evolution of the Italian banking sector in the decades during which the 1936 banking regulation was in place, as well as the historical presence of the banks in the provinces, due to ties to the local communities and the geographical roots of the banks. For example, Banco di Sicilia (part of the Capitalia banking

group) was particularly strong in the southern region of Sicily because of its traditional vocation to serve Sicilian provinces, due to its origins and its close ties to those geographical areas from its foundation in 1849. In the North, Bipop-Carire (part of Capitalia) had a strong presence in the province of Reggio Emilia, due to historical ties with local communities since the 1850s, and a very weak presence in the close-by provinces of Lucca and Pisa, characterized by similar GDP per capita and degree of banking development (in the provinces of Lucca and Pisa, the bank Monte dei Paschi di Siena has strong historical roots dating back to the Middle Ages). Figure 1 plots the relative branch presence of the merged banks in the provinces together with a measure of local banking development, the number of bank branches normalized by the provincial population: as the maps illustrate, there appears to be very little correlation between the two measures. Indeed, the correlation coefficient equals -0.1696 and the rank correlation coefficient across provinces is -0.0707.

As instruments we use the share of branches of the banks involved in the merger, relative to the total number of branches in the province, and the difference between the shares of branches of the two banking groups involved in the merger, UniCredit and Capitalia. The latter variable can capture possible benefits or difficulties in the implementation of the merger at the local level due to asymmetries in the local importance of the banks involved. As noted, the expected sign of our instruments is ambiguous a priori. For instance, if the merger fostered the ability of the merged banks to exploit economies of scale, we expect the probability of credit rationing to be negatively correlated with the share of branches of the merged banks in the province. On the other hand, the merger could have disrupted existing credit ties and exacerbated credit rationing. We also experiment with alternative instrumental variables, such as the change in the provincial share of branches of the banks involved in the merger between 2007 and 2008.

5.2 Data

Our main data source is the VIII UniCredit Survey on small and medium-sized enterprises (SMEs), which was carried out by the Italian banking group UniCredit in 2011 on the previous year 2010. Every year this survey gathers data on a sample of Italian firms that are customers of the bank. The 2011 wave targeted 7,433 firms. The sample is representative of the bank's portfolio, whose composition is well diversified by sector, given the large dimension of the bank in terms of loans, deposits and branches. The survey was designed according to a stratified selection procedure, so that findings are representative at company size level, individual sector level (where the sectors considered are Agriculture, Manufacturing, Services, Trade and Construction), as well as at the territorial level (province).

The main strength of this survey is its very detailed information on individual firms. In particular, the 2011 wave comprises information on firms': a) participation in domestic and international supply chains, as well as details on the supply chains; b) financial structure

and relationships with the banking system; c) extent of internationalization and exports; d) organizational structure and number of employees; e) propensity to innovate. Thus, a unique feature of the 2011 survey wave is that it contains precise measures of both supply chains and access to credit (e.g., credit rationing) that are based directly on firms' responses to survey questions rather than being indirectly inferred from balance sheet statements.

The survey is conducted by highly qualified personnel of a major Italian institute of statistics (Doxa, the Italian branch of the Gallup International Association) on behalf of UniCredit. Over the various survey waves, this personnel has compiled exhaustive instructions to respondents about the interpretation of the survey questions. Furthermore, the 2011 wave was specifically designed to study the phenomenon of domestic and global supply chains, so particular attention was devoted to making the questions intelligible for the firms and to minimizing measurement errors. Finally, the interviewers made clear that the responses to the survey would only be used to compile statistical tables, so we do not expect the firms to misreport information with the objective of building better reputation in the credit market.

Table 1 reports the summary statistics for the variables included in the regressions.[8] The geographic distribution of the firms reveals a prominence of the North of Italy (57% of the total), while other firms are based in the Center (19%), and South and Islands (24%). By construction of the sample, the average size of the firms, measured by the number of employees, is relatively small (15.38). By comparison, the firms in the pooled 1998 and 1993 survey waves of the U.S. National Survey of Small Business Finances count about 30 employees on average. Only 26% of the firms in our sample are corporations. The sector composition is affected by the nature of the sample. In fact, small firms usually dominate sectors such as commerce (28% of the firms in the sample) and services (30%) compared to large firms. Manufacturing firms account for 26% of the total, while Construction represents 10% of the sample. Finally, in the sample there are firms in tourism (2.7%) and agriculture (1.9%) sectors. In general, however, the composition is representative for both sample size and shares of the underlying population, so that sector peculiarities should not affect our analysis.

To complement the survey, we employ data obtained from the Bank of Italy on the presence of banks in local markets. We also use data from the Italian National Statistics Office (ISTAT) on the population of provinces.

[8] For each variable we show summary statistics for all the firms for which information on the variable is available. The summary statistics are very similar if we restrict attention to the sample of firms that report all variables (i.e., the sample of firms in our following regression analysis).

5.3 Measurement

5.3.1 Supply chains

The survey asks each firm to provide details on its participation in supply chains. In particular, the firms are requested to report if they produce in-house all the components of a final good or service or instead specialize in some segments of the production process, buying or selling intermediate products to other firms. The firms that participate in a supply chain are also asked to report their position in the supply chain (upstream, midstream, or downstream). In our sample, 52.8 percent of the firms participate in a supply chain. Among them, 16.2 percent are in an upstream position (that is, purchase raw materials and produce an intermediate product), 10.2 percent are in the middle (that is, use and produce semi-finished intermediate products), and 26.4 percent are at the end of the supply chain (that is, use semi-finished intermediate products and produce final products). While national statistics are not available, these figures are in line with those found by various recent analyses of small and medium-sized Italian firms. Using data from an administrative source ("Studi di Settore"), Drudi and Pacei (2012) report that about 61 percent of small clothing manufacturers in the region of Emilia-Romagna participate in supply chains, versus 39 percent who perform in-house all the production tasks. Considering a sample of small, medium and large manufacturers in the region of Piemonte, Calabrese (2007) reports that about 65% of the businesses participate in supply chains.

A second aspect that the survey explores is whether the firms have subcontracting relationships with their trading partners in supply chains. Based on the Italian civil and commercial law, subcontracting is defined as a contractual arrangement under which a firm commits to deliver a product following the technical procedures specified by the customer or buys a product under an analogous commitment of the supplier. Thus, subcontracting signals that the linkages among firms in the supply chain take a structured, contractual form.

Finally, the survey asks the firms further detailed information about the inter-firm linkages in the supply chains and about the characteristics of trading partners. For example, the firms are requested to report details about the location of their trading partners. We discuss this information in the next sections.

5.3.2 Access to credit

We consider three measures of credit conditions: credit rationing, the number of relationships with banks, and the duration of the relationship with the main bank. Our measure of credit rationing is based on firms' response to the following question in the survey: "In 2010, would the firm have liked to obtain more credit at the interest rate requested by the bank(s)?". This measure is a dummy variable that treats as rationed the firms that responded "yes" to this question. As shown in Table 1, 37.7 percent of the firms in the sample are credit

rationed. Using the Capitalia survey for Italian manufacturing firms, and based on the same type of question, Minetti and Zhu (2011) find for 2000 a share of credit rationed firms of approximately 20 percent. A likely explanation for our somewhat higher figure is that the firms in our sample are small (with an average of 15 employees per firm versus an average of about 80 employees per firm in the Capitalia survey used by Minetti and Zhu, 2011). In fact, Albareto and Finaldi Russo (2012) estimate that the percentage of credit rationed firms in Italy is significantly higher for businesses with fewer than 50 employees.

Next, we construct alternative measures of credit conditions using further information in the survey. The questionnaire asks each firm to indicate the number of banks from which it borrowed. Nearly 41% of the firms have one bank, the mean number of banks is 2.4 and the median is 2. Multiple credit relationships can dilute the strength of the relationship with the main bank, thus exacerbating informational asymmetries and the probability of credit rationing (Petersen and Rajan, 1994). The fragmentation of credit relationships is indeed often found to be an obstacle to credit access for Italian firms (see, e.g., Accetturo et al., 2013, and references therein). As a proxy for the strength of credit relationships, we also use the length of the relationship with the firm's main bank, measured by the number of years the firm has been operating with its current main bank. The literature finds evidence that long-term relationships ease information acquisition and monitoring by banks and, hence, increase credit availability (Petersen and Rajan, 1994, 1995; Berger and Udell, 1995). This implies that a longer relationship with the main bank is likely to reduce the probability that the firm faces credit rationing. In our sample, the duration of the main credit relationship is 13.5 years on average. This figure is in the ballpark of what is found by other studies on Italian firms (e.g., Herrera and Minetti, 2007, report an average length of the main credit relationship of 17 years). Interestingly, while the measure of credit rationing is binary and hence does not contain information on the intensity of rationing, the two alternative measures, number of credit relationships and duration of the main credit relationship, are (roughly) continuous and hence can help capture the intensity of credit frictions.

5.3.3 Instruments

In May 2007, UniCredit bought Capitalia (which in turn comprised Banca di Roma, Banco di Sicilia and Bipop-Carire) for more than $29 billions in shares. The merger strengthened UniCredit's position as Italy's largest bank by market value, with branches stretching from Sicily to Eastern Europe and with geographically diversified operations across four core markets (Italy, with 16% market share; Germany, with 5% market share; Austria, with 19% market share; and CEE, with a presence in 17 countries).[9] The group resulting from the merger

[9] The merger enabled the new UniCredit to achieve a combined market capitalization of more than $135 billions.

adopted a business model consistent with the previous divisional structure of UniCredit; in general, Capitalia's activities were integrated within the existing UniCredit divisions. During the years 2008-2009, retail banking services in Italy were offered through three entities (UniCredit Banca, Banca di Roma, Banco di Sicilia) in order to maximize commercial effectiveness and to leverage on well-recognized brands and expertise that benefited from strong local roots. This goal was pursued through an intragroup branch transfer conducted in accordance with the specific regional responsibilities (i.e., UniCredit Banca in Northern Italy, Banca di Roma in the Centre-South, and Banco di Sicilia in the southern region of Sicily) and through the integration of Bipop-Carire into UniCredit Banca.

As instruments we use the share of branches of the banking groups involved in the 2007 merger, relative to the total number of branches in the province, and the difference between the provincial shares of branches of the two banking groups involved in the merger, UniCredit and Capitalia. As we shall see, in the first stage regressions we obtain evidence that the larger the share of branches of the merged banks in the province, the smaller the probability of credit rationing. This indicates that the merger favored borrowers when the banks involved accounted for a larger portion of the local credit market, for example because the merger allowed to better exploit economies to scale or share among bank branches information which was previously segmented across the banks. The difference in the provincial shares of branches between UniCredit and Capitalia can reflect advantages or disadvantages that can have occurred in the implementation of the merger in a province as a result of asymmetries in the local importance of the banks involved. For instance, in the report prepared by UniCredit and Capitalia to explain the merger, it is clearly indicated that the integration of Capitalia branches into the UniCredit branch structure involved adjustment costs, with such adjustment costs being more sizeable where the number of Capitalia branches to be integrated was larger.

5.3.4 Control variables

We include a comprehensive range of explanatory variables as controls in the regressions. To account for the fact that larger and older firms could have a different propensity to participate in a supply chain, we include firm size, measured as the log of total employees, and age (years from a firm's inception). We also insert dummy variables indicating whether a firm is a corporation, and whether it belongs to a partnership, such as a consortium. In addition, we include industry dummy variables to account for sectoral differences in the propensity to participate in supply chains. We further control for heterogenous local socioeconomic conditions by inserting area dummies indicating whether a firm is headquartered in the South or Center of Italy. (Firms in the North are the benchmark group). In fact, the main geographical areas of Italy differ substantially in infrastructure and institutions. Finally, we control for the provincial bank branch density (total number of branches per

100,000 inhabitants) to capture the degree of financial development of the province.

6 Supply Chain Participation

In this section, we investigate the relationship between a firm's access to credit and its participation in supply chains.

6.1 Baseline results

Table 2 lists the baseline results. In columns 1-2, a firm's access to credit is captured by a dummy variable indicating whether the firm is credit rationed or not. Column 1 reports the marginal effects from the probit model in equation (1). The marginal effect of credit rationing is estimated to be 0.047, suggesting that a credit rationed firm is 4.7 percentage points more likely than non-rationed firms to participate in a supply chain. This magnitude is not small considering that 53% of the firms participate in supply chains.[10]

In column 2, we treat credit rationing as endogenous and instrument for it using the share of branches of the banks involved in the bank merger, and the difference between the shares of branches of the two bank groups involved in the merger. Since both the supply chain participation decision and credit rationing are binary variables, we estimate a bivariate probit model that comprises equation (1) and a probit equation of credit rationing as a function of the instruments, firm controls and region and industry dummies. We find an even larger positive effect of credit rationing on the probability of participating in a supply chain. As shown in column 2, the marginal effect of credit rationing is 0.187, implying that a credit rationed firm is 18.7 percentage points more likely than non-rationed firms to participate in a supply chain. Thus, the probit results in column 1 are confirmed by the IV estimates. One interpretation for the somewhat larger effect obtained after accounting for endogeneity relates to possible reverse causality mechanisms. If the reverse causality mechanism implies a negative effect (e.g., supply chain participation sends a good signal to banks, attenuating rationing), then using IV could correct this and generate a stronger effect of credit rationing on supply chain participation.

The bottom of column 2 reports the estimated coefficients on the instruments from the probit equation of credit rationing. To save space, the coefficients on firm controls and region and industry dummies are not reported. We find that the higher the share of branches of the merged banks in the province, the smaller is the probability of credit rationing. This indicates that the merger favored borrowers when the banks accounted for a larger portion

[10] Interestingly, if a reverse causality mechanism were at work in the sense of supply chain participation sending a good signal to banks, we would expect a negative coefficient on credit rationing. This is the opposite to what we find.

of local branches, for example because the merger allowed to exploit economies to scale or better share information among bank branches. In turn, this would have outweighed potential negative effects (e.g., due to partial disruption of existing credit ties).[11]

The banking literature stresses that the strength of credit relationships can complement measures of credit rationing in capturing firms' access to bank credit. In columns 3-4, we measure the strength of firms' relationships with banks using the number of banks from which a firm borrows. Firms with more banks are reputed to have a weaker relationship with the main one, which could imply a higher probability of credit constraints (Petersen and Rajan, 1994). The probit estimates in column 3 do not indicate a significant relationship between the number of banks and the probability of participating in a supply chain. In column 4 we treat the number of banks as endogenous and instrument for it using the share of branches of the merged banks and the difference between the shares of branches of UniCredit and Capitalia.[12] The IV estimates in column 4 reveal that firms that have relationships with more banks are more likely to participate in a supply chain. This finding is consistent with the results displayed in columns 1-2, suggesting that firms with weaker (more fragmented) credit relationships participate more in supply chains. Further, the first stage result at the bottom of column 4 suggests that a higher share of branches of the merged banks and a larger difference in the shares of branches between UniCredit and Capitalia are negatively associated with the number of banks, which is also consistent with the result for credit rationing shown in column 2.

In columns 5-6 firms' access to bank credit is captured by the length of the relationship with the main bank. A longer bank-firm relationship indicates a stronger relationship, which could imply a smaller probability of credit constraints (Ongena and Smith, 2001). Unlike the probit results in column 5, the IV estimates shown in column 6 suggest that firms with a longer relationship with their main bank are less likely to participate in a supply chain.[13] This result is thus in line with those obtained using credit rationing and number of banks to capture the access to credit. Overall, the consistency in the inferences drawn from using the three alternative measures of access to bank credit is reassuring.

In the estimation, we also control for various firm characteristics. We find that younger firms are more likely to participate in a supply chain. Being part of a supply chain could help a

[11] As for the second instrument, we find that the larger the difference in the shares of branches of the merged banks the smaller the probability of credit rationing. This may suggest that the merger had a stronger positive impact in provinces where it was not too difficult to integrate the Capitalia branches into the UniCredit branch network (i.e., there was sufficient difference between the shares of branches of UniCredit and Capitalia).

[12] Note that, while credit rationing is a binary variable, following prior literature in banking we treat the number of banks and the length of the main credit relationship as continuous variables (see, e.g., Herrera and Minetti, 2007, and references therein). There is substantial variation in these measures across the firms in our sample, so this should not lead to a significant bias.

[13] Consistent with the findings for the number of banks, the first stage results suggest that the merger had a positive effect on the length of the main credit relationship.

firm to grow. We obtain more mixed evidence on the impact of firm size on the participation in supply chains. Firms with partnership are less likely to participate in a supply chain. There is also a significant difference across regions. Firms located in the Center or South are significantly less likely to participate in supply chains compared to firms located in the North.

Table 3 reports robustness checks on the main results. To conserve space, we only report the IV estimates. In columns 1-3 we insert additional control variables, the share of branches of the two main local banks in 2007 and the GDP per capita in the province in the year 2009, to control for the degree of concentration of the local banking market and for local economic conditions. To capture the level of competition faced by the firm, we also insert a dummy ("high competition") that takes the value of one if the firm declares to have a number of competitors higher than the median number in the sample. The results suggest that these additional controls have no significant effect on the supply chain participation decision and the estimated coefficients on credit rationing and on the measures of the strength of credit relationships remain unaltered. In columns 4-6 we experiment with two further controls at the firm level: capital intensity (measured by fixed assets per worker) and current assets for the year 2009. When performing these estimates we suffer from a substantial loss of observations, due to missing data for capital intensity and current assets. The baseline results carry through and the estimated coefficients on the additional controls turn out to be statistically insignificant. In columns 7-9 we experiment with an additional instrumental variable, the change between 2007 and 2008 in the share of provincial branches of the five largest banks in the province. This share might have been significantly affected by the merger between UniCredit and Capitalia. This additional instrument is weakly and negatively correlated with credit rationing, but not with measures of the strength of credit relationships. The results reveal that including this additional instrument causes little change in the estimated coefficients on credit rationing, the number of banks, or the length of the main credit relationship. Overall, the estimates suggest that this further instrument has no additional power in capturing the effects of the merger shock relative to our two preferred instruments.

In columns 10-15 we perform placebo tests. Instead of using the provincial share of branches of the banks involved in the merger, and the difference between the shares of branches of the two banking groups, as instruments for firms' credit conditions we employ the shares of provincial branches of two other major Italian banks, Intesa San Paolo (columns 10-12) and Monte dei Paschi di Siena (columns 13-15). These two variables are unrelated to the 2007 bank merger. As displayed at the bottom of columns 10-15, these two measures are not significantly correlated with credit rationing or with the measures of the strength of credit relationships. This result provides additional evidence that the cross-firm variation in credit conditions is likely a result of the 2007 bank merger. Further, since the two measures are not strongly correlated with firm credit conditions, the second stage estimates are not

statistically significant.

Overall, the results reported in Tables 2 and 3 suggest that firms with more difficult access to bank credit are significantly more likely to participate in a supply chain. In the next sections, we are going to further investigate this point. In Sections 6.2 and 6.3 we aim at disentangling the mechanisms whereby firms' access to credit can affect their participation in supply chains. In Section 7, we explore the relative importance of access to credit in the participation in domestic and international supply chains.

6.2 Trading partners and inter-firm linkages

As noted, two forces could especially push liquidity-constrained firms to participate in a supply chain. First, a firm could view a supply chain as an alternative channel through which to obtain liquidity (to fix ideas, we can label this an "opportunity-driven" motive). Second, the participation in a supply chain could free liquidity that would otherwise be tied up in assets and processes needed for producing all the various product components (we label this a "need-driven" motive). In Tables 4 to 6, we aim at disentangling these motives. In Tables 4 and 5 we especially test the contribution of an opportunity-driven motive by refining the definition of our dependent variable.

If the propensity to participate in a supply chain reflects the firm's desire to gain access to an alternative source of liquidity, the characteristics of the trading partners and of the inter-firm linkages should matter in the relationship between access to credit and the supply chain participation decision. Larger businesses have allegedly easier access to financial markets because more public information is available about them (e.g., they are better covered by the financial press and by financial analysts; Petersen and Rajan, 1994). In addition, a longer trading relationship between two firms in a supply chain will allow the firms to acquire more accurate information about each other. We then expect that a firm can especially resort to a supply chain as an alternative source of liquidity if it establishes contractual links with large trading partners and if it engages in long-term relationships with its trading partners in the supply chain.[14] To test these hypotheses, we exploit the information available in the survey on the size of subcontractors and on the length of the relationships between the firm and its subcontractors in the supply chain. We distinguish subcontractors into two types: those from which a firm acquires its inputs (i.e., the subcontractor is upstream in the supply chain), and those to which a firm sells its inputs (the subcontractor is downstream in the supply chain). In columns 1-2 in Panel A of Table 4, the dependent variable is a dummy

[14] Since firms can obtain trade credit from suppliers, it is natural that they can derive benefits from having large suppliers and from establishing long-term relationships with them. Yet, benefits can also arise if the buyers are large and have long-term relationships with the firm. For example, in such cases the firm could be less frequently called to fund its customers with its internal liquidity (or the provision of such funding could be easier).

that equals one if the firm engages in a subcontracting relationship with a large supplier, and zero otherwise. In columns 3-4, the dependent variable is a dummy that equals one if the firm engages in a subcontracting relationship with a large customer, and zero otherwise. The results in Panel A suggest that indeed credit rationed firms are more likely to engage in subcontracting relationships with large trading partners than non-rationed firms. Moreover, the results are stronger when the firm is downstream and its subcontractor is upstream in the supply chain.

In columns 5-6 of Panel B, the dependent variable is a dummy that equals one if the firm engages in a long-term subcontracting relationship with a supplier, and zero otherwise. In columns 7-8, the dependent variable is a dummy that equals one if the firm engages in a long-term subcontracting relationship with a customer, and zero otherwise. The estimates suggest that a credit rationed firm is significantly more likely to have a long-term relationship with subcontractors than non-rationed firms. Again, this effect is more pronounced when the firm is downstream and its subcontractor is upstream in the supply chain. This tends to confirm the hypothesis that gaining access to an alternative source of liquidity is an objective that firms pursue when they choose to participate in supply chains.

In Panel C, we refine our dependent variable by focusing on the tightness of the inter-firm linkages in supply chains. In supply chains where inter-firm linkages are tight, suppliers could be more inclined to provide liquidity to their customers, for example because they can gather better information on them or because they can more easily enforce the fulfillment of debt obligations.[15] We capture the tightness of inter-firm linkages using information on whether the firm's supplier or customer is also its principal partner in innovative projects, which is likely to imply a tight link. We obtain that credit rationed firms are more likely to have suppliers with which they collaborate in innovative projects.

Panel D of Table 4 considers another dimension of the inter-firm linkages in supply chains. The hold-up literature (see, e.g., Rajan, 1992) maintains that firms that are locked into their creditors are more exposed to hold up and rent extraction by creditors (e.g., in the form of more expensive funding). This reasoning suggests that firms that are more dependent on their trading partners could be exposed to being held up in trade credit relationships and, hence, be less willing to resort to supply chains as a source of liquidity (Cumming, 2012). Consistent with this argument, in the IV estimates in Panel D the coefficient on credit rationing tends to lose significance when we focus on the participation in supply chains in which firms lack autonomy from trading partners. And, in untabulated tests, we further obtain some evidence that credit access has a weaker impact on supply chain participation when firms declare to be less able to switch away from their trading partners (again suggesting that the hold-up risk partially dilutes the appeal of supply chains as an alternative source of liquidity).

[15] However, one might also think that if inter-firm linkages are tight for technological reasons, financial factors might be less relevant in firms' decision to participate in supply chains.

Overall, the tests in Table 4 confirm the baseline results and support the hypothesis that broadening the sources of liquidity is a motive that induces financially constrained firms to participate in supply chains.

Finally, in Table 5 we refine the definition of our dependent variable by exploiting information about the firm's main bank. Banks may or may not attribute importance to a firm's collaboration with other companies in a supply chain. One might suspect that a financially constrained firm has the incentive to join a supply chain merely to send a signal to banks, and not to gain access to an alternative source of funding or to unlock liquidity from its assets and processes. If this were the case, however, our findings should lose significance if the main bank does not attribute importance to collaborations among firms. In Table 5, we rerun our regressions by defining the dependent variable as a dummy that equals one if the firm participates in a supply chain and its main bank does not consider inter-firm collaborations to be important, and zero otherwise. The baseline results carry through; the estimates suggest that firms with more difficult access to credit are significantly more likely to participate in a supply chain. Thus, there is no evidence that credit constrained firms have an incentive to participate in a supply chain to send a good signal to banks.

6.3 Working capital stress

In the tests in Tables 4 and 5, we focused on the financing opportunities that firms could access by participating in supply chains. It is harder to extract information from our data about what we labelled the "need-driven" motive, that is the incentive to outsource tasks and participate in supply chains to unlock liquidity from existing assets and processes. However, our survey provides interesting information on whether the firms recently experienced changes in liquidity needs due to difficulty in meeting working capital requirements. We identify two opposite mechanisms through which such a difficulty could have affected firms' choice of participating in supply chains. Difficulties in meeting working capital requirements could have reinforced the incentive of financially constrained firms to seek liquidity inside a supply chain. However, a recent strand of theories on working capital as a commitment device in supply chains yield an opposite prediction. According to Kalemli-Ozcan, Kim, Shin and Sorensen (2013) and Kim and Shin (2012 and 2013), in supply chains firms could have to hold sizeable amounts of working capital to commit to make effort for the success of the final products. These theories specifically predict that a firm facing working capital stress could be less inclined to participate in a supply chain, even if overall this participation would help the firm to better face liquidity shortages. In Panel A of Table 6, columns 1-4, we study how working capital stress influences the relationship between access to credit and the participation in supply chains. To this end, we construct a dummy ("working capital stress") that takes the value of one if the firm recently experienced changes in liquidity needs due to difficulty in meeting working capital requirements, and zero otherwise. We then insert in

the regressions this dummy as well as its interaction with the variable for credit rationing. Based on the opposite mechanisms described above, ex ante the expected sign of the effect of working capital stress is ambiguous. Consistent across specifications, we find no significant effect of the indicator or of its interaction with credit rationing. A possible interpretation is that the opposite mechanisms detailed above essentially offset each other in determining the impact of working capital stress on supply chain participation.

In Panel B of Table 6, columns 5-8, we try to separate the two competing theoretical explanations for the effect of working capital stress. The theories in Kalemli-Ozcan, Kim, Shin and Sorensen (2013) and Kim and Shin (2012 and 2013) emphasize that the need to hold sizeable amounts of working capital for commitment purposes is more pronounced for firms more upstream in a supply chain. In fact, such firms are farther away from the final products so they need to have more "skin in the game" to be induced to exert effort in the production of their product components. By contrast, our need-driven/financing hypothesis applies more to firms that are more downstream in a supply chain, because such firms could especially benefit from gaining access to suppliers' liquidity. In Panel B of Table 6, we then rerun the regressions of Panel A by exploiting information on the position of the firm in the supply chain.[16] Specifically, the dependent variable is a dummy that equals one if the firm participates in a supply chain in an upstream or midstream position, and zero if the firm is downstream or if the firm does not participate in a supply chain. The estimated coefficient on the interaction between credit rationing and the indicator for working capital stress clearly suggests that liquidity-constrained firms facing working capital stress have a lower incentive to participate in the upstream segment of a supply chain. This finding thus suggests that both the mechanism put forward by Kalemli-Ozcan, Kim, Shin and Sorensen (2013) and Kim and Shin (2012 and 2013) and the need-driven/financing mechanism we emphasize in this paper can be at work in our data.

7 Domestic and International Supply Chains

In a supply chain, the trading partners of a firm can be located throughout the Italian territory or in foreign countries. If a supply chain stretches from Italy to foreign countries, a firm can have the opportunity to interact with more sophisticated suppliers with easier access to financial markets abroad and, hence, better capacity to provide financing. Based on this argument, one could then expect financial constraints to have a larger positive impact on firms' decision to participate in an international supply chain. The survey does not ask the

[16] When a firm joins a supply chain, it can choose strategically the segment of the supply chain where to try to position itself; in other cases, a firm can "upgrade" its position along the supply chain by reorganizing its production process. There is extensive anecdotal evidence that in the last twenty years or so the reorganization of production in the Italian business sector has regarded not only firms' participation in supply chains but also their positioning along the supply chains (Accetturo, Giunta and Rossi, 2011).

firms whether there are segments of the supply chain abroad. In fact, this would probably be beyond the knowledge of the respondents. However, in addition to being asked about their participation in supply chains, the firms are asked whether they have suppliers or customers abroad and whether they engage in subcontracting relationships with foreign suppliers or customers. For our purposes, this is the key piece of information because a firm's trading partners are those relevant for the provision of liquidity to the firm.

In Table 7, Panel A, we first look at the effect of access to credit on a firm's decision to participate in a domestic supply chain. The dependent variable is a dummy variable indicating that the firm participates in a supply chain and has only domestic suppliers or customers. The benchmark group is firms that do not participate in a supply chain. We find only weak evidence that liquidity-constrained firms are more likely to participate in a domestic supply chain. In Panel B we then study firms' decision to participate in an international supply chain. The dependent variable is a dummy that equals one if the firm participates in a supply chain and has suppliers or customers abroad. The benchmark group again consists of firms that do not participate in a supply chain. The magnitude of the coefficients on credit rationing and on the length of the main credit relationship is about twice as large as those in Panel A. Therefore, the effect of credit access is stronger in the case of international supply chains.

To further investigate, in Panel C we use the information on the markets where the suppliers or customers are located and compare the effect of credit rationing on the participation in supply chains with trading partners in Western Europe with its effect on the participation in supply chains with trading partners in the Rest of the World.[17] In columns 1-2 of Panel C, the dependent variable is a dummy indicating that a firm participates in a supply chain and has trading partners in Western Europe. The benchmark group is firms that are not part of a supply chain or that have trading partners in other foreign markets. We find that credit rationed firms are significantly more likely to participate in a supply chain with partners in Western Europe. By contrast, the results in columns 3-4 are insignificant. From Panel C, we may infer that the strong results for international supply chains as revealed in Panel B are likely driven by the group of firms that participate in supply chains with trading partners in Western Europe. Taken together, the results suggest that for an Italian firm seeking liquidity from sophisticated trading partners from Germany, France or the United Kingdom (countries with highly developed financial systems) could be easier than seeking liquidity from domestic trading partners or from trading partners from far-away markets.[18]

[17] To conserve space, in Panels C and D we omit the results for the effect of the number of banks and the length of the main credit relationship. These results (available from the authors) yield insights similar as those for credit rationing.

[18] We have stressed the high degree of development of financial systems in Western European countries. At least when comparing the results for Western Europe with those for the rest of the world, a complementary interpretation is that the up-front costs for interacting with trading partners in Western Europe may be lower

Finally, in Panel D of Table 7 we report the results for the effect of credit rationing on the probability of having only domestic subcontractors (columns 7-8) or also international subcontractors (columns 9-10). Consistent with the results for domestic and international supply chains in Panels A and B, the probit estimates suggest a stronger effect of liquidity constraints on the probability of having an international subcontractor. However, the coefficient on credit rationing is estimated imprecisely when we use an IV approach.

8 Conclusion

This paper has examined the impact of credit access on the participation of small and medium-sized firms in domestic and global supply chains. The results reveal that firms with difficult access to bank credit are more inclined to participate in supply chains and especially to forge ties with international trading partners. We have also found evidence that, in structuring their relationships with trading partners in supply chains, liquidity-constrained firms mimic the kind of relationships that generally facilitate their borrowing from banks. For example, they engage in long-term relationships with large trading partners more than unconstrained firms. Furthermore, they turn out to be especially eager to participate in supply chains in which they have little risk of being held up in trade credit transactions. Overall, the results suggest that for financially constrained small and medium-sized firms the participation in supply chains is a way of broadening the sources of liquidity and unlocking liquidity from assets and processes. These positive effects may outweigh possible difficulties that liquidity-constrained firms could face in covering up-front costs of supply chain participation.

Prior literature has consistently found that financial factors play an important role in firms' production and investment decisions. Our results reveal that financial factors can also shape the organization itself of production activities, by influencing firms' decision to participate in supply chains. In an aggregate perspective, several studies show that, while supply chains are a defining feature of many economies, their relative importance differs quite significantly across countries (see, e.g., OECD, WTO and World Bank, 2014). Our findings suggest that the observed cross-country variation in the importance of supply chains could at least partially stem from the different severity of financial market frictions across countries. In a policy perspective, our results suggest that interventions aimed at favoring firms' participation in supply chains could also have a beneficial impact on firms' access to liquidity. We leave the exploration of these and other issues to future research.

than those for interacting with trading partners in the rest of the world. Thus, for a liquidity-constrained firm it could be easier to sustain up-front costs.

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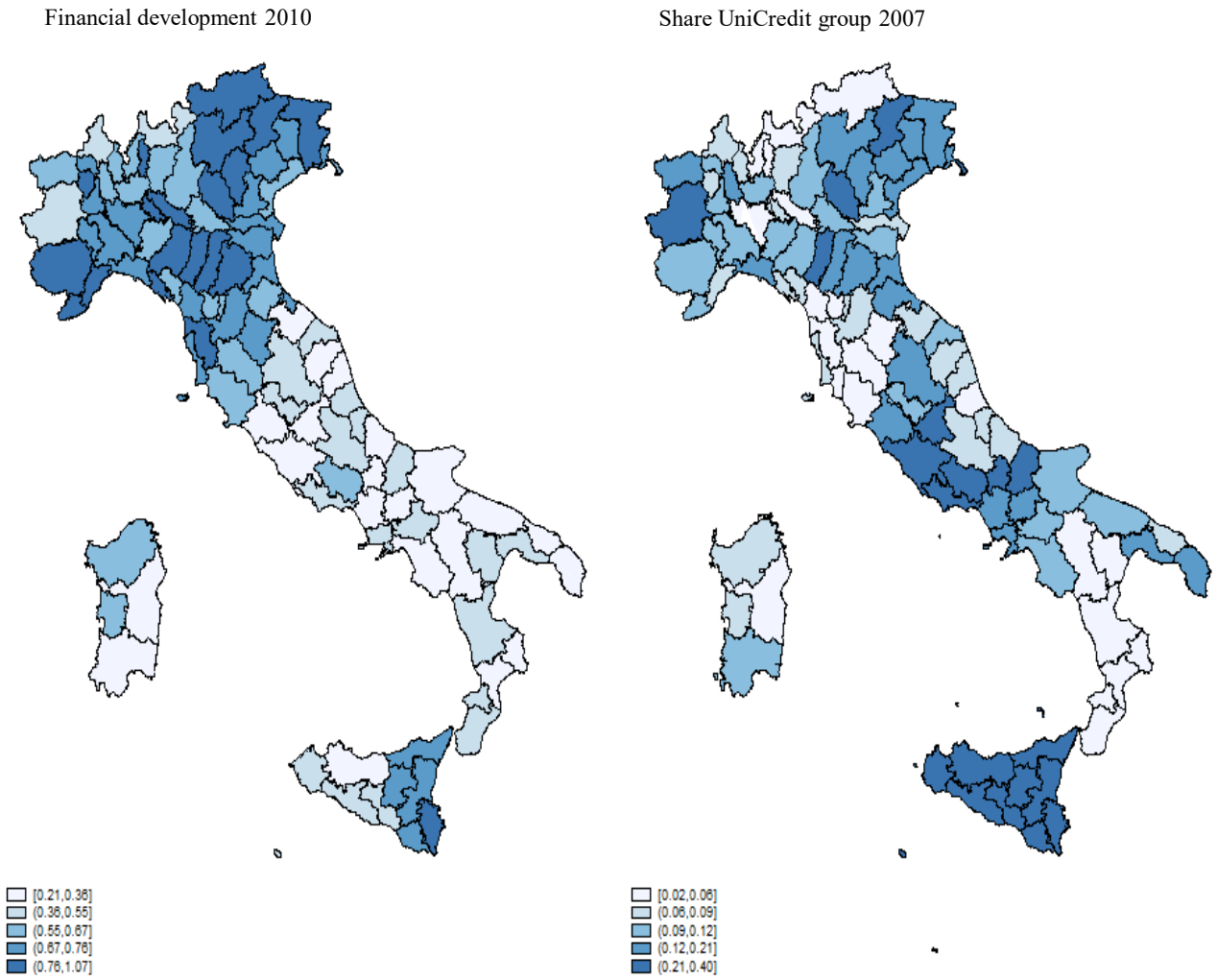

Figure 1. Financial development and Share UniCredit group

Note: This figure plots bank branches per 100,000 inhabitants in the provinces for 2010 (left) and the share of provincial branches of UniCredit and Capitalia for 2007 (right).

Table 1. Summary statistics and description

	Num.	Mean	Std. Dev.	Description
Main dependent variables				
Supply chain	4497	0.528	*0.499*	Dummy that takes the value of one if the firm is in a supply chain
Upstream supply chain	4497	0.162	*0.369*	Role in the supply chain: the firm purchases row materials and produces an intermediate good
Medium supply chain	4497	0.102	*0.303*	Role in the supply chain: the firm uses and produces semi-finished intermediate goods
End supply chain	4497	0.264	*0.441*	Role in the supply chain: the firm uses semi-finished intermediate goods and produces final goods
Credit conditions				
Credit rationing	7247	0.377	*0.485*	Dummy that takes the value of one if the firm is credit rationed, zero otherwise
Number of banks	7433	2.422	*2.094*	Number of banks from which the firm borrowed in the year of the survey
Relationship lenght	7433	13.529	*11.202*	Length of the relationship with the main bank (in years)
Control variables				
Age	7121	18.959	*17.818*	Number of years since inception
Number of Employees	7153	15.380	*42.401*	Total number of employees in the year of the survey
Corporation	7433	0.259	*0.438*	Dummy on whether the firm is a private limited company (LTD) or a public limited company (PLCs)
Partnership	7433	0.169	*0.374*	Dummy that takes the value of one if the firm is part of a partnership, zero otherwise
Branch density 2009	7294	0.627	*0.198*	Number of bank branches in the province in the year 2009, per 100,000 inhabitants
Very high or high working capital stress	7436	0.086	*0.280*	Dummy that takes the value of one if the firm considers working capital one of the two most important reasons of increasing financial needs, zero otherwise
North	7433	0.577	*0.463*	Dummy that takes the value of one if the firm is located in the North of Italy
Center	7433	0.186	*0.389*	Dummy that takes the value of one if the firm is located in the Center of Italy
South	7433	0.237	*0.237*	Dummy that takes the value of one if the firm is located in the South of Italy
Agriculture	7436	0.019	*0.135*	Sector of activity
Construction	7436	0.108	*0.300*	Sector of activity
Commerce	7436	0.284	*0.451*	Sector of activity
Tourism	7436	0.027	*0.161*	Sector of activity
Services	7436	0.301	*0.459*	Sector of activity
Manufacturing	7436	0.262	*0.440*	Sector of activity

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

Table 2. Supply chain participation and credit access

	probit	bivariate probit	probit	IV probit	probit	IV probit
	(1)	(2)	(3)	(4)	(5)	(6)
Rationing	0.047***	0.187**				
	(0.017)	(0.079)				
Number of banks			-0.004	0.135***		
			(0.005)	(0.048)		
Relationship length					-0.001	-0.239***
					(0.008)	(0.081)
Age	-0.001**	-0.001*	-0.001**	-0.002***	-0.001**	0.004**
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.002)
Size (employees)	-0.017**	-0.001	-0.013	-0.108***	-0.016*	-0.004
	(0.009)	(0.004)	(0.009)	(0.033)	(0.009)	(0.010)
Corporation	-0.019	-0.019	-0.023	-0.088***	-0.021	0.006
	(0.027)	(0.014)	(0.026)	(0.029)	(0.027)	(0.028)
Partnership	-0.061***	-0.019*	-0.062***	-0.043*	-0.065***	-0.007
	(0.023)	(0.012)	(0.023)	(0.023)	(0.024)	(0.034)
Banking development	-0.067	-0.039	-0.069	-0.248***	-0.063	0.021
	(0.112)	(0.040)	(0.068)	(0.078)	(0.067)	(0.087)
Center	-0.065**	-0.019*	-0.061**	-0.065**	-0.061**	-0.059**
	(0.029)	(0.010)	(0.029)	(0.029)	(0.029)	(0.025)
South	-0.066*	-0.005	-0.058*	-0.083**	-0.051	-0.044
	(0.034)	(0.015)	(0.034)	(0.034)	(0.034)	(0.037)
Industry & Area dummies	Y	Y	Y	Y	Y	Y
Instruments						
Share UniCredit Group		-0.504**		-1.367***		0.913***
		(0.199)		(0.378)		(0.189)
UniCredit − Capitalia		-0.474***		-0.743***		0.517***
		(0.150)		(0.243)		(0.151)
Observations	4,176	4,176	4,239	4,239	4,163	4,163

Note: This table reports the effects of firms' access to credit on their participation in supply chains. Access to credit is measured by a binary variable for credit rationing (columns 1-2), number of banks (columns 3-4), or length of the relationship with the main bank (columns 5-6). All the columns report the marginal effects and all the regressions include area and industry fixed effects. In columns 2, 4, and 6, the measure for access to credit is instrumented using the share of provincial bank branches of the merged banks (Share UniCredit Group) and the difference between the shares of provincial bank branches of the two banking groups involved in the merger (UniCredit − Capitalia). In column 2, the coefficients on the instruments are from the probit equation of credit rationing on the instruments, firm controls, and industry and region dummies. In columns 4 and 6, the coefficients on the instruments are from the first stage regression of the number of banks and relationship length, respectively, on the instruments, firm controls, and industry and area dummies. See Table 1 and Section 5 for details on the control variables. ***, **, * denote significance at the 1%, 5%, and 10% level, respectively.

Table 3. Supply chain participation and credit access. Robustness

	Additional controls						Additional instrument			Placebo tests					
	bivariate probit	IV probit	IV probit	bivariate probit	IV probit	IV probit	bivariate probit	IV probit	IV probit	bivariate probit	IV probit	IV probit	bivariate probit	IV probit	IV probit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Rationing	0.187**			0.161**			0.183**			0.726			-0.189		
	(0.075)			(0.074)			(0.075)			(1.426)			(0.989)		
Number of banks		0.137***			0.133***			0.136***			-0.169			-0.142	
		(0.045)			(0.031)			(0.049)			(0.190)			(0.251)	
Relationship length			-0.242***			-0.504***			-0.242***			-0.252			-0.173
			(0.074)			(0.064)			(0.082)			(0.306)			(0.395)
Share of two main banks	0.048	0.123	0.146	0.105	0.296*	0.373***									
	(0.056)	(0.104)	(0.101)	(0.089)	(0.151)	(0.123)									
Province GDP per capita	0.001	0.002	0.001	0.002	0.002	0.000*									
	(0.001)	(0.002)	(0.002)	(0.002)	(0.004)	(0.000)									
High competition	-0.000	0.040**	-0.005**	-0.002	0.039	-0.054**									
	(0.008)	(0.016)	(0.019)	(0.012)	(0.025)	(0.026)									
Capital intensity 2009				0.004	-0.002	0.004									
				(0.003)	(0.005)	(0.003)									
Current assets 2009				-0.018	-0.039	-0.053									
				(0.021)	(0.038)	(0.050)									
Firm controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry & Area dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Instruments															
Share UniCredit Group	-0.495**	-1.351	0.916***	-0.601	-1.780**	0.353*	-0.441**	-1.350***	0.878***						
	(0.197)	(1.154)	(0.190)	(0.461)	(0.718)	(0.187)	(0.206)	(0.394)	(0.186)						
UniCredit – Capitalia	-0.488***	-0.913**	0.512***	-0.543*	-0.706*	0.170	-0.481***	-0.743***	0.519***						
	(0.146)	(0.464)	(0.156)	(0.310)	(0.400)	(0.127)	(0.160)	(0.241)	(0.152)						
D Share first five banks							-0.594*	-0.118	0.292						
							(0.351)	(0.465)	(0.294)						
Share Intesa SanPaolo										0.102	-0.328	-0.334			
										(0.103)	(0.465)	(0.316)			
Share Monte dei Paschi													-0.243	-0.606	-0.492
													(0.251)	(1.030)	(0.449)
Observations	4,176	4,239	4,163	2,095	2,131	2,097	4,176	4,163	4,163	4,176	4,239	4,163	4,174	4,237	4,161

Note: This table reports robustness tests for the effects of firms' access to credit on their participation in supply chains. Columns 1-6 consider additional control variables; columns 7-9 employ an additional instrument "D Share first five banks" (the change between 2007 and 2008 in the share of provincial branches of the five largest banks in the province); columns 10-15 report results of placebo tests using the share of provincial bank branches of two banks not involved in the merger (Share Intesa SanPaolo and Share Monte dei Paschi). Access to credit is measured by a binary variable for credit rationing (columns 1, 4, 7, 10 and 13), number of banks (columns 2, 5, 8, 11, and 14), or length of the relationship with the main bank (columns 3, 6, 9, 12, and 15). All the columns report the marginal effects and all the regressions include firm-level controls, industry and area fixed effects. In columns 1-6 the measure for access to credit is instrumented using the share of provincial bank branches of the merged banks and the difference between the shares of provincial bank branches of the two banking groups involved in the merger. In column 1, 4, 7, 10 and 13, the coefficients on the instruments are from the probit equation of credit rationing on the instruments, firm controls, and industry and area dummies. In columns 2, 5, 8, 11 and 14, the coefficients on the instruments are from the first stage regression of the number of banks on the instruments, firm controls, and industry and area dummies. In columns 3, 6, 9, 12 and 15, the coefficients on the instruments are from the first stage regression of the relationship length on the instruments, firm controls, and industry and area dummies. See Table 1 and Section 5 for details on the control variables. ***, **, * denote significance at the 1%, 5%, and 10% level, respectively.

Table 4. Credit access, characteristics of trading partners and inter-firm linkages

	probit	bivariate probit	probit	bivariate probit	probit	bivariate probit	probit	bivariate probit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel (A) Large subcontractor				*Panel (B) Long subcontracting relationship*			
	Supplier		Acquirer		Supplier		Acquirer	
Rationing	0.012**	0.011**	0.006***	-0.017	0.023***	0.017***	0.023***	-0.046
	(0.005)	(0.006)	(0.002)	(0.045)	(0.005)	(1.207)	(0.005)	(0.044)
Firm controls	Y	Y	Y	Y	Y	Y	Y	Y
Industry & Area dummies	Y	Y	Y	Y	Y	Y	Y	Y
Instruments								
Share UniCredit Group		-0.371*		-0.390*		-0.396**		-0.329*
		(0.212)		(0.207)		(0.193)		(0.192)
UniCredit – Capitalia		-0.448***		-0.455***		-0.489***		-0.483***
		(0.172)		(0.149)		(0.127)		(0.163)
Observations	4,176	4,176	4,176	4,176	4,176	4,176	4,176	4,176
	Panel (C) Principal partner for innovation				*Panel (D) Autonomy in supply chain*			
	Supplier		Customer		No autonomy		Partial autonomy	
Rationing	0.030***	0.050***	0.020**	0.025	0.026**	0.019	0.028***	0.009
	(0.012)	(0.005)	(0.009)	(0.022)	(0.011)	(0.020)	(0.008)	(0.022)
Firm controls	Y	Y	Y	Y	Y	Y	Y	Y
Industry & Area dummies	Y	Y	Y	Y	Y	Y	Y	Y
Instruments								
Share UniCredit Group		-0.518***		-0.326		-0.372*		-0.369*
		(0.198)		(0.233)		(0.207)		(0.208)
UniCredit – Capitalia		-0.347**		-0.473***		-0.451***		-0.436***
		(0.157)		(0.175)		(0.163)		(0.158)
Observations	4,176	4,176	4,176	4,176	4,176	4,176	4,176	4,176

Note: This table reports tests for the effects of characteristics of trading partners and inter-firm linkages on the relationship between access to credit and participation in supply chains. In panel A, columns 1-2, the dependent variable equals 1 if the firm has a subcontracting relationship with a large supplier in the supply chain, and 0 otherwise; in columns 3-4, the dependent variable equals 1 if the firm has a subcontracting relationship with a large acquirer in the supply chain, and 0 otherwise. In panel B, columns 5-6, the dependent variable equals 1 if the firm has a long-term subcontracting relationship with a supplier in the supply chain, and 0 otherwise; in columns 7-8, the dependent variable equals 1 if the firm has a long-term subcontracting relationship with an acquirer in the supply chain, and 0 otherwise. In panel C, columns 1-2, the dependent variable equals 1 if the supplier is the firm's principal partner in innovative projects, and 0 otherwise; in columns 3-4, the dependent variable equals 1 if the customer is the firm's principal partner in innovative projects, and 0 otherwise. In panel D, columns 5-6, the dependent variable equals 1 if the firm has no autonomy from its trading partners in the supply chain, and 0 otherwise; in columns 7-8, the dependent variable equals 1 if the firm has partial autonomy from its trading partners in the supply chain, and 0 otherwise. All the columns report the marginal effects and all the regressions include firm-level controls, industry and area fixed effects. In columns 2, 4, 6 and 8, the measure for access to credit (credit rationing) is instrumented using the share of provincial bank branches of the merged banks and the difference between the shares of provincial bank branches of the two banking groups involved in the merger. The coefficients on the instruments are from the probit equation of credit rationing on the instruments, firm controls, and industry and area dummies. See Table 1 and Section 5 for details on the control variables. ***, **, * denote significance at the 1%, 5%, and 10% level, respectively.

Table 5. Characteristics of the main bank and participation in supply chains

	probit	bivariate probit	probit	IV probit	probit	IV probit
	(1)	(2)	(3)	(4)	(5)	(6)
Rationing	0.032***	0.076***				
	(0.012)	(0.022)				
Number of banks			-0.003	0.231*		
			(0.004)	(0.139)		
Relationship length					0.006	-0.422**
					(0.008)	(0.215)
Firm controls	Y	Y	Y	Y	Y	Y
Industry & Area dummies	Y	Y	Y	Y	Y	Y
Instruments						
Share UniCredit Group		-0.413*		-1.381***		0.914***
		(0.218)		(0.356)		(0.179)
UniCredit – Capitalia		-0.482***		-0.724***		0.515***
		(0.170)		(0.260)		(0.138)
Observations	4,176	4,176	4,239	4,239	4,163	4,163

Note: This table reports tests for the effects of banks' characteristics on the link between access to credit and participation in supply chains. The dependent variable is a dummy variable that equals one if the firm participates in a supply chain and its main bank does not consider inter-firm collaborations to be important, and zero otherwise. All the columns report the marginal effects, and all the regressions include firm-level controls and industry and area fixed effects. In columns 2, 4, and 6, the measure for access to credit is instrumented using the share of provincial bank branches of the merged banks and the difference between the shares of provincial bank branches of the two banking groups involved in the merger. In column 2, the coefficients on the instruments are from the probit equation of credit rationing on the instruments, firm controls, and industry and area dummies. In columns 4 and 6, the coefficients on the instruments are from the first stage regression of the number of banks and relationship length, respectively, on the instruments, firm controls, and industry and area dummies. See Table 1 and Section 5 for details on the control variables. ***, **, * denote significance at the 1%, 5%, and 10% level, respectively.

Table 6. Supply chain participation, credit access, and working capital stress

	Panel (A) Supply chain or not				*Panel (B) Upstream/Midstream or not*			
	Very high working capital stress		Very high or high working capital stress		Very high working capital stress		Very high or high working capital stress	
	probit	bivariate probit	probit	bivariate probit	probit	bivariate probit	probit	bivariate probit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Rationing	0.049***	0.188**	0.050***	0.188**	0.047***	0.055	0.047***	0.056
	(0.018)	(0.079)	(0.018)	(0.081)	(0.015)	(0.059)	(0.015)	(0.059)
Working capital stress	0.029	0.010	0.067	0.023	0.072	0.025	0.065*	0.022
	(0.053)	(0.019)	(0.044)	(0.018)	(0.050)	(0.018)	(0.037)	(0.014)
Rationing*working capital stress	-0.052	-0.016	-0.074	-0.022	-0.110**	-0.036*	-0.080**	-0.026*
	(0.076)	(0.023)	(0.053)	(0.018)	(0.047)	(0.020)	(0.036)	(0.014)
Firm controls	Y	Y	Y	Y	Y	Y	Y	Y
Industry & Area dummies	Y	Y	Y	Y	Y	Y	Y	Y
Instruments								
Share UniCredit Group		-0.503**		-0.503**		-0.416*		-0.415*
		(0.199)		(0.200)		(0.250)		(0.251)
UniCredit – Capitalia		-0.474***		-0.475***		-0.436***		-0.436***
		(0.150)		(0.150)		(0.150)		(0.150)
Observations	4,176	4,176	4,176	4,176	4,176	4,176	4,176	4,176

Note: This table examines the link between working capital stress and participation in supply chains. In columns 1-4 the dependent variable is a dummy that equals one if the firm participates in a supply chain, and zero otherwise. In columns 5-8 the dependent variable is a dummy that equals one if the firm is upstream or midstream in a supply chain, and zero if the firm is downstream or not part of a supply chain. "Working capita stress" in columns 1-2 and 5-6 is defined as a dummy that equals one if the firm has increased liquidity needs and views working capital as the most important factor; and in columns 3-4 and 7-8 it is defined as a dummy that equals one if the firm has increased liquidity needs and views working capital as the most or second most important factor. All the columns report the marginal effects, and all the regressions include firm controls, industry and area fixed effects. In columns 2,4, 6 and 8, the measure for access to credit (credit rationing) is instrumented using the share of provincial bank branches of the merged banks and the difference between the shares of provincial bank branches of the two banking groups involved in the merger. The coefficients on the instruments are from the probit equation of credit rationing on the instruments, firm controls, and industry and area dummies. See Table 1 and Section 5 for details on the control variables. ***, **, * denote significance at the 1%, 5%, and 10% level, respectively.

Table 7. Domestic and international supply chains and credit access

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Panel (A) Domestic supply chains						*Panel (B) International supply chains*					
	probit	bivariate probit	probit	IV probit	probit	IV probit	probit	bivariate probit	probit	IV probit	probit	IV probit
Rationing	0.033*	0.047					0.077***	0.087***				
	(0.019)	(0.079)					(0.017)	(0.011)				
Number of banks			-0.009*	0.114**					-0.001	0.117**		
			(0.005)	(0.050)					(0.004)	(0.052)		
Relationship length					-0.007	-0.174***					0.006	-0.320**
					(0.009)	(0.063)					(0.010)	(0.125)
Firm controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry & Area dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Instruments												
Share UniCredit Group		-0.319		-1.298***		1.125***		-0.550*		-1.808***		0.568***
		(0.265)		(0.373)		(0.214)		(0.324)		(0.570)		(0.181)
UniCredit – Capitalia		-0.398**		-0.952***		0.583***		-0.654***		-0.800**		0.399**
		(0.202)		(0.298)		-0.159		(0.242)		(0.385)		(0.202)
Observations	3,589	3,589	3,644	3,644	3,580	3,580	2,533	2,533	2,571	2,571	2,521	2,521

	Panel (C) Supply chains in Western Europe vs. Rest of the world				*Panel (D) Domestic vs. international subcontracting*			
	Western Europe		Rest of the world		Domestic		International	
	probit	bivariate probit	probit	bivariate probit	probit	bivariate probit	probit	bivariate probit
Rationing	0.018*	0.023***	0.006	0.008	0.012***	-0.003	0.030***	-0.012
	(0.009)	(0.005)	(0.007)	(0.006)	(0.004)	(0.017)	(0.006)	(0.028)
Firm controls	Y	Y	Y	Y	Y	Y	Y	Y
Industry & Area dummies	Y	Y	Y	Y	Y	Y	Y	Y
Instruments								
Share UniCredit Group		-0.535		-0.413		-0.450**		-0.463**
		(0.359)		(0.296)		(0.190)		(0.192)
UniCredit – Capitalia		-0.624***		-0.602***		-0.356**		-0.441***
		(0.241)		(0.225)		(0.155)		(0.142)
Observations	2,483	2,533	2,533	2,533	3,931	3,931	4,119	4,119

Note: This table reports the effects of firms' access to credit on their participation in domestic and international supply chains. In Panel A, columns 1-6, the dependent variable is a dummy that takes the value of 1 if the firm participates in supply chains and has only domestic customers or suppliers, and 0 otherwise. In Panel B, columns 7-12, the dependent variable is a dummy that takes the value of 1 if the firm participates in supply chains and has foreign customers or suppliers, and 0 otherwise. In panel C, columns 1-2, the dependent variable is a dummy that takes the value of 1 if the firm participates in supply chains and has customers or suppliers in Western Europe, and 0 otherwise; in columns 3-4, the dependent variable is a dummy that takes the value of 1 if the firm participates in supply chains and has customers or suppliers in the rest of the world, and 0 otherwise. In panel D, columns 7-8, the dependent variable is a dummy that takes the value of 1 if the firm has only domestic subcontractors, and 0 otherwise; in columns 9-10, the dependent variable is a dummy that takes the value of 1 if the firm has international subcontractors, and 0 otherwise. Access to credit is measured by a binary variable for credit rationing, or by the number of banks, or by the length of the relationship with the main bank. All the columns report the marginal effects, and all regressions include firm-level controls, industry and area fixed effects. In columns 2, 4, 6, 8, 10 and 12, the measure for access to credit is instrumented using the share of provincial bank branches of the merged banks and the difference between the shares of provincial bank branches of the two banking groups involved in the merger. In panel A column 2, panel B column 8, and panels C and D, the coefficients on the instruments are from the probit equation of credit rationing on the instruments, firm controls, and industry and area dummies. In panel A column 4 and panel B column 10, the coefficients on the instruments are from the first stage regression of the number of banks on the instruments, firm controls, and industry and area dummies. In panel A column 6 and panel B column 12, the coefficients on the instruments are from the first stage regression of the relationship length on the instruments, firm controls, and industry and area dummies. See Table 1 and Section 5 for details on the control variables. ***, **, * denote significance at the 1%, 5%, and 10% level, respectively.