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By *Ettore Croci, Marta Degl'Innocenti, and Si Zhou*

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This Version: 14 March 2019

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Keywords: *Access to syndicated loans, Supply chain relationships, Loan syndication structure, Loan pricing.*

JEL Classification: G21, G30, L1

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1. Introduction

Bank lending to borrowers with supply chain links has exploded in recent years. As shown in Figure 1, the volume of syndications for these borrowers has seen a sharp increase since the early 2000s, while the number of supply-chain link has remained relatively stable over time and the fraction of listed firms with supply chain links has even decreased over time (see Figure 2).

[Please insert Figures 1 and 2 about here]

The growing literature on syndicate loans offers contrasting arguments and evidence regarding the effect of supply chain participation. A large strand of the literature shows that customer-base concentration results in higher loan markups and lower relationship lending. These results suggest that supply chain relationships expose lenders to additional risks because the financial distress of one firm may affect the entire supply chain (Cohen and Frazzini, 2008; Hertzel, Li, Officer, and Rodgers, 2008; Dhaliwal, Judd, Serfling, and Shaikh, 2016; Campello and Gao, 2017). In contrast, Cen, Dasgupta, Elkamhi and Pungaliya (2016) find that long relationships with principal customers allows borrowers to obtain lower loan pricing and less restrictive covenants. The authors argue that a long relationship offer the loan market an implicit certification of the borrower quality, leading to lower loan pricing for firms with a supply chain participation. In addition, Hasan, Minnick and Raman (2017) show that supply chain allows banks to collect information on the borrower via existing lending relationships with other firms in the same supply chain.

This paper suggests and tests a new explanation to this apparent contradiction. We argue that supply chain participation has two effects on the pricing of a syndicated loan: the direct effect

captured by previous literature, and an indirect effect through the structure of the syndicated loan. Specifically, we investigate whether supply chain participation affects the syndicate loan structure and whether, through this channel, impacts the loan markups. If the supply chain offers a certification of their quality to the credit market, borrowers with supply chain participation can find it easier to access this market than other firms. However, this certification effect may not translate into lower loan markups if the borrowers obtain loans with certain characteristics. Indeed, the existence of a supply chain link may require the lead agent to exert more monitoring efforts to minimize the exposure to supply-chain specific risks. As a consequence, the lead agent must retain a higher fraction of the loan to induce the necessary monitoring. In this case, the lender might demand a higher yield. So, this increased yield can be not only a compensation for the additional risks undertaken by offering a loan to a risky borrower, but also for the lack of diversification at loan level that stems from retaining a larger share of the syndicate (Ivashina, 2009).

We gather information on the supply chain relationship from Compustat's Segment Database, while the data on bank loan comes from LPC–Dealscan. We link all this information with firm-level fundamentals retrieved from Compustat. Our data encompasses 11,632 loan facilities with 3,441 unique borrowers over the period 1984-2016.

We start by examining the effect of the supply chain relationship on the likelihood of receiving a syndicate loan. Then, we further explore whether supply chain is associated to specific loan characteristics that require more intensive due diligence and monitoring efforts. To this end, after having identified the main lead agent following Chakraborty, Goldstein and MacKinlay (2018), we split the syndicate loans in two categories: high concentrated loans where the lead agent retains a high loan share; and low or non-concentrated loans where the lead agent has a relatively low loan share. We find evidence that borrowers with a supply chain link are more likely to receive

a loan only in concentrated syndicates where the lead agent retains a high fraction of the loan. These first results support the view that supply chain might provide a certification effect to the borrower, but this benefit is limited only to concentrated loans. Furthermore, we analyse whether the syndicate structure differs for borrowers with a supply chain participation. Consistently with the results on access to loans, we find indeed that supply chain requires the lead agent to retain a larger share of the syndicate.

Next, we investigate the relationship between supply chain and loan interest rate spreads and covenants. As argued by previous empirical evidence, lenders may price the default contagion risk and associated costs of the participation in the supply chain by demanding high interest rate spreads and more restricted covenants (Cohen and Frazzini, 2008; Hertzel, Li, Officer, and Rodgers, 2008; Dhaliwal, Judd, Serfling, and Shaikh, 2016; Campello and Gao, 2017). However, as discussed above, there exist also an indirect channel through with supply chain affects loan pricing. The lead agent could demand high markups for either the diversification effects and/or for the supply chain participation, which involve additional risks. To disentangle these two effects, following Ivashina (2009), we run a two-stage least squares (2SLS) method to estimate whether higher markups are explained by the diversification effect, once controlled for the level of adverse selection or moral hazard within syndicate. Consistent with this *diversification view,* we find that the lead banks demand higher spreads over LIBOR and more covenants for retaining a higher share in the syndicate. Once controlled for this indirect effect, the supply chain is not directly associated to any risk premium. This indicates that supply chain does not demand a higher markup for supply chain *per se*.

Finally, we run a battery of additional tests and analysis. Firms could be willing to engage in supply chain relationships to get access to the credit market. To control for this issue and

mitigate endogeneity concerns, we run three additional tests. First, we exploit suppliers of services and differentiated products, which are hard to replace because they provide unique or highly customized inputs (Cunat 2007; Giannetti, Burkart and Ellingsen, 2011). Second, following Campello and Gao (2017), we create an instrumental variable based on the increase in downstream industries concentration following M&As, which could improve the chances for a firm to engage in a supply chain. Finally, we only consider borrowers with principal costumers that account for more than 15% of their total sales[2]. Overall, we find that the positive effect of a supply chain link on access to syndicated lending is confirmed by these tests.

Another key endogeneity-related challenge to the interpretation of our result could be related to omitted-variable concerns. To alleviate these issues, we propose a battery of tests. Specifically, we exclude from the sample firms with a high customer base concentration by employing alternative measures of costumer concentration proposed by Campello and Gao (2017) and cases in which suppliers and customers have a long-term relationship from the sample (Cen, Dasgupta, Elkamhi and Pungaliya, 2016). In addition, we control for the reputation of the firms engaged in the supply chain relationship, previous access to the credit market, relationship lending (Hasan, Minnick, and Raman, 2017). Omitted-variable concerns do not seem to affect our results.

We provide several contributions to the existing literature on supply chain. Firstly, our study adds new understanding regarding the benefits and costs of supply chain relationships in the credit market adding to the already existing studies that focus principally on customers (Kale and Sharhur, 2007; Banerjee, Dasgupta, Kim, 2008; Cen, Dasgupta, Elkhami, Pungaliya, 2016; Dhaliwal, Judd, Serfling, and Shaikh, 2016; Campello and Gao, 2017; Hasan, Minnick, and

[2] Information on customer–supplier relationships are based on the Compustat segment customer file. This information is publicly available as SFAS No. 14 (before 1997) and SFAS No. 131 (after 1997) require firms to disclose the existence and sales to principal customers representing more than 10% of total firm revenues. A firm could just meet the requirement to share more information with the market and gain form the reputation effect.

Raman, 2017). This line of research has examined the effect of supply chain in the syndicated loan market from the perspective of the lending relationship with the prospective borrower's supply chain partner (Bharath, Dahiya, Saunders, and Srinivasan, 2007; Hasan, Minnick and Raman, 2017), customer concentration (Campello and Gao, 2017), and the long-term supply-customer relationship (Cen, Dasgupta, Elkhami, Pungaliya, 2016). This paper, to the best of our knowledge, is the first to focus on the structure of the syndicated loans for borrowers with a supply chain participation. We find that supply chain requires the lead agent to retain a higher share in the syndicate.

Second, we provide evidence that the supply chain increases the likelihood to get access to the syndicated loan market and might offer a certification effect in concentrated syndicated loan markets. We further show that this certification persists regardless of the existence of a lending relationship with the prospective borrower's supply chain partner (Bharath, Dahiya, Saunders, and Srinivasan, 2007); and long-term supply-customer relationship (Cen, Dasgupta, Elkhami, Pungaliya, 2016).

Finally, our article contributes to the literature on the risk factors related to supplier-customer relationships (Banerjee, Dasgupta, and Kim, 2008; Campello and Gao, 2017; Cohen and Frazzini, 2008; Kale and Shahrur, 2007; Kolay, Lemmon, and Tashjian, 2016; Titman and Wessels, 1988). Specifically, our paper shows that the lead agent demands higher markups for its monitoring activities and costs, but not for supply chain *per se*.

This paper is organized as follows. Section 2 reviews the relevant literature and develops the hypotheses based on the existing literature. Section 3 presents the methodology and the sample construction. Section 4 discusses the main results related to access to syndicate loans, syndicate structure, loan pricing and number of restricted covenants. Section 5 presents additional tests, in

particular to address concerns related to the role of relationship lending; and endogeneity. Finally, Section 6 concludes.

2. Literature Review and Hypothesis development

Previous research on syndicated loans has acknowledged that borrowers' reputation can mitigate asymmetric information with the lender and affect the syndicate structure and lending conditions. In the economic literature, reputation created from past behaviour affects firms' future opportunities and allows them to derive economic benefits (Wilson, 1985; Weigelt and Camerer, 1988). In the context of lending, firms enhance their reputation as borrowers by making capital and interest payment on time, avoiding covenant violation, and, generally, through non-opportunistic behaviour (Diamond, 1989). This reputation mechanism can at least partly reduce the lender screening and monitoring activities and translates into better loan terms. Hasan, Minnick and Raman (2017) show that banks can use information on the borrower acquired from existing lending relationships when they have decided to extend loans to other firms in the same supply chain. The reason is that through repeated interactions with the borrower, a bank could get access to more information about that firm's supply chain partners, such as factors of production as well as industry conditions and trends compared to banks without an existing lending relationship (e.g., Petersen and Rajan, 1994; Bharath, Dahiya, Saunders, and Srinivasan, 2007). Thus, a supply chain relationship *per se* might offer further certification of a firm's quality to the credit market independently of the fact that a firm has a credit history with the banking system (*certification hypothesis*).

Consistent with this view, Cen, Dasgupta, Elkamhi, and Pungaliya (2016) show that a continuing long-term relationship with a principal customer offers a certification about the

supplier's quality, which in turns leads to lower loan pricing. They pointed out that a supply chain link enhances the reputation of the borrowers because of the relationship between the two non-financial parties, which often entails firm-specific investments. Lenders can thus observe these relationships and learn more about the borrower's characteristics than about borrowers without any supply chain relationship. This certification effect provides a valuable ex-ante screening process for a potential lender.

Nonetheless, having a close and long association with fewer, larger customers could also expose firms to costs and risks (Campello and Gao, 2017; Hasan, Minnick and Raman, 2017). For example, a close relationship over time between a supplier and costumer could impose the suppliers to invest in relationship-specific assets that have little or no value outside of this relationship (Allen and Phillips, 2000; Banerjee, Dasgupta, and Kim, 2008; Kale and Shahrur, 2007). Moreover, large customers tend to exert a higher bargaining power with respect to prices and the timing of payments (Fee and Thomas, 2004). In addition, firms are exposed to aggregate sales fluctuations, liquidity problems, and increased cash flow risks via supply chain (Cohen and Frazzini, 2008; Di Giovanni, Levchenko, Mejean, 2014; Kolay, Lemmon, and Tashjian, 2016). All these factors can enhance a firms' default risk and their financial costs (Campello and Gao, 2017; Dhaliwal, Judd, Serfling, and Shaikh, 2016). As a consequence, banks could demand a higher premium for providing a loan to a borrower with a supply chain link in this way setting higher pricing costs (*risk hypothesis*).

These increased risks associated to supply chain participation may also have an indirect effect through the loan share held by the lead arranger. In fact, a supply chain relationship could also require banks to exert more monitoring to properly assess the risks involved. Under these circumstances, the lead agent will have to increase its share in the loan and form more concentrated

syndicates. Therefore, even though having a supply chain offers a certification of firm quality and possibly non-opportunistic behaviour from past actions, supply chain could require the lead agent to implement more monitoring activities and retain a high participation share. Although the increase of the loan fraction held by the lead agent reduces adverse selection concerns in the syndicate, it also results in additional costs for the lead agent. Because of this, the lead bank might demand higher pricing for holding a higher credit risk due to larger participation shares (Ivashina, 2009). If supply chain participation requires more monitoring, we might also observe that borrowers with a supply chain participation are associated with more concentrated loans where the lead agent retains a higher fraction of the syndicate. In this case, high cost of pricing could be required by the lead agent as a compensation for the lack of diversification rather than for supply chain participation *per se* (*Diversification hypothesis*).

3. Methodology and Sample Construction

3.1 Empirical methodology

The first step in our empirical analysis is to determine whether the supply chain effect translates into an easier access the syndicate loan market. We investigate the influence of supply chain links by estimating the probability for borrowers with and without supply chain links in securing syndicate loans. However, the association between supply chain and the probability of receiving a syndicate loan could be due to endogenous selection of firms based on their fundamental characteristics. To address such selection concerns, we match each actual borrower to a control sample of non-borrowers (henceforth pseudo borrowers) using a propensity score matching approach. Specifically, we use a probit model to estimate the probability of receiving loan against firm-level variables such as the logarithm of total assets, ROA, and leverage in the year prior to

receive the loan. We find up to five pseudo borrowers from the same industry for each actual borrower using the closest propensity scores from the probit estimation. Then, we use the sample composed of actual and pseudo borrowers to estimate the following conditional logit model:[3]

$$\text{Loan} = \beta_1 \text{Variable of interests} + \beta_2 \text{Borrower characteristics} + \text{Borrower} \times \text{Facility year} + \varepsilon \quad (1)$$

where the dependent variable *Loan* takes value one if the borrower has received at least one syndicated loan at a given year, and 0 otherwise. The main variables of interests are: 1) *Supply chain*, it is equal to 1 if the borrower has at least one supplier or customer in the last five years prior to receiving the loan, and 0 otherwise.[4] We control for borrower fundamentals including the logarithm of total asset, return on asset (ROA), cash holding, leverage, Tobin's Q and CAPEX. We also include the logarithm of the total number of loans received by the borrower.

Next, we employ a panel regression model to examine whether the supply chain requires the lead agent to retain a larger share of the syndicate. To identify the main lead agent of a loan with multiple lenders, we closely follow the procedure suggested by Chakraborty, Goldstein and MacKinlay (2018). Lead agent is identified by the highest ranked agent for each facility following the ranking hierarchy suggested by Chakraborty, Goldstein and MacKinlay (2018).

$$\text{Lead share} = \beta_1 \text{Supply chain} + \beta_2 \text{Borrower characteristics} + \beta_3 \text{Synd characteristics} + \text{Bank} + \text{Industry} + \text{Facility year} + \varepsilon \quad (2)$$

where *Lead share* indicates the percentage retained by the lead agent. We control for borrower-level fundamentals as in Eq (1). In addition, we also include facility-level characteristics, i.e. log facility amount, Log facility duration and Log number of banks. Furthermore, consistently with

[3] McFadden (1974) offers an introduction to the conditional logit regression. For recent applications in finance, see for example Kuhnen (2009), Dyck, Morse, and Zingales (2010), Bena and Li (2014).

[4] Consistent with previous studies on lending (Bharath, Dahiya, Saunders, and Srinivasan, 2011), we consider a period of five years to define the supply chain dummy. In unreported tests, we also consider alternative horizon of 1 year and 3 year prior to the loan, the results are consistent.

Ivashina (2009), we consider syndicate-specific reputation variables, which refer to previous connections between syndicate members (the definition of these variables is reported in Table A1 of the Appendix). We also incorporate industry, facility start year and bank fixed effects in the estimation.

The next step of the analysis consists of estimating the impact of the supply chain relationship on pricing, and the number of covenants. The loan pricing consists of the spread over the LIBOR that is calculated following Berg, Saunders and Steffen (2016). As alternatives, we also consider the All-in spread drawn which measures which is the sum of the spread over the LIBOR and annual fees; and the number of restricted covenants. The test specification is the following:

$$\begin{aligned}\text{Pricing} = \beta_1 \text{Supply chain} + \beta_2 \text{Borrower characteristics} + \beta_3 \text{Synd characteristics} \\ + \text{Bank} + \text{Industry} + \text{Facility Year} + \varepsilon\end{aligned} \tag{3}$$

The diversification effect suggests that a larger lead bank's share increases the spread that it demands to compensate for credit-risk exposure. To identify the premium demanded by the lead agent for the lack of diversification, we follow Ivashina (2009)'s procedure that consists of introducing instruments that would affect the degree of adverse selection/moral hazard without affecting the lead agent's degree of diversification. Specifically, we use as instruments syndicate-specific reputation variables, which refer to previous connections between syndicate members. We include the lead agent's share, and we control for borrower-level fundamentals and facility-level characteristics as in Eq (2). Finally, we incorporate industry, facility start year and bank fixed effects in the estimation. The system is estimated using two stage least square (2SLS).

3.2 Sample and Data

We identify a supply chain relationship by using Compustat's Segment Customer database as common in the literature (Cen, Dasgupta, Elkamhi and Pungaliya, 2016; Campello and Gao, 2017). [5] According to Regulation S-K and the Statement of Financial Accounting Standard (SFAS) No. 14, firms are required to disclose all customers that represent 10% or more of a firm's total sales.

We extract bank loan contract information from LPC–Dealscan and link loan-level data to Compustat firm data following Chava and Jarrow (2004) and then using the Dealscan-Compustat Link extended by Michael Roberts.[6] We consider each loan facility as an independent contract. Our dataset encompasses data on loan facilities from the DealScan database and publicly listed borrowers from Compustat between 1984 and 2016. To be included in our sample, we require the availability of all financial variables from Compustat employed in the study.

Firm-level fundamentals are collected from Compustat. Market information, including equity volatility, market volatility, and risk-free rate, are retrieved from CRSP, and linked using the CRSP/Compustat Merged database. Table A1 of Appendix offers the definitions of each variable. Loan-related and bank-related information are retrieved from DealScan. Overall, our sample consists of 11,632 facilities with 3,441 unique borrowers. Table 1 presents summary statistics about the sample of syndicated loans used in the analysis, as well as borrower characteristics.

[Insert Table 1 about here]

[5] We consider a firm to have a supply chain link also when the name or GVKEY of the costumer is not reported but the firm is reported in the list of the suppliers.
[6] Links are accessed through the following link: http://finance.wharton.upenn.edu/~mrrobert/styled-9/styled-12/index.html

4. Empirical Analysis

In this section, we first analyse whether supply chain participation increases the likelihood of receiving a syndicate loan. Next, we focus on whether firms with supply chain links benefit from easier access to loans in a concentrated syndicate where the lead bank retains a high fraction of the loan. Then, we further examine whether the syndicate structure differs for borrowers with a supply chain participation. Next, we test whether supply chain leads to higher markups and stricter covenants. To test the diversification effect, we employ a second-stage regression, where the dependent variables correspond to the lead bank's loan share and the lead bank's required spread.

4.1 Supply chain relationships and access to the syndicated loan market

In this subsection we examine whether the supply chain relationship improves the standing of the participating firms in the eyes of the lending banks, leading to an easier access to the loan market. As discussed in the introduction, the lead agent could be reluctant to grant a loan to borrowers associated with more monitoring activities and costs. However, if the supply chain embeds a certification effect, we might observe an opposite effect.

To run this test, we first create the sample of control firms as described in the Methodology section. Actual and pseudo borrowers are used to estimate the conditional logit model in Eq. 1 to determine the impact of the supply chain relationship on the decision to offer a syndicated loan to the firm. Table 2 shows the results. Specifically, Column 1 of Table 2 does not consider control variables, while Column 2 of Table 2 show that the supply chain participation positively and significantly increases the likelihood of receiving a loan. The base regression in Column 2 suggests that the existence of a supply chain link is associated with an increase in the probability of receiving a loan. It also shows that the likelihood of receiving a loan is higher (1) when borrowers

are smaller, less profitable, have lower book leverage and cash but a higher value, Tobin Q, and CAPX, (2), and stronger relationship lending with the leader bank. Overall, these results are consistent with findings in the previous literature.

In Column 3 of Table 2, we include a measure of riskiness for the borrower that is the Distance to Default (Bharath and Shumway, 2008; Merton 1974). The coefficient of supply chain is still significant at 1% although is decreased from 0.154 to 0.065. This finding suggests that that supply chain effect persists also when we control for loans' quality.

[Insert Table 2 about here]

The results of Table 2 suggest that supply chain might produce a certification effect that allows the borrower to easily enter the loan market**,** in this way supporting the *Certification hypothesis*.[7] If supply chain relationship embeds a quality certification effect, banks could exert lower screening and monitoring activities on borrowers with a supply chain relationship. However, it may also be the case that the easier access is limited to loans with certain characteristics, which could require more intensive monitoring efforts. To this end, the next section considers the concentration of the syndicate measured in terms of loan share held by the lead agent.

4.2 Supply Chain and Syndicated Loan Structure

In this subsection, we examine whether the access to the syndicate loan market or borrowers with a supply chain participation compared to the other borrowers depends on the structure of syndicates. A supply chain relationship signals a dimension of firm quality hinges on the expectation that lead banks are required to exert less intense monitoring activities when they lend

[7] As a further analysis, we also consider private firms. The results are consistent with those reported in Table 2.

to a borrower with a supply chain link. According to Sufi (2007), if the borrower requires less intense monitoring and diligence duties, the lead bank retains a smaller share of the loan and forms a less concentrated syndicate. However, the lead bank might keep a higher share in the case of borrowers with a supply chain participation to overcome moral hazard problems. The bank could, therefore, have the incentive to adequately monitor the risks associated with the supply chain.

Table 4 shows the results of the main model only in the case of high concentrated loans where the lead agent retains a high loan share. More specifically, we consider a loan as concentrated if the lead agent's loan share is larger (or less) than the cross-sectional mean of lead agent' loan share. Columns 1 Table 3 show that the supply chain increases the propensity of receiving a concentrated loan. Column 2 of Table 3 considers as an alternative definition of loan concentration whether the lead agent's loan share is larger than 50%. The results of Column 2 are consistent with those reported in Columns 1. These findings suggest that borrowers with a supply chain loan are more likely to receive a loan if the lead agent retains a high loan share.

[Insert Table 3 about here]

4.3. Pricing and conditions of bank loans

After having analyzed how supply chain relationship affects the access to the syndicated loan market, we turn our attention to the financial and non-financial conditions of the loans. In the previous analysis, we have shown that borrowers with supply chain participation are more likely to receive a syndicated loan only in concentrated markets. Therefore, higher markups might be explained by a specific structure of the syndicate rather than by the supply chain *per se*. We follow Ivashina (2009) and instrument the lead share to examine whether the supply chain impacts the

conditions of the loan directly or only via its effects on the syndicate structured.

4.3.1 Pricing of bank loans

In this section, we estimate the impact of the supply chain relationship on loan pricing using the model in Equation 3. To account for the impact of syndicate structure on the loan pricing, we run a two-stage least squares (2SLS) model to estimate the effect of diversification effect on lead agent's required spread. To identify the main lead agent of a loan with multiple lenders, we closely follow the procedure suggested by Chakraborty, Goldstein and MacKinlay (2018).

The loan pricing consists of the spread over the LIBOR, calculated following Berg, Saunders and Steffen (2016), and All-In Spread Drawn. In each regression, we control for the borrower's characteristics, relationship lending, loan-level characteristics, bank fixed-effects, year fixed-effects, borrowers' industry-fixed effects. The control variable includes the logarithm of borrowing firms' total asset, ROA, cash holding, leverage, Tobin's Q, CAPEX, while the syndicate characteristics include: Log facility amount, Log facility duration and Log number of banks.

Column 1 of Table 4 reports results of the OLS model where the two main variables of interests are the lead bank's loan share and supply chain, Columns 2 and 3 show the second-stage regression, where the dependent variable of Column 2 corresponds to the lead bank's loan share, while the dependent variable of Column 3 is the lead bank's required spread.

Following Ivashina (2009), we use two measures of syndicate-specific reputation as instrumental variables, which are thus not part of the second-stage regression. Columns 4 to Columns 6 of Table 4 report the results for the OLS and 2SLS models when the dependent variable is the logarithm of All-In Spread Drawn, while the focus is on the covenant index calculated following Bradley and Roberts (2015) in Columns (7) and (9). First, Table 4 shows that the

variables relative to the lead bank's reputation are both significantly and negatively related to the lead bank's loan share. A higher degree of lead bank's reputation within the syndicate will reduce information asymmetry concerns. Therefore, the lead agent is required to hold lower loan share by the other participants. Furthermore, Columns 2, 5 and 8 of Table 4 show that the lead agent retains a higher participation when a borrower has a supply chain relationship. In all the regressions, the estimated coefficients of supply chain are significant at 5%. This indicates that the main lead agent retains a higher loan share for borrowers with a supply chain participation. Therefore, supply chain requires the lead agent to exert more monitoring activities or effort to signal the quality of the borrowers to the other participants in the syndicate.

[Insert Table 4 about here]

Furthermore, consistently with Ivashina (2009), we find that the share retained by the lead bank exerts a positive and significant effect on the spread over the LIBOR in Column (3). This result provides support to the diversification effect. In contrast, we notice that supply chain is not significant in the second-stage regression where the dependent variable is the spread over the LIBOR. This means that supply chain does not yield to higher spread over LIBOR once we account for the endogenous relationship between loan pricing and loan structure, which is also affected by supply chain. This means that we do not find support for the risk hypothesis. This estimate differs significantly from the OLS analysis, in which, similarly to Gao and Campello (2017), the supply chain dummy appears to be significant. Overall, our results suggest that banks require higher spread over LIBOR because the borrowers with supply chain participation get access to more concentrated syndicate loans where the lead agent retains a higher share. To recover the monitoring

costs, the lead agent applies a higher markup that it is however not associated to supply chain *per se*. We further extend this analysis by considering All-In Spread Drawn[8] instead of the spread over LIBOR. Again, we find evidence that the lead agent's loan share drives the loan pricing, while supply chain does not produce any significant effect on loan pricing.

Next, we also consider whether the supply chain relationship affects the number of restrictive covenants imposed by the lender in the loan contract. Consistently with the diversification effect, we should observe that the lead agent might demand a higher number of restrictive covenants for holding a higher share, while the coefficient of supply chain should be not significant. The Dealscan database includes detailed covenant information. Following Bradley and Roberts (2015), we build a covenant index that considers equity sweeps, debt sweeps, asset sweeps, dividend restrictions, and secured debt. All five different covenants are coded as 1, and 0 otherwise, and then summed-up. Therefore, the index ranges from 0 to 5. For this analysis, we use the Eq. 3 but with the covenant index as dependent variable. Again, we present both OLS and 2SLS results. Column 7 of Table 4 shows that borrowers with a supply chain relationship are not exposed to a higher number of restrictive covenants featured in bank loans compared to similar borrowers without any supply chain relationship. In Columns 8 and 9 we rerun the first and second-stage regression. Again, consistently with the *diversification hypothesis*, we find that the share retained by the lead bank exerts a positive and significant effect on the number of required restricted loans. Instead, supply chain is not significant.

[8] All-in-spread-drawn is the sum of the annual spread paid over LIBOR for each dollar drawn down from the loan and annual fee.

5. Additional Analyses

This section presents the additional analyses we carried out to rule out alternative stories as well as to assess the robustness of our results. We begin by analysing whether an existing relationship between the lender and the supply chain firms drives our results. Then, we will address endogeneity concerns related to the relationship between the access to the loan market and supply chain. We will conclude the section presenting some additional tests.

5.1 Relationship Lending

This subsection examines whether the results of Table 2 are associated to an existing relationship between the supply chain firms and the lenders in the syndicated loan markets. To put it differently, the easier access to the loan market can be due to the knowledge of the borrowing firm via previous loans to the supply chain rather than a certification effect due to the supply chain. In fact, in line with Hasan, Minnick and Raman's (2017) arguments, the borrower could be already known to the potential leader and participants of the syndicate loans via the supply chain. Thus, it could be that a lender is more inclined to provide a loan to a borrower when the firms in its supply chain have also received a loan.

To establish the supply chain effect in Table 5, we use alternative definitions. We first start with the binary variable *Supply chain loan*, which takes the value of 1 if the actual (pseudo) borrower has a supply chain firm(s) that has already received a syndicate loan in the past five years, otherwise it is equal to 0. The second variable is *Supply chain no-loan*, which takes the value of 1 if the actual (pseudo) borrower does not have any supply chain firm(s) that has received a loan in the past five years. Instead, it is equal to 0 if the actual (pseudo) borrower has at least one firm in the supply chain that has received a loan over the last five years. While these variables look at

the overall syndicated loan market, we also capture the direct relationship between the lead agent and the borrowers with the dummies *Supply chain bank* and *Supply chain no bank*. *Supply chain bank* takes the value of 1 if the actual (pseudo) borrower has a supply in firm(s) that has received a syndicate loan from the same lender(s) in the past five years. It is equal to 0 if the actual (pseudo) borrower does not have any supply chain firm(s) that has received a syndicate loan from the same lender(s) over the last five years. It is also equal to 0 if the actual (pseudo) borrower does not have any supply chain firm(s) that has received a loan more in general. *Supply chain no bank* takes the value of 1 if the actual (pseudo) borrower does not have any supply chain firm(s) that has received a loan from the same lender. Otherwise *Supply chain no bank* is equal to 0. All the dummies are also equal to 0 if the borrower does not have a supply chain link at all. Table 5 presents the results for these dummies.

[Insert Table 5 about here]

Column 1 of Table 5 shows that both the dummies Supply chain loan and Supply chain no-loan have positive and statistically significant coefficients at the 1% level that are respectively equal to 0.183 and 0.100. In Column 2, both the dummies Supply chain no bank and Supply chain bank are positively and significantly at the 1% level related to the likelihood of receiving a loan with a coefficient of respectively 0.274 and 0.129. We also perform the comparison on the coefficients between *Supply chain loan* and *Supply chain no loan*, and between *Supply chain bank* and *Supply chain no bank.* For example, in model (1), the coefficient of *Supply chain loan* is significantly higher than the one of *Supply chain no loan* at 1% of significance level (Chi square statistics equal to 7.66 with P-value to be 0.01). In model (2), the coefficient of *Supply chain bank* is also significantly higher than that of *Supply chain no bank* (Chi square statistics equal to 8.18

with P-value to be 0.00). Overall, these results suggest that the effect of supply chain increases more when there is relationship lending between the lender and the borrower via the supply chain. While these results are in line with Hasan, Minnick and Raman (2017), however, as an important distinguishing feature, we find that such an effect appears to only partially explain the impact of supply chain on the likelihood of receiving a loan. Under all specifications of the supply chain dummy, we find that supply chain *per se* is associated with an increase of likelihood of receiving a loan. Therefore, supply chain produces a reputational effect that does not fully reflect the existing lending relationship between the bank and the borrower's supply chain partner.

5.2. Supply chain and participation to the syndicated loan market: Endogeneity concerns

This subsection addresses a few concerns associated with the potentially endogenous nature of the relationship between the access to the loan market and supply chain. The first concern it examines is related to reverse causality: an easier access to credit may push firms to form supply chains. For example, a firm could be willing to create a supply chain relationship to get access to the credit market and more favourable conditions from the lender. To control for this issue and mitigate endogeneity concerns, we run a battery of tests.

We start only considering the supply chain cases in which the suppliers provide services and differentiated products that are unique or highly customized inputs, and where the customers need differentiated and service inputs (Rauch, 1999; Cunat 2007; Giannetti, Burkart and Ellingsen, 2011). Both these suppliers and customers are more difficult to be replaced. Since these relationships are characterized by high switching costs, it is unlikely that firms create ad hoc supply chain links to get access to the lending market. Column 1 of Panel A from Table 6 shows the results for this test, which are consistent with our initial findings.

Second, we employ an instrumental variable approach. Following Campello and Gao (2017), we use M&A activities in downstream industries to create the instrument. We argue that M&A activities would allow firms to enter in a new supply chain link, but it would not necessarily affect the probability to obtain a loan. We retrieve information on M&A deals from SDC database. Then, we apply the filters to the data selection suggested by Ahern and Harford (2014).[9]

We calculate our instrumental variable for the test as follows. First, we adapt the instrument proposed by Campello and Gao (2017) to our context. Specifically, instead of focusing on the M&A transactions in the costumer's industry, we examine the M&As activities in the partner industry of a borrower. The partner of a borrower can be either a supplier or a costumer depending on the role of the borrower in the supply chain (if the borrower is a supplier the partner will be a costumer and vice versa).

$$\text{SC\_M\&A}_i = \sum_{j=1}^{n_i} \%\text{Sales}_{i,j} \times \text{Industry\_average} \times \frac{\text{Acquisition}_j}{\text{Sales}_j} \tag{4}$$

where *Acquisition* is the transaction values of M&As scaled by the acquirers' total sales, *Sales*, as a proxy for acquisition activity*; Industry_average* is the average acquisition of firms in the industry over the past five years; *%Sales* measures the supplier's percentage sales to each customer. Each of the firms in our sample supplies products to a portfolio of customers, and those customers may be in different industries. In other words, *SC_M&A is* the weighted sum of the five-year acquisition activity across the industries to which the borrower's supply chain partners belong, weighted by the supplier's percentage sales to each customer. Results are shown in Column 2 of Panel A from

[9] Specifically, we consider: 1) only completed deals where both the acquirer and target are U.S. firms; 2) the acquirer can be matched with a Compustat identifier; 3) the acquirer purchases at least 20% of the target during the transaction, and owns at least 51% after the transaction; 3) the acquirer does not buy its suppliers and vice versa; 4) suppliers and customers do not belong to the same two-digit SIC industry.

Table 6. Overall, we find that the positive effect of supply chain link on access to syndicated lending is confirmed by this IV approach.

[Insert Table 6 about here]

As the last test, we strengthen the definition of supply chain. SFAS No. 14 (before 1997) and SFAS No. 131 (after 1997) require firms to disclose large customers representing more than 10% of the total firm revenue. If benefits from this disclosure are expected in the form of an easier access to the credit market, then firms may deliberately create these supply chain links. We expect that this reverse causality issue to be more serious around the 10% threshold, where it is easier for firms to strategically create supply chains. To overcome this problem, we only consider borrowers with principal costumers that account for more than 15% of their total sales. In Column 3 of Panel A, the supply chain dummy takes a value equal to 1 only if the sales percentage from supplier *i* to customer *j* over *i* 's total sales is at least equal to 15%. Results are remarkably similar to those shown in Columns 2 of Table 2, providing support to the view that firms do not strategically create supply chain relationships because of the access to the syndicated loan market.

After addressing reverse causality, we direct our attention to the omitted variables problem in Panel B of Table 6. Firms with large customers are vulnerable to costs and risks (for example delay of payment, relationship-specific investment, and default contagious risk) that can prevent them from getting access to the credit market (Campello and Gao, 2017; Murfin and Njoroge, 2014). We take this eventuality into account by excluding from the sample firms with a high customer base concentration. Specifically, following Campello and Gao (2017), we calculate alternative measures of costumer concentration, namely Costumer Concentration and Costumer Sales.[10] For each borrower we calculated its aggregated sales from all customers/suppliers against

[10] They are respectively the sum of the percentage sales coming from the set of customers the firm reports as "major customers", and Herfindahl index of sales to large customers.

the borrowers' total sales. Then we rank this scale by year in quintiles and drop those borrowers ranked in the top quintile (with the highest scale). Column 1 of Panel B of Table 6 focuses on the costumer sales, while Column 2 of Panel B focuses on the Herfindahl index of sales to large customers. The Supply chain dummy has an estimated coefficient respectively of 0.151 and 0.149 in Columns 1 and 2 (statistically significant at the 1% level).

Another issue could be related by the fact that supply chain exerts a quality-signalling effect only in the long-term. So, we further analyse if the length of the relationship is an important determinant of our results. To this end, consistent with Cen, Dasgupta, Elkamhi and Pungaliya (2016), we consider only the supply chain relationships that last less than three years and the results hold as shown in Column 3 of Panel B. We still find that *Supply chain* is positively and significantly related to the probability of receiving a loan.

Another concern could be related to the fact that borrowers are more likely to access the loan market simply because the firms in its supply chain exert a reputation-signalling effect. To control for this issue, we consider a firm exerting a reputation-signalling effect if it belongs to S&P 500 index in Column 4 of Panel B. We therefore add into the model a variable, *S&P inclusion,* which accounts for the percentage of firms in the supply chain that are listed in the S&P500 index. *S&P inclusion* takes a value only when supply chain dummy is equal to one. This can cause a perfect multicollinearity problem when interacting *S&P inclusion* with supply chain dummy. Therefore, we modify the definition of the supply chain dummy to take the value of 1 if the borrower has a supply chain firm that account for more than 20% of its total sales in the last five years, and 0 otherwise. Column 4 of Panel B shows that supply chain dummy remains significantly and

positively related to the probability of receiving a loan. Instead, the coefficient of *S&P inclusion*Supply Chain* is not significant.[11]

An additional endogeneity related issue is that banks could value the supply chain link simply because all the firms in the supply chain repeatedly access the credit market, and therefore are already known to potential leader and participants to the syndicate loans. While we already account for this issue in Table 5, we provide an additional test where we remove the cases where the customer and the supplier share the same (lead) bank in loan syndication. In other words, this model does not consider the loan deals in which the leading lender provides a loan to the actual (pseudo) borrowers when firms in the supply chain have also received a loan. Specifically, Columns 5 of Panel B focuses solely on the supply chain links where the supply chain's partners have not received a loan in the credit market (independently by the lender), while Columns 6 focuses on the supply chain links where the borrower and supply chain's partners share the same lender. Again, we still find that having a supply chain link significantly increases the probability of receiving a loan.

5.3. Further tests and analyses

This subsection further examines whether the results of Table 2 could be affected by the estimation method and matching procedure we have employed. Therefore, in Table 7 Panel A, we have run our analysis by using the linear probability model (LPM) (Columns 1 and 2) and the

[11] As a further analysis, we explicitly investigate the effect of borrower reputation on the likelihood to access the loan market. For this additional test, we follow Leary and Roberts (2014) and we create a dummy, *Industry leader*, which is equal to 1 if the borrower is ranked at the top third position among its peer firms from the same industry according to each of three ranking criteria: profitability, market share and stock return. In this unreported test, we find that *Supply chain* is positively and significantly related to the probability of receiving a loan, while *Industry leader is* almost never significant.

entire universe of Compustat without the matching procedure (Columns 3 and 4). The results are consistent with those reported in Table 2.

[Insert Table 7 about here]

A further concern could be related to the fact that firms with a supply chain participation rely more heavily on the syndicate market than other firms because they do not get easily access to other markets. Therefore, we question whether the access to debt markets or equity market is precluded to firms with a supply chain relationship compared to other borrowers. To conduct this further test, we collect data on additional types of non-bank debts and preferred stocks from Thomson Reuters. We identify the following categories of non-bank debt consistently with the Master_Deal_Type code in Thomson Reuters: bonds, program debts, mortgage debts. Specifically, the dependent variable for this analysis consists of the proceeds of each category of debt and preferred stocks for companies located in the US over the period 1985-2016. Equity refers to net stock issues calculated following Hirshleifer, Hsu and Li (2013)'s procedure. The data for net equity issues is retrieved from Compustat and CRSP. To compute this additional analysis, we use the same model specification (control variables and fixed effects) of Eq. 1. Panel B of Table 7 shows the results. Specifically, with the exception of mortgage (for which we found a negative coefficient, but almost equal to zero), our results suggest that borrowers with supply chain relationships are more likely to get non-bank debts and preferred stocks than borrowers without a supply chain relationship. Instead, borrowers with a supply chain relationship are less likely to issue equity. Overall, the existence of a supply chain relationship seems to favour the access to various debt markets.

Moreover, in unreported tests, we re-run our models excluding the years 2007-2009 of the financial crisis to make sure that our results are not due to the effect of the crisis in the supplier-

customer relationships (Garcia-Appendini and Montorial-Garrica, 2013). Then, we further distinguish whether the borrower is a supplier or a customer to examine if the position in the supply chain affects how the firm is perceived by the lenders. In all these cases, we find that the coefficient of the supply chain dummy is similar to that of the baseline model.

6. Conclusions

Supply chain relationships are becoming more and more relevant (Campello and Gao, 2017). This paper examines and provides new evidence about how the existence of these links impacts the loan market, in terms of both access to credit and pricing. There are several reasons to expect that supply chain relationships matter. We argue that being part of such chains provides a reputational advantage to the firms involved. This reputational advantage derives from the firm-specific investments that customers and suppliers make to build and foster this continuous relationship. This can be interpreted as a signal about the quality of the firms, providing a valuable ex-ante screening process to banks when these firms access the loan market.

Using data from the syndicated loan market in the US, we document a large beneficial effect of supply chain links in accessing the syndicated loan markets, in particular when the costumer and supplier share the same banks. These results are confirmed in a battery of tests to mitigate endogeneity concerns. Some of these tests are designed to exclude that the supply chain effect is mainly driven by lending relationship phenomena (Bharath, Dahiya, Saunders, and Srinivasan, 2007; Hasan, Minnick, and Raman, 2017); the length of the supply chain relationship, reputation (Cen, Dasgupta, Elkhami, Pungaliya, 2016), and customer base concentration (Campello and Gao, 2017). We further explore whether supply chain is associated to specific loan markets that require more intensive monitoring efforts. On this respect, this paper provides novel evidence about the

impact of supply chain relationships on the structure and composition of the syndicate. As concerns the syndicate structure, we find that the lead agent holds a larger share of the loan for borrowers with a supply chain participation. In these syndicates, the lead agent experiences higher credit-risk exposure and as a result implements more monitoring activities. Therefore, following Ivashina (2009), we run a two-stage least squares (2SLS) method to estimate the impact of the lead agent's share on loan pricing after controlling for possible adverse selection and moral hazard concerns in the syndicate. Our findings show that the lead banks demand higher pricing and covenant for retaining a higher share in the syndicate. However, once controlled for this diversification effect, we also show that supply chain is not associated to any risk premium. Overall, our findings indicate that the effect of supply chain in the lending market requires better understanding and may give new insights into important research areas such as market segmentation, optimum lead's loan share.

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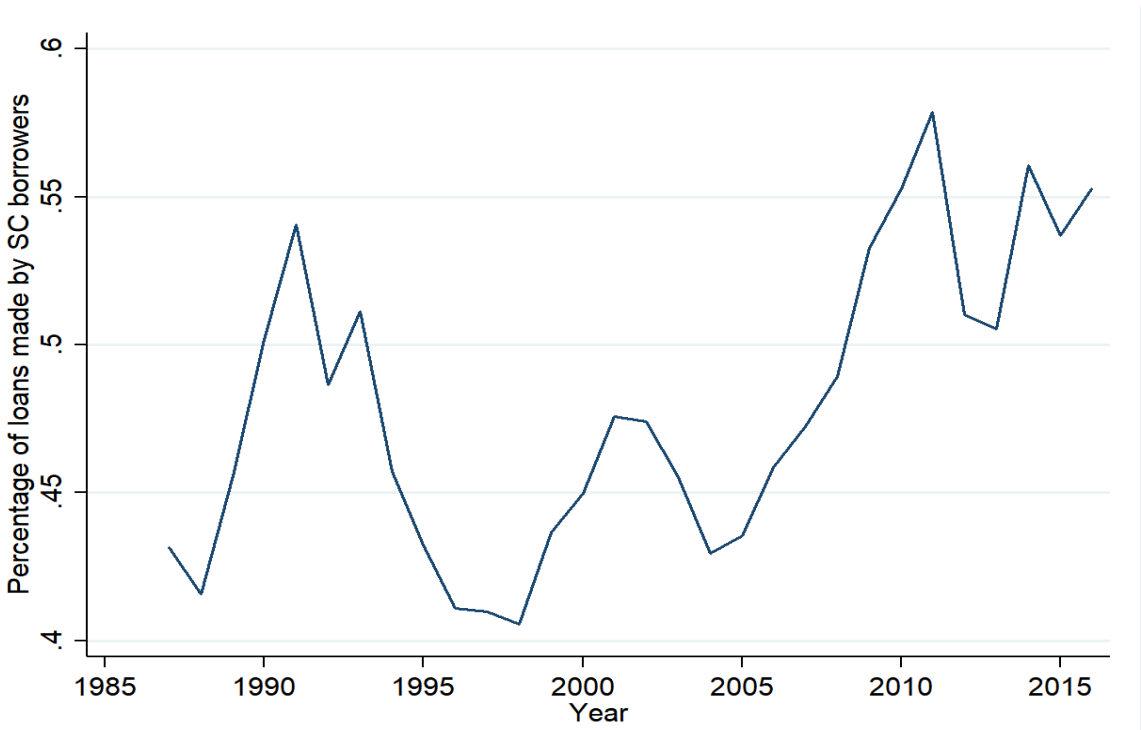

Figure 1: Percentage of loans made by borrowers with supply chain links

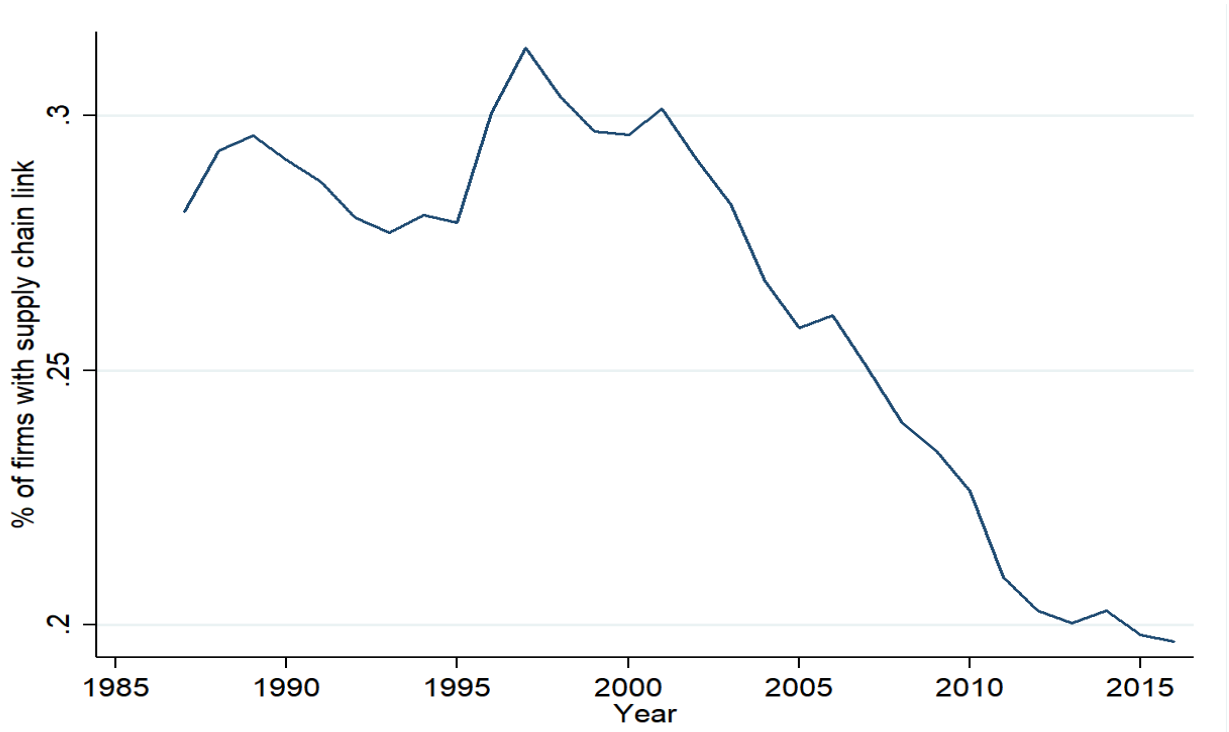

Figure 2: Percentage of firms with supply chain links

Table 1: Summary statistics

This table presents the summary statistics of all variable in this study. The sample spans the 1987-2016 window. All continuous variables are winsorized within 1st and 99th percentiles. See Table A1 of the Appendix for variables' definition.

Variables	Mean	Std. Dev.	Median	#Obs.
	Loan characteristics			
Facility Amount (mil.)	440.51	1,074.08	155	11,632
Facility Maturity	46.96	23.04	49	11,632
Syndicate Size	10.82	9.71	8	11,632
	Syndicate structure			
Lead share	0.28	0.23	0.20	11,632
	Price terms			
Spread (%)	1.51	1.09	1.37	11,632
Covenant Index	1.16	1.53	1	11,632
	Borrower characteristics			
Total asset	7255.61	23760.07	995.17	10,743
ROA	0.08	0.09	0.08	10,743
Cash	0.08	0.11	0.03	10,743
Leverage	0.32	0.23	0.30	10,743
Tobin's Q	1.43	0.63	1.26	10,743
CAPX	255.32	717.29	31.34	10,743
Past lending	3.08	3.30	2	10,743

Table 2: Access to the Syndicated Loan Market

This table reports the estimation results of the baseline model (1). For all columns the dependent variable is the propensity of receiving syndicate loans. Variables' definition is provided in Table A1 of the Appendix. Standard errors reported in parentheses, ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)
Supply chain	0.316***	0.154***	0.065***
	(0.02)	(0.02)	(0.02)
Default risk			-0.385***
			(0.07)
Log past lending		2.329***	2.041***
		(0.03)	(0.03)
Log total asset		-0.274***	-0.219***
		(0.03)	(0.04)
ROA		-0.383***	-0.299**
		(0.11)	(0.14)
Cash		-1.188***	-1.386***
		(0.08)	(0.09)
Leverage		-0.387***	-0.208***
		(0.05)	(0.06)
Tobin's Q		0.091***	0.064***
		(0.01)	(0.02)
Log CAPX		0.089***	0.091***
		(0.02)	(0.03)
Borrower*Year FE	Yes	Yes	Yes
Pseudo R2	0.01	0.14	0.11
Obs.	112,477	112,477	69,640

Table 3: Does supply chain affect access to concentrated loans

This table investigates the effect of supply chain on the access to loan types segmented by the lead agent's loan share. In all columns the dependent variable is the propensity of receiving loans. In columns (1) concentrated loans are defined if the lead agent's loan share is larger than the cross-sectional mean of lead agent' loan share. In columns (2) loans are defined as concentrated if the lead agent's loan share is larger than 50%. Lead agent is identified by the highest ranked agent for each facility following the ranking hierarchy suggested by Chakraborty, Goldstein and MacKinlay (2018). Variables' definition is provided in Table A1 of the Appendix. Standard errors reported in parentheses, ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Standard errors are clustered at borrower level.

Dep. Var.:	Lead Agent Share > Mean	Lead Agent Share > 50%
	(1)	(2)
Supply chain	0.029***	0.022***
	(0.01)	(0.01)
Log past lending	-0.075***	-0.069***
	(0.02)	(0.01)
Log total asset	-0.217***	-0.130***
	(0.01)	(0.01)
ROA	-0.316***	-0.324***
	(0.06)	(0.06)
Log CAPX	-0.032***	-0.023**
	(0.01)	(0.01)
Cash	0.088*	0.107**
	(0.05)	(0.04)
Leverage	-0.067***	-0.028
	(0.02)	(0.02)
Tobin's Q	-0.023***	-0.007
	(0.01)	(0.01)
R2	0.42	0.39
Bank FE	Yes	Yes
Borrower sector FE	Yes	Yes
Year FE	Yes	Yes
Obs.	9,373	9,373

Table 4: Supply chain and loan pricing

This table reports the results corresponding to the spread required by the participant banks, Eq (3). The dependent variables for Column (1) and (3) are the spread over the LIBOR (in %) of the syndicate loans; for Columns (4) and (6) All-In Spread Drawn; for Columns (7) and (9) the covenant index calculated following Bradley and Roberts (2015). The dependent variables for Column (4) and (6) are the all-in spread drawn. Columns (2),(5) and (8) report the first stage results from a 2SLS estimation where regressing syndicate reputation against the lead agent participation. Columns (3), (6) and (9) report the second stage results of the 2SLS estimation. Variable definitions are provided in Table A1 of the Appendix. Standard errors reported in parentheses, ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Standard errors are clustered at borrower level.

Dep. Var.:	Spread			All-In Spread Drawn			Covenant Index		
	OLS	1st stage	2nd stage	OLS	1st stage	2nd stage	OLS	1st stage	2nd stage
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Syndicate reputation: lead to participant	-	-0.041***	-	-	-0.036***	-	-	-0.038***	-
		(0.01)			(0.01)			(0.01)	
Syndicate reputation: reciprocal	-	-0.053***	-	-	-0.050***	-	-	-0.048***	-
		(0.00)			(0.00)			(0.00)	
Lead agent participation	0.946***	-	3.712***	0.778***	-	6.831***	1.087***	-	4.239***
	(0.09)		(0.50)	(0.21)		(1.23)	(0.14)		(0.80)
Supply chain	0.041**	0.005**	0.024	0.077*	0.005**	0.040	-0.017	0.005**	-0.034
	(0.02)	(0.00)	(0.02)	(0.04)	(0.00)	(0.04)	(0.03)	(0.00)	(0.03)
Log past lending	0.171***	0.003	0.172***	0.231***	0.000	0.242***	0.303***	0.002	0.306***
	(0.03)	(0.00)	(0.03)	(0.07)	(0.00)	(0.08)	(0.05)	(0.00)	(0.05)
Log total asset	-0.431***	0.002	-0.437***	-0.962***	0.003	-0.989***	-0.652***	0.001	-0.659***
	(0.03)	(0.00)	(0.03)	(0.07)	(0.00)	(0.07)	(0.05)	(0.00)	(0.05)
ROA	-2.119***	-0.014	-2.050***	-4.000***	-0.028	-3.770***	-0.821***	-0.019	-0.728***
	(0.12)	(0.02)	(0.17)	(0.28)	(0.02)	(0.35)	(0.20)	(0.02)	(0.22)
Log CAPX	-0.068***	-0.004	-0.053**	-0.168***	-0.002	-0.152***	-0.070**	-0.006**	-0.048
	(0.02)	(0.00)	(0.03)	(0.05)	(0.00)	(0.05)	(0.03)	(0.00)	(0.04)
Cash	0.569***	0.010	0.549***	1.239***	0.010	1.196***	0.408***	0.004	0.400**
	(0.09)	(0.01)	(0.11)	(0.21)	(0.01)	(0.25)	(0.15)	(0.01)	(0.16)
Leverage	0.990***	0.018***	0.933***	1.831***	0.010	1.758***	0.526***	0.025***	0.440***
	(0.04)	(0.01)	(0.05)	(0.10)	(0.01)	(0.12)	(0.07)	(0.01)	(0.08)
Tobin's Q	-0.109***	-0.005**	-0.093***	-0.271***	-0.004**	-0.245***	-0.139***	-0.005**	-0.124***
	(0.02)	(0.00)	(0.02)	(0.04)	(0.00)	(0.04)	(0.03)	(0.00)	(0.03)
Log facility amount	-0.366***	0.017***	-0.400***	-0.225***	0.017***	-0.298***	-0.316***	0.019***	-0.360***
	(0.03)	(0.00)	(0.03)	(0.06)	(0.00)	(0.08)	(0.04)	(0.00)	(0.05)
Log facility duration	0.194***	-0.003	0.194***	0.685***	-0.007	0.716***	0.361***	-0.006	0.374***
	(0.03)	(0.00)	(0.04)	(0.08)	(0.00)	(0.08)	(0.05)	(0.00)	(0.05)
Log number of banks	0.500***	-0.387***	1.642***	0.343***	-0.388***	2.830***	1.182***	-0.394***	2.500***
	(0.05)	(0.01)	(0.21)	(0.12)	(0.01)	(0.51)	(0.08)	(0.01)	(0.62)
Cragg-Donald Wald F statistic			173.31			150.72		150.84	
Stock-Yogo critical values: 10%			19.93			19.93		19.93	
R2	0.55	0.75	0.52	0.52	0.78	0.48	0.37	0.75	0.37
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Borrower sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	8,311	8,311	8,311	7,243	7,243	7,243	9,153	9,153	9,153

Table 5: Access to the Syndicated Loan Market and Relationship Lending

This table reports the estimation results of the baseline model (1). For all columns the dependent variable is the propensity of receiving syndicate loans. Supply chain loan takes the value of 1 if the actual (pseudo) borrower has a supply chain firm(s) that has received a syndicate loan in the past 5 years. It is equal to 0 if the actual (pseudo) borrower does not have any supply chain firm(s) that has received a syndicate loan in the past five years. Supply chain no loan takes the value of 1 if the actual (pseudo) borrower does not have any supply chain firms(s) that has received a syndicate loan in the past five years. It takes 0 if the actual (pseudo) borrower has at least one firm in the supply chain that has received a loan in the past five years. Supply chain bank takes the value of 1 if the actual (pseudo) borrower has a supply chain firm(s) that has received a syndicate loan from the same lender(s) in the past 5 years. It is equal to 0 if the actual (pseudo) borrower does not have any supply chain firm(s) that has received a syndicate loan from the same lender(s) in the past five years. Supply chain no bank takes the value of 1 if the actual (pseudo) borrower does not have any supply chain firm(s) that has received a loan from the same lender in the past five years. It takes the value of 0 for the rest of the cases. The dummies take also the value of 0 if the actual (pseudo) borrower does not have a supply chain link at all. Variables' definition is provided in Table A1 of the Appendix. Standard errors reported in parentheses, ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Sector-propensity score matching	
	(1)	(2)
Supply chain loan	0.183***	
	(0.02)	
Supply chain no loan	0.100***	
	(0.03)	
Supply chain bank		0.274***
		(0.03)
Supply chain no bank		0.129***
		(0.02)
Log past lending	2.309***	2.309***
	(0.03)	(0.03)
Log total asset	-0.240***	-0.240***
	(0.03)	(0.03)
ROA	-0.135***	-0.136***
	(0.04)	(0.04)
Cash	-1.059***	-1.060***
	(0.08)	(0.08)
Leverage	-0.199***	-0.201***
	(0.04)	(0.04)
Tobin's Q	0.074***	0.075***
	(0.01)	(0.01)
Log CAPX	0.081***	0.079***
	(0.02)	(0.02)
Supply chain loan=Supply chain noloan Chi-square test statistics	9.24	
p-value	0.00	
Supply chain bank=Supply chain nobank Chi-square test statistics		21.73
p-value		0.00
Borrower*Year FE	Yes	Yes
Pseudo R2	0.14	0.14
Obs.	112,477	112,477

Table 6: Endogeneity issues

Panel A of this table reports the estimation results of the baseline model (1). For columns (1) and (3) the dependent variable is the propensity of receiving syndicate loans. Column (1) only considers the supply chain cases in which: the suppliers provide services and differentiated products that are unique or highly customized inputs, and where the customers need differentiated and service inputs. Column (2) reports the first stage and second stage results from a 2SLS estimation with an instrument variable, respectively. In column (3), borrowers with less than 15% of customer sales are defined as borrowers with no supply chain link. In Panel B the dependent variables of all columns are the propensity of receiving syndicate loans. Column (1) and (2) exclude the borrowers with the top-quintiles ranks of supplier (customer) concentration proxy by percentage of customer sales against total sales and the Herfindahl index of customer sales, respectively. In Column (3), borrowers with more than 3 years of supply-customer relationship are excluded from the estimation sample. In Column (4), the supply chain dummy is equal to 1 if the borrower has a supply chain firm that accounts for more than 20% of its total sales in the last five years, and 0 otherwise. Results of Column (5) is based on the estimation using the sample of borrowers with supply chain link firms receiving no loans in past 5 years. Column (6) is based on the estimation using the sample of borrowers with supply chain link firms receiving no loans from the same bank as the borrowers in past 5 years. Variables' definition is provided in Table A1 of the Appendix. Standard errors reported in parentheses, ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A	SC Dep.	IV approach		Cus 15%
	(1)	(2)		(3)
		1st stage	*2nd stage*	
Supply chain	0.174***		0.048**	0.143***
	(0.05)		(0.02)	(0.03)
Supply chain M&A		0.001***		
		(0.00)		
Log past lending	2.064***	0.168***	0.389***	2.328***
	(0.08)	(0.00)	(0.01)	(0.03)
Log total asset	-0.048	0.106***	-0.033***	-0.213***
	(0.10)	(0.01)	(0.01)	(0.03)
ROA	-0.486**	-0.024***	-0.011	-0.139***
	(0.22)	(0.01)	(0.01)	(0.04)
Cash	-1.333***	0.229***	-0.140***	-1.041***
	(0.23)	(0.01)	(0.01)	(0.08)
Leverage	-0.370***	-0.004***	-0.002*	-0.203***
	(0.12)	(0.00)	(0.00)	(0.04)
Tobin's Q	0.084**	0.035***	0.008***	0.079***
	(0.04)	(0.00)	(0.00)	(0.01)
Log CAPX	-0.035	0.045***	0.012***	0.088***
	(0.07)	(0.00)	(0.00)	(0.02)
Borrower*Year FE	Yes	Yes	Yes	Yes
R2	0.11	0.11	0.07	0.13
Kleibergen-Paap test statistics		1542.03		
p-value		0.00		
Obs.	15,072	112,477	112,477	112,477

Table 6: Endogeneity issues (cont'd)

Panel B	Cus sales	Cus HHI	Cus relation	SC reputation	Supply chain loan=0	Supply chain bank=0
	(1)	(2)	(3)	(4)	(5)	(6)
Supply chain	0.151***	0.149***	0.147***	0.016***	0.101***	0.135***
	(0.02)	(0.02)	(0.02)	(0.00)	(0.03)	(0.02)
S&P inclusion				0.020***		
				(0.00)		
Supply chain × S&P inclusion				-0.006		
				(0.01)		
Log past lending	2.336***	2.334***	2.385***	0.322***	2.480***	2.349***
	(0.03)	(0.03)	(0.03)	(0.00)	(0.04)	(0.03)
Log total asset	-0.239***	-0.232***	-0.233***	-0.049***	-0.192***	-0.267***
	(0.03)	(0.03)	(0.03)	(0.00)	(0.04)	(0.03)
ROA	-0.142***	-0.143***	-0.110***	-0.085***	-0.096**	-0.116***
	(0.04)	(0.04)	(0.04)	(0.01)	(0.04)	(0.04)
Cash	-1.005***	-1.013***	-0.956***	-0.122***	-0.877***	-1.032***
	(0.08)	(0.08)	(0.08)	(0.01)	(0.10)	(0.08)
Leverage	-0.199***	-0.197***	-0.158***	-0.045***	-0.106**	-0.151***
	(0.04)	(0.04)	(0.04)	(0.01)	(0.04)	(0.04)
Tobin's Q	0.074***	0.076***	0.068***	0.008***	0.057***	0.064***
	(0.01)	(0.01)	(0.01)	(0.00)	(0.02)	(0.01)
Log CAPX	0.073***	0.071***	0.079***	0.009***	0.040	0.066***
	(0.02)	(0.02)	(0.02)	(0.00)	(0.03)	(0.02)
FE	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.14	0.14	0.14	0.08	0.14	0.14
Obs.	104,508	104,527	90,173	116,728	51,972	90,275

Table 7: Other Tests: Access to the Syndicated Loan Market

This table reports the estimation results of the baseline model (1). For all the columns the dependent variable is the propensity of receiving syndicate loans. Columns (1) and (2) consider the linear probability model (LPM); Columns (3) and (4) consider the entire universe of Compustat without the matching procedure. This table reports the estimation results for the access to the equity market and other debt markets. In Panel B, Column (1) refers to net stock issues calculated following Hirshleifer, Hsu and Li (2013)'s procedure; Columns (2), (3), (4) and (5) consider the proceeds of each category of debt and preferred stocks for companies located in the US over the period 1985-2016. Variables' definition is provided in Table A1 of the Appendix. Standard errors reported in parentheses, ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Standard errors are clustered at borrower level.

Panel A	LPM estimation		All sample LPM estimation	
	(1)	(2)	(3)	(4)
Supply chain	0.017***		0.024***	
	(0.00)		(0.00)	
Supplier		0.014***		0.014***
		(0.00)		(0.00)
Customer		0.008***		0.039***
		(0.00)		(0.00)
Log past lending	0.322***	0.323***	0.657***	0.654***
	(0.00)	(0.00)	(0.00)	(0.00)
Log total asset	-0.050***	-0.049***	0.038***	0.035***
	(0.00)	(0.00)	(0.00)	(0.00)
ROA	-0.086***	-0.086***	-0.000	0.001
	(0.01)	(0.01)	(0.00)	(0.00)
Cash	-0.122***	-0.122***	-0.069***	-0.069***
	(0.01)	(0.01)	(0.00)	(0.00)
Leverage	-0.045***	-0.045***	0.003*	0.003*
	(0.01)	(0.01)	(0.00)	(0.00)
Tobin's Q	0.007***	0.008***	0.007***	0.006***
	(0.00)	(0.00)	(0.00)	(0.00)
Log CAPX	0.009***	0.009***	0.003***	0.003***
	(0.00)	(0.00)	(0.00)	(0.00)
FE	Yes	Yes	Yes	Yes
R2	0.08	0.08	0.16	0.17
Obs.	116,728	116,728	261,038	261,038

Table 7: Other Tests: Access to the Syndicated Loan Market (cont'd)

Panel B	Equity	Bond	Mortgage	Preferred Stock	Program debt
	(1)	(2)	(3)	(4)	(5)
Supply chain	-0.008***	0.063***	-0.000*	0.004***	0.032***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Log past lending	-0.007	0.522***	0.001***	0.007***	0.270***
	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)
Log total asset	-0.079***	0.087***	0.000***	0.007***	0.050***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ROA	-0.078***	-0.024***	-0.000	-0.004***	-0.013***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Cash	0.052***	-0.051***	0.000*	0.001	0.028***
	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)
Leverage	0.090***	0.012***	0.000	0.001*	0.004*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Tobin's Q	-0.030***	0.016***	0.000	-0.000	0.009***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Log CAPX	0.025***	0.007***	-0.000***	-0.001***	-0.006***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
FE	Yes	Yes	Yes	Yes	Yes
R2	0.04	0.10	0.00	0.01	0.04
Obs.	254,038	261,038	261,038	261,038	261,038

Appendix

Table A1: Description of the variables

Variable	Source	Description
	General	
Lead arranger	Dealscan	The lead agent is identified by the highest ranked agent for each facility following the ranking hierarchy suggested by Chakraborty, Goldstein and MacKinlay (2018).
Loan	Dealscan	It is the propensity of receiving a loan. It is equal to 1 when a firm has received a syndicated loan as indicated in the facility table in Dealscan. Otherwise it is equal to zero.
	Price terms	
Spread	Dealscan	Spread over LIBOR (non-LIBOR-based loans are excluded from the sample) paid on drawn amounts on credit lines.
All-in-spread-drawn	Dealscan	All-in-spread-drawn is the sum of the annual spread paid over LIBOR for each dollar drawn down from the loan and annual fee.
Covenant Index	Dealscan	Following Bradley and Roberts (2015), we build a covenant index that considers equity sweeps, debt sweeps, asset sweeps, dividend restrictions, and secured debt. All five different covenants are coded as 1, and 0 otherwise, and then summed-up.
	Loan characteristics	
Facility Amount	Dealscan	Facility amount in USD million as indicated in the field FacilityAmt in the facility table in Dealscan, adjusted for inflation in 2005 dollars.
Facility Maturity	Dealscan	Facility maturity in months as indicated in the field Maturity in the facility table in Dealscan.
Syndicate Size	Dealscan	Following Berg, Saunders and Steffen (2016), number of lenders (lead arranger and participants) of a syndicated loan facility as indicated by the LenderShares table in Dealscan.
	Syndicate Reputation	
Syndicate reputation: lead to participant	Dealscan	Following Ivashina (2009), the maximum percent number of deals arranged by the same lead agent with the same participate against the total number of deals organized by the lead agent over a five-year horizon.
Syndicate reputation: reciprocal	Dealscan	Following Ivashina (2009), dummy variable that is equal to one if the same lead agent and the same participate switch role over the a five-year horizon prior to the current syndication.
	Syndicate Structure	
Lead share	Dealscan	Following Sufi (2007), percentage retained by the leader lender of a syndicated loan facility as indicated by the LenderShares table in Dealscan.
	Supply chain	

Supply chain	Dealscan/ Compustat	It is a dummy that takes the value of 1 if the borrower has at least one supply chain partner over the last previous five years; otherwise it is zero. The data on supply chain is retrieved from Compustat's Segment Customer database.
Supply chain loan	Dealscan/ Compustat	It is a dummy that takes the value of 1 under two criteria: if the borrower has at least one supply chain partner over the last previous five years and 2) at least one supply chain's partner has received a loan over the last five years. The dummy is equal to zero if at least one of the above two criteria is not satisfied. The data on supply chain is retrieved from Compustat's Segment Customer database.
Supply chain bank	Dealscan/ Compustat	It is a dummy that takes the value of 1 under two criteria: if the borrower has at least one supply chain partner over the last previous five years; 2) at least one supply chain's partner has received a loan over the last five years from the same bank. The dummy is equal to zero if at least one of the above two criteria is not satisfied. The data on supply chain is retrieved from Compustat's Segment Customer database.
Borrower characteristics		
Total assets	Compustat	Total assets in USD millions of dollars.
Leverage	Compustat	Ratio of book value of total debt to book value of assets.
Profitability (ROA)	Compustat	Ratio of net income to total assets.
Cash	Compustat	Cash is equal to the sum of cash and short-term investments to total assets.
CAPX	Compustat	CAPX is the logarithm of capital expenditures.
Tobin's Q	Compustat	It is the ratio of (book value of assets – book value of equity + market value of equity) to book value of assets.
Relationship Lending		
Past Lending	Dealscan	It is the logarithm of number of loans received in the last 5 years.
Supply Chain's Reputation		
S&P inclusion	Compustat	This variable accounts for the percentage of firms in the supply chain that are listed in the S&P500 index.

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