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Cheap Trade Credit and Competition in Downstream Markets

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Abstract

Using a unique dataset with information on 20 million inter-firm transactions, we provide evidence that suppliers offer cheap trade credit to ease competition in downstream markets. We show theoretically that trade credit allows suppliers to transfer surplus to high-bargaining-power customers while preserving sales to other buyers. Suppliers optimally choose a trade credit limit up to which customers can purchase on account. This contractual feature allows suppliers to target infra-marginal units and to leave unaffected customers' marginal costs. Empirically, we find that suppliers grant trade credit to high-bargaining-power customers only when they fear the cannibalization of sales to other low-bargaining-power customers. Exploiting a law that lowered the cost of offering trade credit, we show that higher provision of trade credit to high-bargaining-power customers leads to an expansion of the suppliers' customer base and higher growth of sales to low-bargaining-power customers.

JEL classification: G3, D2, L1

Keywords: Trade credit, competition, input prices, supply chains

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1 Introduction

Trade credit is the most important source of short-term funding for firms around the world.[1] All existing theories aim to explain why financially constrained firms rely on financing from their suppliers (e.g., Biais and Gollier, 1997; Burkart and Ellingsen, 2004), which typically comes with extremely high implicit interest rates (Petersen and Rajan, 1994 and 1995; Cunat, 2007).

While supplier finance to constrained firms is relatively well understood, there is growing evidence that firms, with relatively easy access to financial markets and lots of cash on their balance sheets, can delay payments to their suppliers at no cost (Murfin and Njoroge, 2014; Barrot, 2016; Breza and Liberman, 2017). This involves that plenty of outstanding trade credit is extremely cheap. Existing studies suggest that large firms with bargaining power may squeeze smaller suppliers by asking for cheap trade credit. Yet, it remains unclear why these high-bargaining-power customers would not simply ask for price discounts and why there is plenty of trade credit between large suppliers and customers.

Using a novel dataset with unprecedented detail on trade credit provision by approximately 700 suppliers in about 20 million transactions, this paper puts forward and tests a novel explanation for cheap trade credit to large customers, with presumably weak financial constraints. We conjecture that trade credit is an instrument for a supplier to transfer surplus to a high-bargaining-power customer without cannibalizing sales to other (low-bargaining-power) customers.

To generate empirical predictions on trade credit provision and its effects on competition in downstream markets, we propose a stylized vertical-relationship model. An upstream firm serves a downstream market with several competing customers. We assume that one of the customers has high bargaining power with respect to the supplier and must be transferred the good at favorable conditions in order to accept the supplier's offer. The main objective of the model is to explore the supplier's choice to reward the high-bargaining-power customer

[1] See Rajan and Zingales (1995) and Giannetti (2003).

by means of price discounts or cheap trade credit.

Empirically, discounts are uniform or increase with the quantity purchased, like loyalty discounts or rebates.[2] Therefore, we explore the effects of granting uniform discounts over the prevailing market price of the input to a high-bargaining-power customer. We highlight two main effects. First, the discount directly affects the marginal cost of the high-bargaining-power firm, and thus makes it more aggressive in the downstream market. This implies that the supplier's sales to that firm increase, but at a smaller profit margin. Second, the low-bargaining-power competitors may not only purchase less, but may also be deterred from entering the market. If the low-bargaining-power competitors in the downstream market are clients of the same supplier, uniform price discounts may thus lead to sales cannibalization and reduce the supplier's profits. An increasing price schedule would allow the supplier to avoid the cannibalization of sales, but prices are seldom observed to be increasing.

We show that by offering trade credit to the high-bargaining-power customer, the supplier can implement a price schedule that increases in the quantity purchased. This maintains the high-bargaining-power customer's marginal cost high and limits competition precisely when demand is strong and profits from low-bargaining-power customers are potentially high. To achieve this goal, trade credit is designed to have the features of a credit line conditional on input purchases. In particular, the supplier optimally chooses a credit limit up to which the high-bargaining-power firm can purchase the input on account and receive trade finance at an implicit interest rate that is below its cost of capital. This feature of the contract allows the supplier to target infra-marginal units, and therefore leaves unaffected the customer's marginal cost and consequently the market price. This is valuable to the supplier when demand is high and selling to low-bargaining-power customers is particularly profitable.

Thus, from the point of view of the supplier, trade credit leaves competition in downstream markets unaffected when it matters most and avoids the cannibalization of sales to other downstream firms, which guarantee higher profit margins. Since it allows the transfer

[2] In fact, non-linear price schedules are explored under the assumption of decreasing marginal prices (see, e.g., Luo, Perrigne, and Vuong, 2018).

to be conditional on the quantity transacted between customer and supplier, trade credit is preferable to cash transfers. It would also dominate cash transfers in models with financially constrained suppliers, as trade credit allows sellers to stabilize profits.

To test the model's predictions, we need evidence on whether customer bargaining power matters for trade credit provision, and on how the effect of customer bargaining power depends on competition in the downstream market. Our data provides unprecedented advantages to study trade credit for several reasons. First, the register contains comprehensive information on the monthly exposure of each customer to a given supplier, matured trade credit, monthly payments, and any delayed payments besides a wealth of firm level information. Second, we observe each supplier's customer base in a variety of downstream markets. Thus, besides exploiting heterogeneity in customer and supplier characteristics, we can also benefit from differences in the structure of downstream markets.

Our empirical analysis consists of several steps. First, we provide some stylized facts supporting the assumptions of the model. In particular, we document the similarities between trade credit and bank credit lines. As the volume of purchases of a customer increases, the amount of new purchases that a customer is able to make on account decreases. This confirms our theory's implication that trade credit targets infra-marginal units and implements an increasing price schedule. Second, we document a positive correlation between the amount of trade credit received by a customer and its input costs, suggesting that trade credit is likely to be a substitute for lower input prices.

In a second step, we directly test the mechanism of our model. Consistent with the findings of previous literature, we show that customers with higher bargaining power, as proxied by their size relative to the supplier, obtain significantly more trade credit. However, this effect appears entirely driven by high-bargaining-power customers that are surrounded by a larger number of competitors, which are also customers of the same supplier. Quantitatively, the link between downstream competition and bargaining power can account for up to 70%, or 200 billion Euro, of trade credit provided to firms in our sample. Big customers surrounded by competitors that do not share the same supplier do not receive more trade credit. If fact, they receive *less* trade credit, as is consistent with suppliers' incentives to favor aggressive behavior and acquisition of market shares in order to increase their own sales.

These effects are estimated in specifications that include triple interactions of supplier, time, and customer industry fixed effects. These interactions result in approximately 900 thousand fixed effects, which hold constant the supplier capacity to offer trade credit as well as the propensity to provide trade credit depending on the nature of the input transacted or the customer industry time-varying demand for trade credit. We also control for customer time-varying characteristics non-parametrically, by including interactions of customers and time fixed effects. In additional robustness checks, we show that our findings are robust when we restrict the sample to firms supplying non-tradable goods, we control for the length of the relationship, and use alternative ways to measure the scope for cannibalization in the downstream market. Overall, these findings lend support to our hypothesis that suppliers transfer rents through trade credit to limit competition in the downstream market and to avoid the cannibalization of their high-profit-margin customers' sales.

In a final step, we exploit an exogenous decrease in the cost of providing trade credit due to a law that favored the securitization of receivables. The law increased financially constrained suppliers' ability to provide trade credit. Consistent with the predictions of our theoretical framework, the reform results in an increase in the supply of trade credit to high-bargaining-power customers. Following the reform, thanks to the increase in trade finance to high-bargaining-power customers, suppliers become up to 25% more likely to establish new relationships with small firms. At the same time the input costs of high-bargaining-power customers increase by 0.3 percentage points, confirming the conjecture that more trade credit is associated with higher input prices. Sales to small firms also increase. We find no evidence that the increase in input demand of low-bargaining-power customers may arise from a relaxation of financial constraints.

Our paper contributes to several strands of the literature. First, we explore how financing affects competition in the spirit of Brander and Lewis (1986). To the best of our knowledge, we are the first to explore the role of trade credit, a financial arrangement affecting vertical relations, which has been overlooked in the industrial organization literature.[3] This is surprising given that anecdotal evidence suggests that trade credit may play an important role. For instance, the success of Dell and large retailers in the US and the UK has been associated with an efficient management of working capital resulting from suppliers providing cheap financing (e.g., Ruback, 2003; *Financial Times*, 2005).[4]

In this respect, our paper exploring how this vertical contract affects competition in the downstream market provides important policy implications. While it may appear to provide an unfair competitive advantage to large firms, trade credit favors relatively smaller firms and is desirable when concerns about dynamic efficiency are important. Trade credit, however, is costly in terms of static efficiency, as it favors entry by maintaining higher prices in the downstream market. Considering this tradeoff, which our paper is the first to highlight, is of crucial importance for competition authorities evaluating the use of trade credit.

Second, we contribute to the trade credit literature. Trade finance is widely used in international and domestic supply chains (Petersen and Rajan, 1997; Giannetti, Burkart and Ellingsen, 2011; Antras and Foley, 2015). A recent strand of this literature highlights that relatively large firms, with access to external finance, are offered plenty of trade credit.

[3]The theoretical literature has focused on the competitive effects of vertical integration and vertical contracts requiring forms of exclusivity or price maintenance (see Rey and Tirole, 2007). For empirical tests of these theories, see Lafontaine and Slide (2007), Hortaçsu and Syverson (2007), Villas-Boas (2007), Mortimer (2008) and, more recently, Houde (2012), and Crawford, Lee, Whinston and Yurukoglu (2018), among others.

[4]Antitrust cases have occasionally considered trade credit. For instance, in the US antitrust case, Catalano, Inc. v. Target Sales, Inc. 446 U.S. 643 (1980), Californian beer retailers brought suit against their wholesalers, who allegedly agreed to an abrupt cut in payment terms although they seemed to be competing on this dimension beforehand. The district court for the Eastern District of California and the court of Appeal rejected this case on the basis that such a reduction in trade credit provision might in fact foster entry and price competition on the wholesale market. However, the U.S. Supreme Court reversed the appeal in 1980, on the basis that the coordinated cut in payment terms amounted to a collusive and anti-competitive behavior. Similarly, in 1978, the European Commission examined an agreement among tobacco firms from Luxembourg and Belgium to collectively reduce payment terms. The Commission deemed this agreement as an anti-competitive practice.

Breza and Liberman (2017), Barrot (2016), Murfin and Njoroge (2014) present evidence suggesting that high-bargaining-power customers squeeze smaller suppliers by delaying payments. While these papers provide clear evidence that buyer bargaining power is related to the use of trade credit, it remains unclear why suppliers would not offer price discounts instead of trade credit. To explain the use of trade credit, existing literature typically uses quality guarantees (Breza and Liberman, 2017) or other frictions. We hypothesize that trade credit use is related to competition in downstream markets and provide empirical evidence supporting our conjecture.

In our theory, trade credit allows the supplier to price discriminate between different customers without distorting competition in the downstream market. Brennan, Macsimovic and Zechner (1988) also model trade credit as a means of price discrimination, but in their framework, trade credit is provided to financially constrained firms; cash-rich firms select cash-only contracts because the interest on trade credit is higher than their cost of capital. In contrast, we provide a theory of cheap trade credit to high-bargaining-power, and typically cash-rich, firms.

2 Data and Stylized Facts

In this section, we first present our unique dataset with information on about 20 million inter-firm transactions. Then, we document three stylized facts that motivate our theoretical and empirical analysis.

2.1 Data Sources

Our main data source is the CRIBIS/CRIF credit register, which provides information on approximately 1,100 suppliers based in Italy. These firms report information on all their customers over time to the register. The purpose of CRIBIS/CRIF is to assist the clients, that is, the suppliers in our dataset, with invoicing and payment collection from all the customers.

Therefore, the register contains comprehensive information on the monthly exposure of each customer to a given supplier, matured trade credit, monthly payments, and any delayed payments. For all customers and suppliers in the dataset, the credit register also reports internal identifiers, fiscal identifiers, as well as age, legal structure, SIC codes, number of employees, and financial information, such as sales turnover, at the beginning of the sample. We obtain data from September 2012 to August 2016 and have a total of 47 million customer-supplier monthly relationships. We also have balance sheet information on Italian limited liability firms from CRIBIS/CRIF over this period.

The customers in our dataset include individual buyers, unincorporated companies, and limited liability companies. Since individual buyers and non-limited liability companies are likely to be occasional buyers, which are not necessarily integrated in the production process, we focus our empirical analysis on limited-liability companies. Applying this filter reduces our final dataset to 19,623,468 customer-supplier monthly observations for a total of 672 suppliers and 418,915 customers.

Our data provides unprecedented advantages to study trade credit for several reasons. First, most of the papers in the literature are unable to match customers and suppliers (e.g., Petersen and Rajan, 2997; Giannetti, Burkart and Ellingsen, 2011). Even the few notable exceptions rely on selected samples: For instance, Breza and Liberman (2017) consider a large number of small suppliers delivering to one large supermarket, the customer; Murfin and Njoroge (2014) rely on Compustat data, which only allow to observe the largest customers of US listed companies and are therefore biased towards large customers purchasing from smaller suppliers. We observe all customers, which differ in size, industry and location, for a large variety of suppliers. We can thus explore how firms provide trade credit to customers of different types.

Second, we not only have information on the stock of trade credit, but we also observe the flow of transactions occurring over time between each customer-supplier pair. This allows us to identify new payments and the fraction of purchases on account.

CRIBIS/CRIF also reports when payments are due and when a payment is made. In addition, we can use information on trade credit maturity and late payments to infer, respectively, a supplier's propensity to provide trade credit and a customer's propensity to take advantage of the supplier. While we have no direct information on the cost of trade credit, Italian firms typically provide trade credit at zero cost. The practice of providing early payment discounts, which may translate in a very high implicit interest rate on trade credit (Petersen and Rajan 1994), is not prevalent in Italy (Cannari, Chiri and Omiccioli, 2005) and is not that frequent even in the US, where only a minority of firms receive early payment discounts (Giannetti, Burkart and Ellingsen, 2011).

Table I shows the main characteristics of our final dataset.

[Table I About Here]

Panel A describes the characteristics of suppliers. We measure size using the number of employees. Suppliers tend to be relatively large with almost 300 employees on average. As Figure 1 makes clear, however, there is large cross-sectional variation in size among the suppliers in our sample. Moreover, Figure 2 documents that suppliers and customers are widely distributed across industries.

[Figures 1 and 2 About Here]

Reflecting their relatively large dimensions, suppliers report on average nearly 1,400 different customers, and tend to have a relatively large monthly trade credit exposure (39 million Euro on average). To construct proxies for competition in the downstream market, we consider that firms tend to compete with nearby firms. Therefore, we consider each of the 20 Italian regions as a downstream market. Suppliers on average have over 50 customers in a four-digit SIC code industry and region and, on average, almost a quarter of a supplier's sales are within an industry and region.

Panel B describes the firms that are reported as customers in the credit register. These firms are on average smaller than suppliers and have fewer than two suppliers reporting to the credit register. As Figure 1 makes clear, however, there are some very large customers enabling us to explore cross-sectional differences in size for the construction of one of our bargaining power measures.

Panel C describes the trade credit transactions. It shows that there is large variation in the Euro amount of new sales reflecting the large cross-sectional heterogeneity of the customers in our sample. Only a fraction of transactions (28%) involves trade credit. Also, new sales are not entirely realized using trade credit: Typically, suppliers offer trade credit on 16% of the value of a new transaction, and for the rest they require an immediate payment. As we discuss below, this suggests that trade credit may be a means for suppliers to target infra-marginal units produced by customers, a property that will be important in our theory. Panel C also shows that there is large variation in trade credit maturity. The median customer receiving trade credit can postpone the payment for nearly two months.[5] Nevertheless, as captured by the variable *Delays*, a few customers are late in paying their suppliers.

Finally, Panel D presents some information on the relationships between customers and suppliers, including our proxies for customer bargaining power. On average, customers and suppliers are 350km apart, somewhat closer than the average distance between the customers in our sample and all potential suppliers in a given four-digit SIC code, which we identify considering (nearly) all limited liabilities firms registered in Italy. Thus, consistent with the findings of Bernard, Moxnes and Saito (forthcoming) and Carvalho, Nirei, Saito, and Tahbaz-Salehi (2016), customers tend to establish relationships with closer suppliers. The mean distance of a customer's potential alternative suppliers can be viewed as a proxy for the extent of competition in an upstream market. To the extent that a customer has several closer potential suppliers, it can easily switch and therefore has high bargaining power.

Panel D also shows our second proxy for the relative bargaining power of customers

[5]While the top quartile of trade credit maturity is 77 days, for few transaction the maturity of trade credit appears very long. To limit the effects of outliers, in the empirical analysis, we consider the logarithm of trade credit maturity.

and suppliers: The relative size of customers and suppliers.[6] While most customers are smaller than their suppliers (the 75th percentile of the relative size variable is 0.71), there are customers that are significantly larger than the suppliers and on average the relative size is over 4. It is precisely this variation that we will exploit in our empirical analysis.

2.2 Stylized Facts on Trade Credit Use

In this section, we present three stylized facts on trade credit, which we will then use to develop our theory.

Trade credit flows to large customers Figure 3 shows the extent to which trade credit is used in transactions with customers of different dimensions, as measured by the number of employees. Against the commonly held view that trade credit is provided to mitigate the financial constraints of smaller firms, the extent to which transactions involve the use of trade credit increases with customer size. We also consider how the relative size of customer and supplier, again captured by the number of employees, is associated with trade credit use. The relationship appears non-monotonic. Customers that are significantly smaller than their suppliers are able to conclude a larger fraction of their purchases on account than customers that are somewhat larger. However, as the customer size increases relative to that of the supplier, an ever larger fraction of transactions involves trade credit. In fact, customers that are significantly larger than their suppliers perform most of their purchases on account.

[Figure 3 About Here]

This evidence is in line with previous literature discussed in the introduction. It suggests that financial constraints may help explain trade credit provision to small firms, when suppliers have cheaper access to external funding and can provide credit more efficiently than banks (for reasons highlighted in previous literature). However, the relative bargaining

[6] We measure relative size in terms of employment because our hypothesis implies that sales directly depend on trade credit.

power between customer and supplier also matters, and may be the reason why most of trade credit is awarded. This is particularly clear from Figure 4, which shows that the Euro amount of trade credit granted to customers with over 1,000 employees is over one third of the total trade credit outstanding in our sample.

[Figure 4 About Here]

Trade credit as a credit line As shown in Table I, on average only 16% of purchases can be made on account. The rest of the balance must be settled right away. To have a better understanding of trade credit is important to know whether a customer's increase in purchases always involve a proportional increase in purchases on account, a feature of trade credit previously undocumented.

[Table II About Here]

In Table II, we regress the variable capturing the proportion of new purchases on account on a customer's past purchases, which we measure using a rolling sum of past purchases over three or six months. The use of trade credit in new transactions increases with past purchases before eventually being capped or even decreasing, as reflected by the negative coefficient on past purchases' quadratic term. We obtain a similar result when we use as a dependent variable the logarithm of a supplier's trade credit exposure to a given customer during a month. This evidence not only suggests that trade credit provision by a supplier has the feature of a credit line, but also shows that there is an upper bound to the use of trade credit. Figure 5 graphically confirms this point by showing a negative correlation between current and past trade credit usage.

[Figure 5 About Here]

Trade credit and production costs A legitimate question is how trade credit is related to input prices. Unfortunately, although the CRIBIS/CRIF credit register provides a comprehensive picture of trade credit flows and exposures, we do not have information on transacted quantities and input prices. We can nevertheless provide suggestive evidence on whether trade credit is a complement or substitute for input price discounts using input costs, defined as the cost of materials and services, as a crude proxy for the input prices paid by the firm.[7] Customers that use more trade credit should have higher input costs if they tend to pay higher input prices. Such a positive correlation would suggest that trade credit is a substitute for price discounts.

[Table III About Here]

Table III relates a customer's input costs, defined as input costs over sales, to alternative measure of trade credit usage. In columns (1) and (2), we use the ratio of the total amount of trade credit granted to that customer during the year, divided by its purchases from CRIF.[8] In columns (3) and (4), we use the total amount of trade credit received. We also control for the customer size and its receivables. Estimates in columns (1) and (3) indicate that trade credit use is positively correlated with input costs. Importantly, in columns (2) and (4), we find that the higher the share from suppliers in the dataset (as measured by the *Share of Suppliers* variable), the stronger the positive correlation, as is consistent with the fact that we observe a larger fraction of trade credit. The share of input costs covered in the transactions data is negatively correlated with input costs.

In what follows, we make use of these empirical facts to develop a stylized model. We have two goals: First, to illustrate why suppliers may want to provide trade credit to high-bargaining-power customers, and, second, to derive testable predictions that we bring to the data.

[7] Having data on detailed trade credit on a comprehensive sample of customers and suppliers as well as transacted quantities and input prices is not common. For this reason, previous literature relies on crude proxies for input prices from firms' balance sheets, such as input costs (see, e.g., Giannetti, Burkart and Ellingsen, 2011) or profit margins (see, e.g., Murfin and Njoroge, 2014).

[8] To ease the interpretation, we normalize the variables to have mean zero and standard deviation one.

3 Theory and Testable Implications

To generate empirical predictions on trade credit provision and its effects on competition in downstream markets, we introduce a stylized vertical-relationship model. An upstream firm serves a downstream market with several competing customers. We assume that one of the customers has high bargaining power with respect to the supplier and must be transferred the good at favorable conditions in order to accept the supplier's offer. While we do not model the source of bargaining power, such a situation may arise if it is easier for larger firms to find alternative sources of the good, for instance, by integrating backward and producing the good in house (Katz, 1987). Large customers may also contribute to create surplus for the supplier through technological and brand enhancement or allowing to achieve economies of scale. For any of these reasons, the supplier needs to reward high-bargaining-power customers for entering in the transaction.

The main objective of the model is to explore the supplier's choice to reward the high-bargaining-power customer by means of a price discount or (cheap) trade credit. We show that under general conditions the supplier prefers to offer cheap trade credit to avoid the cannibalization of sales to low-bargaining-power customers.

3.1 The model

For simplicity, we assume that the aggregate demand in the downstream market is linear and that two firms, firm A and firm B, compete à la Cournot.[9] The aggregate demand in the downstream market is:

$$p = \widetilde{\alpha} - q_A - q_B,$$

where $\widetilde{\alpha}$ is a random variable, capturing demand uncertainty, distributed with cumulative density function $F(.)$ over the support $[\underline{\alpha}, \overline{\alpha}]$ with $\underline{\alpha} > 0$.

[9] Our results do not depend on these assumptions. As long as the firms' products are substitutes, the main thrust of the analysis goes through. Specifically, the implications of the model are unchanged if there are N competitors or if products in the downstream market are strategic complements, such as with Bertrand competition.

After observing the demand shock, firm A and firm B maximize profits simultaneously choosing the quantities q_A and q_B, respectively. If it chooses $q_B > 0$, firm B also has to pay a fixed cost of production K. Thus, while firm A is always active, firm B may decide not to enter the market.

Differently from firm B, firm A has high bargaining power. Following Katz (1987), we capture this by requiring that the transaction with the supplier must generate an exogenously given surplus of at least $\overline{U}$ for firm A. Put differently, firm A has a more stringent participation constraint than firm B, which purchases the good as long as it expects to make non-negative profits. As will be clear later, not having to transfer any surplus to firm B, the supplier has no reason to offer a price below c or trade credit to firm B in equilibrium.

For simplicity, we assume that there is a unique supplier in the upstream market, which sells the input at price c. The input price is exogenously given in our model and one may think of it as being determined by a number of (potential) entrants that could offer the same input at cost c. To have a non-trivial equilibrium in which some quantity of the good is transacted for any level of the demand shock, we assume that $\underline{\alpha} > c$ throughout the analysis.

The supplier can transfer surplus to firm A by offering a discount δ on the upstream market price, c. The discount is assumed to apply uniformly to all units of the good purchased by firm A. Alternatively, the supplier can offer (cheap) trade credit. In this case, the supplier extends credit conditional to the quantity purchased by firm A at a discount on the cost of capital of firm A.[10]

The timing is as follows:

1. Given the unit price of c, the supplier offers a contract to firm A, granting surplus $\overline{U}$.

2. The demand shock realizes.

[10] As will be clear later, trade credit implements an increasing price schedule. Explicitly increasing price schedules (or discounts that decrease in quantity) are not observed and it is standard in the literature to assume that non-linear price schedules are concave (see, e.g., Luo, Perrigne, and Vuong, 2018).

3. Firm B decides whether to enter.

4. Firms simultaneously choose quantities q_A and q_B.

Below, we consider the cases in which $\overline{U}$ is transferred through price discounts and trade credit separately. All proofs are in Appendix II.

3.2 Price Discounts

We first consider an equilibrium in which the supplier grants firm A a discount δ over the prevailing market price of the input, c.

Lemma 1 provides the equilibrium quantities of firms A and B as a function of the realization of the demand shock, α, and the discount, δ.

Lemma 1 *If the supplier offers firm A a price discount δ, the input demands of firms A and B are, respectively:*

$$q_A^d(\delta;\alpha) = \left\{ \begin{array}{cc} \frac{1}{2}(\alpha+\delta-c) & \alpha \leq \alpha^*(\delta,K) \\ \frac{1}{3}(\alpha+2\delta-c) & \alpha > \alpha^*(\delta,K) \end{array} \right\}$$

and

$$q_B^d(\delta;\alpha) = \left\{ \begin{array}{cc} 0 & \alpha \leq \alpha^*(\delta,K) \\ \frac{1}{3}(\alpha-\delta-c) & \alpha > \alpha^*(\delta,K) \end{array} \right\},$$

with $\alpha^*(\delta;\alpha) = c+\delta+3\sqrt{K}$.

The supply functions of firms A and B are equivalent to their demands for the input from the supplier. Their functional forms capture that, when firm A receives a discount, firm B enters only for relatively high realizations of the demand shock; otherwise, firm A is a monopolist in the downstream market.

The supplier sets the discount δ to satisfy firm A's participation constraint, which is:

$$\delta \int_{\underline{\alpha}}^{\overline{\alpha}} q_A^d(\delta;\alpha)dF(\alpha) = \overline{U}. \tag{1}$$

This condition determines the optimal value of δ in our setting. Note that the problem is well defined only if the supplier can have positive revenues from firm A notwithstanding the discount. This is the case if

$$\int_{\underline{\alpha}}^{\overline{\alpha}} cq_A^d(\delta;\alpha)dF(\alpha) > \overline{U}.$$

This condition implies an upper bound for the relevant values of $\overline{U}$ and is satisfied as long as the value of δ satisfying firm A's participation constraint (equation (1)) is lower than c. Henceforth, we assume that such a condition is satisfied.

Offering the discount involves a clear direct cost, $\overline{U}$, in terms of lost revenues from firm A for the supplier. However, it may also have an additional indirect cost, because offering a discount to firm A may reduce the supplier's revenues from firm B. To see this, consider firm B's demand in Lemma 1 when $\delta > 0$. Not only does firm B's demand fall with δ because of firm A's aggressive behavior, but also is firm B less likely to enter for relatively low level of demand ($\alpha \in [\alpha^*(0,K), \alpha^*(\delta,K)]$).

Considering these two effects, the supplier may experience a drop in profits because of the discount δ to firm A equivalent to:

$$\chi \equiv \int_{\alpha^*(0,K)}^{\overline{\alpha}} c\left(q_B^d(0;\alpha) - q_B^d(\delta;\alpha)\right) dF(\alpha) + \int_{\underline{\alpha}}^{\overline{\alpha}} \left[cq_A^d(0;\alpha) - (c-\delta)q_A^d(\delta;\alpha)\right] dF(\alpha), \tag{2}$$

where the first term corresponds to the lost revenues from firm B when firm A has a cost advantage, and the second term captures both the loss from selling to firm A at a discount and the additional revenues from the increased demand of firm A.

Expression (2) captures the total cost associated with the discount for the supplier. On the one hand, the discount affects the marginal cost of firm A and thus makes it more aggressive in the downstream market. This means that the supplier's sales to firm A rise, but at a smaller profit margin. On the other hand, firm B is less likely to enter for relatively low level of demand and purchases relatively less when it enters.

Given equation (1), χ can be rewritten as

$$\int_{\underline{\alpha}}^{\overline{\alpha}} c\left(q_A^d(0;\alpha) + q_B^d(0;\alpha) - q_A^d(\delta;\alpha) - q_B^d(\delta;\alpha)\right) dF(\alpha) + \overline{U}.$$

As summarized in the following proposition, the total cost of providing the discount, χ, is larger than the direct cost $\overline{U}$ if the cannibalization of the quantity sold to firm B is larger than the additional purchases of firm A. We label this effect, if present, as cannibalization of sales.

Proposition 1 *The total cost of providing the price discount to firm A, χ, is larger than the direct cost, $\overline{U}$, if the following condition is satisfied:*

$$\int_{\alpha^*(0,K)}^{\alpha^*(\delta,K)} \frac{(\alpha - c)}{6} dF(\alpha) > F(\alpha^*(\delta,K))\frac{\delta}{2} + (1 - F(\alpha^*(\delta,K))\frac{\delta}{3}. \tag{3}$$

In expected terms, the condition in Proposition 1 compares the lower quantity caused by the discount for intermediate values of α in the left-hand side (resulting from the shift from a duopoly to monopoly) with the higher quantity due to the discount for the remaining values of α (right-hand side). Thus, in markets in which a supplier has many small customers, which may not enter the market for intermediate realizations of the demand shock, the aggressive behavior of firm A involves large costs for the supplier. In these markets, cheap trade credit may be optimal.

3.3 Trade Credit

In what follows, we consider the case in which offering a discount to firm A implies high indirect costs for the supplier because sales to firm B are cannibalized ($\chi > \overline{U}$). We show that the supplier can offer a trade credit contract and eliminate the cannibalization of sales between customers.[11]

Consistent with our stylized facts, we model trade credit as a credit limit conditional on input purchases.[12] In particular, the supplier optimally chooses a limit $\overline{x}$, which allows firm A to purchase on account up to $q_A < \overline{x}/c$ units of the input. As we show below, this feature of the trade credit contract allows the supplier to transfer surplus without affecting competition in the downstream market and eliminates the cannibalization of sales.

Trade credit can successfully transfer surplus to firm A if it is cheaper than firm A's cost of capital. We denote the discount over the firm's cost of capital as ϕ. Note that if the supplier offers trade credit at zero cost, the discount is equal to firm A's cost of capital. The supplier can however arbitrarily increase the discount by lengthening trade credit maturity.

The supplier optimally chooses the trade credit discount and limit, ϕ and $\overline{x}$, respectively, in order to maximize its profits, subject to the constraint that it has to grant firm A an expected surplus of $\overline{U}$. We show that as long as $\chi > \overline{U}$, the supplier can always offer a trade credit contract that involves no indirect costs.

The trade credit offer implies that the supplier's expected profits from firm A are:

$$\int_{\underline{\alpha}}^{\overline{\alpha}} \left[(c-\phi) \min\left\{ \frac{\overline{x}}{c}, q_A^{tc}(\phi;\alpha) \right\} + c \max\left\{ q_A^{tc}(\phi;\alpha) - \frac{\overline{x}}{c}, 0 \right\} \right] dF(\alpha),$$

where q_A^{tc} denotes the demand schedule of firm A as a function of the trade credit discount,

[11]If $\chi < \overline{U}$, trade credit is never optimal because price discounts to the high-bargaining-power customer increase the supplier's sales.

[12]Such a feature of trade credit emerges also in contracting models with financial frictions as the need to satisfy suppliers/financiers' participation constraints and customers/borrowers' incentive-compatibility constraints implies an upper limit on trade credit (see, e.g., Burkart and Ellingsen, 2004). In our theory, this feature has a special role related to competition in downstream markets.

ϕ, and the demand shock, α.

The trade credit offer $(\overline{x}, \phi)$ has to satisfy firm A's participation constraint in expectation. This can be written as:

$$\phi \int_{\underline{\alpha}}^{\alpha^{**}\left(\frac{\overline{x}}{c}\right)} q_A^{tc}(\phi; \alpha) dF(\alpha) = \overline{U}, \tag{4}$$

where $q_A^{tc}(\phi, \alpha^{**}) = \frac{\overline{x}}{c}$ determines the level of the demand shock α^{**} such that firm A can purchase all the desired units on account. Up to this level of the shock realization, firm A can purchase on account obtaining a subsidy ϕ per dollar spent. Thus, its marginal cost, equivalent to the supplier's profit margin, is $c - \phi$. For higher realizations of the demand shock, if firm A purchases more than $\frac{\overline{x}}{c}$ units, its marginal cost, again equivalent to the supplier's profit margin, is c, as any units above this level cannot be purchased on account and are therefore not subsidized.

We consider the set of trade credit contracts $(\phi, \overline{x})$ such that the demand functions of firms A and B can be written as in Lemma 1, but substituting ϕ for δ for $\alpha \leq \alpha^*(0, K)$ and setting δ equal to zero for $\alpha \geq \alpha^*(0, K)$. This implies that for realizations of the demand shock above $\alpha^*(0, K)$, firm B finds it optimal to enter as if firm A were not transferred any surplus. We can thus compute the total cost of providing the subsidy to firm A following the same steps as in Proposition 1 to obtain the supplier's expected changes in revenues from firm A and firm B. It immediately follows that if $\alpha^{**} \leq \alpha^*(0, K)$, the right-hand side of equation (3), capturing the lost sales to firm B for intermediate realizations of the aggregate demand shock, is always zero because the entry decision of firm B is never distorted. Put differently, there is no cannibalization of sales to firm B because it enters for any realization of the shock above $\alpha \geq \alpha^*(0, K)$ and subsequently purchases the input precisely as if firm A were not transferred any surplus. Therefore, any trade credit contract with $\alpha^{**} \leq \alpha^*(0, K)$ eliminates the indirect cost of transferring surplus to firm A.

In sum, the supplier can always satisfy the participation constraint of firm A by choosing a sufficiently low $\overline{x}$ such that $\alpha^{**} \leq \alpha^*(0, K)$. By choosing a correspondingly sufficiently high ϕ, the supplier can satisfy the participation constraint (4).

The following proposition summarizes this result.

Proposition 2 *If* $\chi - \overline{U} > 0$*, the supplier always prefers to transfer* $\overline{U}$ *via trade credit rather than a price discount.*

The intuition behind Proposition 2 is the following. Trade credit is a contingent contract, which transfers surplus to firm A depending on the realization of the demand shock, α. For low levels of the aggregate demand, the actual value of the transfer to firm A depends on the level of its demand from the supplier. Since each additional unit of the good purchased comes with a trade credit subsidy ϕ, the marginal cost of firm A is $c - \phi$.

However, firm A cannot purchase on account any units above $\frac{\overline{x}}{c}$. As long as the supplier chooses a trade credit limit such that $\alpha^{**}\left(\frac{\overline{x}}{c}\right) \leq \alpha^{*}(0, K)$, firm A marginal cost is equal to c when firm B finds it optimal to enter the market. Thus, any indirect costs arising from sales cannibalization disappear when the supplier offers a trade credit contract to firm A. Put differently, trade credit enacts an increasing price schedule for the high-bargaining-power customer and thus eliminates any sales cannibalization.

Interestingly, the supplier may optimally choose a ϕ so high that it makes losses on the very first units sold. Our model shows that this is part of the supplier's profit-maximizing strategy, and not a sign that customers exploit suppliers. By heavily subsidizing the high-bargaining-power customer when demand is low, the supplier preserves its profits from other customers when aggregate demand is high.

3.4 Alternative Ways of Transferring Surplus

Trade credit implements a state-contingent price schedule, which allows the supplier to discriminate between customers and demand states. In this way, by targeting infra-marginal units, trade credit eliminates any spillover effects on competition in the downstream market and limits the distortions created by the transfer of surplus to a subset of customers. One may wonder whether other mechanisms could achieve the same outcome.

For instance, the supplier could transfer a fixed amount of cash, $\overline{U}$, to the high-bargaining-power customer, effectively offering a two-part tariff. In this case, the transfer would not be contingent on the realization of the aggregate demand shock even when demand is relatively low. While the direct cost of the cash transfer would be $\overline{U}$ as for trade credt, it would deliver lower expected profits than trade credit to the supplier. The reason is that for $\alpha \leq \alpha^*(0, K)$ the trade credit subsidy, ϕ, decreases firm A's marginal cost and consequently increases its demand for the good from the supplier. This increases the supplier's revenues when the aggregate demand is low and firm B would not enter. A fixed cash transfer does not yield this benefit and is therefore strictly dominated by trade credit.

In addition, trade credit may be preferable to a cash transfer for reasons that we do not explicitly model. The supplier may want some sort of profit sharing with the high-bargaining-power customer when demand and consequently profits are low if it is financially constrained. By partially subordinating the transfer on the purchases, trade credit may reduce external financing costs for the supplier and dominate any fixed cash transfer.

In a more general model, a financially constrained supplier may be compelled to transfer more surplus in high-demand states of the world because it faces a financial constraint when sales and consequently cash flows are low. This may be thought of as a binding upper bound on ϕ if the supplier is unable to extend the trade credit maturity beyond a certain point. Such an upper bound would imply that $\overline{x}$ may have to increase in a way that distorts firm B's entry decision. In this case, even if a transfer using trade credit implies some distortions on competition in the downstream market, the expected distortion is lower than with a price discount as long as states of the world with high α are sufficiently likely. Importantly, as we show in our empirical analysis, a decrease in the supplier's financial constraint does result in an increase the supplier's sales to low-bargaining-power customers.

3.5 Discussion

The model relies on a number of assumptions, which by no means are needed to generate the predictions we test in the empirical analysis. Our objective is to model trade credit to firms in a downstream market, in which a supplier has a few customers with high bargaining power and several other customers, with significantly less bargaining power. We model this insight assuming that a customer with no bargaining power enters the market with lower probability if the competitor is more aggressive. Our insight that trade credit is a way to transfer surplus to important customers without cannibalizing sales to high-profit-margin customers is however more general.

In particular, relaxing the assumptions on the demand schedules faced by firms in the downstream market, trade credit would yield the same benefits of targeting infra-marginal units and avoiding sales cannibalization if for instance the low-bargaining-power customer, firm B, faced a higher elasticity of demand.[13] Also in this case, a trade credit limit strictly lower than the minimum quantity that the high-bargaining-power customer generally purchases would allow to transfer surplus without sale cannibalization.

More in general, the key insight of our model is that trade credit targeting infra-marginal units makes dominant players in the downstream market less aggressive than price discounts and allows the supplier to expand sales to marginal customers in states of the world with high demand.

This mechanism does not require that there is a unique supplier in the upstream market. Even in the presence of other suppliers that provide price discounts to their customers, trade credit could limit competition in the downstream market by making some customers less aggressive. Suppliers would thus extend trade credit if they want to avoid the cannibalization of sales to their other customers. Interestingly, suppliers that are not well established in a downstream market may prefer to offer price discounts to make their few customers more aggressive and acquire market share through their expansion.

[13]This could be the case in a model with monopolistic competition.

Finally, we note that other mechanisms besides the sales cannibalization could justify cheap trade credit. For instance, suppliers may be unable to price discriminate between customers. If all customers have to be charged the same price for the input, cheap trade credit may be a way to offer a better deal to an important customer without violating any rules on price discrimination.

3.6 Predictions

The model generates the following predictions, which we bring to the data:

1. Sales are more likely to involve trade credit if customers have better outside options and high bargaining power.

2. Within the same downstream market, a supplier grants more trade credit to high-bargaining-power customers when it also provides inputs to other weaker-bargaining-power firms.

3. A relaxation of a supplier's financial constraints favoring trade credit provision is expected to allow the supplier to acquire more small customers.

In what follow, we first test our theoretical predictions about the cross-sectional determinants of trade credit provision. We then exploit time variation provided by a reform that reduced the cost of extending trade credit to study the real effects of trade credit on competition in downstream markets.

4 Evidence on Trade Credit Usage

4.1 Methodology

To test the model's predictions, we need evidence on whether customer bargaining power matters for trade credit provision and on how the effect of customer bargaining power depends on competition in the downstream market. The CRIBIS/CRIF credit register allows us to exploit not only substantial heterogeneity in supplier and customer characteristics, but also in the structure of local downstream markets. It is therefore an ideal environment to test our theory.

In most of the empirical analysis, we estimate the following model:

$$\begin{aligned} \textit{Trade Credit}_{f,s,t} &= \alpha_0 + \alpha_1 \times \textit{Log Mean Potential Distance}_{f,s,t} + \alpha_2 \times \textit{Relative Size}_{f,s,t} \\ &+ \alpha_3 \times \textit{Relative Size}_{f,s,t} \times \textit{Customer Base}_{i,r,s,t} + \theta \mathbf{X} + \eta_{s,t,i} + \delta_r + \varepsilon_{f,s,t}. \end{aligned}$$

All models are estimated using OLS and heteroskedasticity robust standard errors clustered at the customer-firm level. The dependent variable *Trade Credit* captures trade credit usage in transactions between a supplier s and a customer f in month t. In alternative specifications, it is either the *Ratio of Trade Credit in New Transactions*, or a binary variable equal to one if the transaction involves trade credit, *Dummy Use of Trade Credit*, or the logarithm of the trade credit exposure of a supplier to a given customer at the end of the month, *Log Exposure*. In some specifications, we also use the trade credit maturity as a proxy for the customer's willingness to provide trade credit.

An advantage of our setting is that trade credit does not involve early payments discounts in Italy.[14] This means that the measures of trade credit usage largely capture supply. Only if early payment discounts increase the cost of trade credit and the customers actively choose the timing of repayment, trade credit usage mixes demand and supply (Ng, Smith and Smith, 1999). For this reason, among our measures, only *Log Exposure* could be somewhat contaminated by demand if customers pay late. As we explain below, the robustness of our results to different measures of trade credit use and our empirical strategy assuage any concerns that demand may explain the results even when we use *Log Exposure*.

The explanatory variables include our two proxies for customer bargaining power. The

[14] Surveying the institutional features of trade finance in Italy, Cannari, Chiri and Omiccioli (2005) report that about 82% of the purchases on account do not involve any form of early payment discounts.

first, *Log Mean Potential Distance*, measures the distance of the customer from alternative suppliers of the same input, which we identify as alternative suppliers with the same four-digit-SIC code. Customers with nearby alternative suppliers may switch more easily. Therefore, they should have more bargaining power and may be able to obtain more trade credit, which implies $\widehat{\alpha}_1 < 0$.

The second measure, *Relative Size*, captures bargaining power through the ratio between the size (in terms of employment) of a customer and the size of the supplier. While actual bargaining power may be better captured by a customer's purchases from a given supplier relative to that supplier's total sales, purchases and sales depend on trade credit provision. For this reason, we base our bargaining power proxy on relative firm size, which can be taken as (more) exogenous to trade credit. A first test of the model is whether a customer that is larger than its supplier is able to obtain more trade finance, i.e., $\widehat{\alpha}_2 > 0$. The advantage of this second measure of bargaining power is that, differently from the first, it varies across customers in the same local downstream market. It therefore allows us to test whether the sensitivity of trade credit to bargaining power changes depending on the number of competitors that share the same supplier.

Our theory predicts that, within the same downstream market, the sensitivity of the trade credit supply to a customer's bargaining power should be higher if the supplier has other customers whose sales could be cannibalized. To test this, we measure the scope for sales cannibalization with the number of other customers of supplier s that operate within the same four-digit SIC code i and within the same region r as customer f, implicitly assuming that the competitors of a firm are not only in the same four-digit SIC code, but also in the same region. We define this variable *Customer Base* and interact it with *Relative Size* to study whether, consistent with our predictions, a supplier's decision to extend trade credit depends on the composition of its customer base. By interacting this variable with *Relative Size*, we test the mechanism through which bargaining power affects trade credit provision. In downstream markets with a large number of customers, trade credit allows the supplier to transfer a rent without negatively affecting its total revenues. Our theory would therefore imply that $\widehat{\alpha}_3 > 0$.

The matrix ($\mathbf{X}$) includes controls for a customer's age and operating profits as well as the total past transactions with that supplier, the size of the current transaction, and the distance between the supplier and the customer. More importantly, all specifications include triple interactions of supplier (s), time (t) and customer-industry (i) fixed effects ($\eta_{s,t,i}$) with time effects that are at the monthly level and customer-industry effects that are at the four-digit SIC code level. These interactions result in approximately 900 thousand fixed effects, which hold constant the supplier capacity to offer trade credit as well as the propensity to provide trade credit depending on the nature of the input transacted or the customer industry time-varying demand for trade credit. In practice, we implement a within-supplier estimator, which allows us to investigate how a supplier discriminates between different customers in the same industry at a given point in time, depending on their bargaining power and the number of competitors that share the same supplier. We also include region fixed effects, δ_r, throughout the analysis to account for local markets' geographic and institutional differences.

While computationally demanding, holding constant suppliers' characteristics across time and customer industries, our estimator allows us to rule out a wide-range of alternative explanations. A possible concern is that (observable and unobservable) customer characteristics, such as a customer's credit risk, determine the supplier's willingness to provide trade credit. This is unlikely because our inference is not only based on a customer characteristic, *Relative Size*, but also on its interaction with *Customer Base*. Nevertheless, to address this challenge, we show that our empirical results are robust to the inclusion of customer fixed effects and even of interactions of customer and time fixed effects.

While our main results are unaffected by the inclusion of these fixed effects, we do not include customer fixed effects in our baseline specifications because we observe relatively few customers with multiple suppliers in our data. Moreover, customers are likely to have different demand for the goods sold by different suppliers, and consequently trade finance.

This aspect of trade credit differs from bank credit as a borrower's demand for loans can often be assumed to be fungible across different banks (Khwaja and Mian, 2008) and limits how useful a within-customer estimator is to achieve identification.

Finally, we estimate our empirical model on alternative subsamples, perform a placebo test, and consider additional controls and outcome variables to evaluate alternative explanations. We introduce these tests below. Jointly, these tests provide full support for the implications of our theory.

4.2 Preliminary Evidence

Table IV relates our two proxies for customer bargaining power to the use of trade credit. Besides the ratio of trade credit in new sales (columns (1) to (3)), we consider the probability that any trade credit is used in new transactions (columns (4) to (6)) and the logarithm of a supplier's exposure to a given customer (columns (7) to (9)).

[Table IV About Here]

In all cases, we observe that customers with closer potential suppliers, which presumably have lower switching costs, are offered more trade credit. The effect is relatively large. Going from the bottom to the top quartile of potential suppliers' average distance in column (1) translates in 3 percentage points higher share of trade credit in a new transaction, corresponding to an 18% increase relative to the sample mean.

Similarly, the positive estimate on *Relative Size* in columns (1), (4), and (7) confirms that larger customers are able to perform a larger fraction of purchases on account. In columns (2), (5), and (8), we investigate whether the effect of *Relative Size* exhibits any non-linearities. The share of sales on trade finance increases by nearly 2.7 percentage points if *Relative Size* is larger than one, but smaller than 10 (*Relative Size Category 2*). Strikingly, the effect is significantly greater for customers that are 10 times larger than their suppliers (*Relative Size Category 3*). In these cases, the share of trade finance increases by about 9.3

percentage points. In columns (3), (6), and (9), we include customer fixed effects. As is consistent with our theory, we continue to find that a customer obtains more trade credit if the average distance of potential alternative suppliers of a given input is lower or if its relative size increases. Unsurprisingly, since most of the variation in our customer bargaining power proxies is cross-sectional, the effect of the relative size variable is reduced.

The effects we uncover are not only driven by the intensive margin: Customers are more likely to be offered trade credit when their bargaining power improves. As a consequence, customers with higher relative size in comparison to the supplier, or with closer potential suppliers, have a larger credit exposure towards that supplier. These results provide empirical support for the link between customer bargaining power and the provision of trade credit.

The remaining control variables provide interesting information. Overall, the negative effect of *Log Distance* in columns (4) to (9) indicates that distant customers are less likely to receive trade credit, and have a lower trade credit exposure to their suppliers. However, in columns (1) to (3), suppliers appear to allow distant customers to perform more purchases on account suggesting that conditional on offering some, suppliers offer more trade credit, but possibly for shorter periods, thus explaining the lower exposure. The mixed effect of distance hints that suppliers do not have close relationships with relatively distant customers and therefore they offer less trade credit, as is consistent with the findings of McMillan and Woodruff (1999). However, suppliers also seem to bribe some distant buyers by allowing a higher proportion of purchases on account, an effect similar to the one highlighted in banking by Degryse and Ongena (2005).

More interestingly for the purpose of testing our theory, the ratio of trade credit to sales decreases with past revenues and increases with current revenues. This finding fully supports our theory implication that suppliers avoid offering marginal units of the good on account. It is also consistent with the evidence in Figure 5, which documents a non-monotonic relationship between current and past trade credit usage.

Finally, as is consistent with earlier literature emphasizing the role of financial constraints, it appears that older and more profitable customers obtain less trade credit.[15] This makes even more surprising the positive and significant coefficients of *Relative Size*. Larger customers, and especially much larger customers, are unlikely to be more financially constrained than their suppliers. Nevertheless, they obtain lots of trade credit. This, together with our stylized facts, further indicates the relevance for a complementary theory of trade credit based on customer bargaining power.

4.3 Main Results

In Table V, we test the main prediction of our theory, i.e., that trade credit is used by suppliers to avoid the cannibalization of sales to low-bargaining-power customers. We explore whether a supplier extends more trade credit when it has many competing customers in the same market, as captured by *Customer Base*.

[Table V About Here]

Consistent with the predictions of the model, the interaction between *Relative Size* and *Customer Base* is positive across all columns. Suppliers with a larger customer base in a downstream market offer more trade credit to high-bargaining-power customers. As shown in columns (2), (5), and (8), also in this case, the effect is monotonically increasing in the customer's bargaining power.

Quantitatively, the elasticity of trade credit to the customer's bargaining power increases considerably with the number of firms in the supplier's customer base. In column (1), going from the bottom to the top decile of the suppliers' customer base increases the sensitivity of trade credit provision to bargaining power by 64% (5.446×0.025 relative to the baseline of 0.249). The sensitivity more than doubles in the case of the extensive margin of trade credit

[15] In order not to lose too many observations due to missing information in the dataset providing firms balance sheets, we control for beginning-of-period customer characteristics from the trade credit registry. These controls thus drop out in the specifications with customer fixed effects. We show that time-varying customer characteristics do not affect our findings by including customer-month fixed effects in the robustness checks.

(i.e., the probability that some trade credit is used in a new transaction), while it increases by two and half times for the aggregate exposure (5.446×0.675 relative to the baseline of 2.434).

[Table VI About Here]

One may wonder whether *Customer Base* may capture regions with many firms in a given industry. In these downstream markets, high-bargaining-power customers may be particularly important and extract more trade credit independently from whether their competitors share the same supplier and the potential for sales cannibalization. To evaluate the merit of this alternative explanation, we design a placebo test. We consider how the presence of firms that compete with many customers that are not clients of the same supplier affects the impact of a customer's bargaining power on trade credit provision. We define *Outside Customer Base* as the number of firms in the same region and four-digit SIC code of customer *f*, which are not clients of the same supplier. If suppliers offer trade credit, instead of discounts, to high-bargaining-power customers to avoid the cannibalization of sales, the interaction between *Outside Customer Base* and *Relative Size* should not have the same impact as the one between *Customer Base* and *Relative Size.* If anything, our theory would imply that a higher number of competitors that are not its customers should induce the supplier to provide the input at a lower price rather than trade credit, in order to favor its clients' acquisition of market share.

The estimates in Table VI are fully consistent with our theory. Indeed, suppliers appear to provide less trade credit when an important customer is surrounded by competitors that are not in its customer base. Consider a customer in a market with no other customer of the same supplier, but with number of competitors in the top decile. The sensitivity of the suppliers' trade credit provision to such a customer's relative size is close to 0 (as results from 9.52×(−0.035) relative to 0.481). Instead, the elasticity of a customer at the top decile of the suppliers' *Customer Base* but with no outside competitors is 0.68 (0.037×5.446).

Such an interpretation is consistent with the empirical evidence that firms that are offered more trade credit have higher input costs (Table III). More importantly, this indicates that there is nothing peculiar to the customer, the location, or the industry driving trade credit. Instead, competition between firms in the downstream market and the supplier's incentives to avoid sales cannibalization explains why suppliers offer trade credit to high-bargaining-power customers.

4.4 Maturity and Late Payments

While so far we have focused on the quantity of trade credit provided, trade credit maturity is another feature of the contract related to the supplier's willingness to offer trade credit. Longer maturity at zero cost signifies that the supplier is more inclined to offer trade credit.

Table VII exploits information on the contracted maturity of trade credit. In columns (1) to (3), the dependent variable is the agreed maturity of trade credit extended by a supplier to a given customer. It is computed as the logarithm of the number of days since delivery when a payment is due. In columns (5) to (7), the dependent variable is a dummy that takes value equal to one if the supplier offered trade credit with maturity longer than 120 days. We use the same specification as in the tests above, except that the sample only includes transactions that involve trade credit.

[Table VII About Here]

We find that the customer's bargaining power lengthens the maturity of trade credit in the same way as it increases the amount of trade credit supplied. Moreover, the effect of the customer's bargaining power is stronger when the supplier has a larger number of customers in the same market. Instead, the presence of a larger number of competitors that are not clients of the same supplier is associated with a shorter maturity of trade credit. Consistent with our earlier findings, this suggests that the supplier substitutes trade credit with price discounts, to make customers more aggressive in the downstream market. The effects in

Table VII are not only statistically, but also economically significant. A high-bargaining-power firm obtains 3.1% longer maturity in downstream markets when the supplier has many other customers. This seems significantly more important for longer term maturities, as the probability of receiving trade credit with a maturity longer than 120 days (on average, 6% of the sample) is strictly increasing in the logarithm of a firm's competitors that are customers of the same supplier.

An alternative explanation for our findings is that suppliers are more willing to supply trade credit when they deem the customer to be more creditworthy. Not only customers with high *Relative Size* may be considered to be more creditworthy, but suppliers may have an information advantage in evaluating customers and obtaining a repayment when they have relationships with many firms in the same downstream market.

To evaluate the merit of this alternative explanation in columns (4) and (8) of Table VII, we consider whether customers with high bargaining power are indeed more creditworthy. To do so, we use the length and incidence of late payments relative to the agreed maturity as dependent variables. If customer creditworthiness matters, we would expect late payments to be strictly decreasing with relative size. The estimates in columns (4) and (8) clearly reject this hypothesis. If anything, high-bargaining-power customers appear to take advantage of their suppliers by paying late. This suggests that some customers exercize their bargaining power also by choosing the timing of repayment.

4.5 Robustness

Table VIII presents a number of additional robustness tests for our main findings. Specifically, we address concerns related to the measurement of competition in downstream markets, the impact of the length of the relationship on trade credit, and customer unobserved time-varying characteristics.

[Table VIII About Here]

First, in columns (1), (5), and (9) (labeled *HHI*), we measure a supplier's incentives to avoid sales cannibalization by high-bargaining-power customers using the Herfindahl index of its customers' employment, instead of the number of its customers in that downstream market.[16] A low HHI indicates that the supplier's customer base is dispersed. Thus, even if a few customers with high *Relative Size* have stronger bargaining power, the supplier may be concerned about the cannibalization of sales to other relatively smaller customers. The interactions in all columns are negative and indicate that, consistent with our previous results, relative size matters the most when the supplier's customer base is very fragmented. In column (1), an HHI close to one (indicating a very concentrated customer base) drives the effect of relative size close to zero.

So far we have assumed that competition is local and that firms within the same industries are more likely to cannibalize the sales of their competitors located in the same region. To focus on industries in which this assumption is definitely valid, in columns (2), (6), and (10) (labeled *Non-Tradables*), we consider only customers in non-tradable industries, such as transport, services, and retail. Our estimates are qualitatively invariant, although the interaction term between *Customer Base* and *Relative Size* loses significance when we use the *Ratio of Trade Credit in New sales* as dependent variable. This is most likely due to the fact that in this subsample the extent of competition with other customers of the same supplier may be measured noisily because especially in the retail industry, firms are organized as chains. Since we only know the address of the headquarters, *Customer Base* may be understated.

This test is helpful also because in non-tradables industries, firms' location choices are driven by their demand and not by their supplier location, which allows us to more easily interpret the distance variables without incurring in reverse causality problems.[17]

[16]Results are similar if we compute the HHI using sales instead of employment. We tabulate estimates based on employment instead of sales because the latter more directly depend on trade credit.

[17]One of our proxies for customer bargaining power, the average distance of alternative potential suppliers, is based on the geography of potential suppliers. To study whether its effect may be driven by the fact that suppliers located in the North are reluctant to provide trade credit to customers in Southern Italy, which has higher crime rate and weaker enforcement of laws, we repeat our tests excluding all customers located

In the columns labeled *Length*, we include a measure of the length of the relationship between the supplier and the customer as a control. The variable *Length* is measured in number of months between the transaction and the first appearance of supplier-customer link. The main estimates of interest remain unaffected, suggesting that high-bargaining-power customers are not simply long-term clients. The effect of the *Length* on trade credit provision is negative and significant suggesting that trade credit is more used at the start of a relationship possibly to guarantee the quality of the good (Long, Malitz, and Ravid, 1993).

Finally, in columns (4), (8), and (12) (labeled *Customer×Time FE*), we control for customer time-varying characteristics non-parametrically by including interactions of customers and time fixed effects. While *Relative Size* loses significance as it may be expected given that variability between suppliers may be limited, its interaction with *Customer Base* is positive and statistically significant. This is fully consistent with our theory and previous results: Given the relative bargaining power of their customers, suppliers' propensities to supply trade credit depend on their *Customer Base* in a given downstream market and the scope for sales cannibalization.

5 Real Effects of Trade Credit Provision

While so far we have taken a supplier's customer base as given, in this section, we study how an exogenous change in suppliers' ability to provide trade credit affects customer-supplier relationships in the downstream market and customers' production costs. Our model implies that trade credit provision affects competition in downstream markets. Financially constrained suppliers are unable to transfer surplus to their high-bargaining-power customers using trade credit. Due to their immediate needs for cash, they may instead use price discounts making high-bargaining-power customers more aggressive and incurring in the cannibalization of sales to small, low-bargaining-power firms. A relaxation of suppliers' financial constraints should favor the provision of trade credit to high-bargaining-power customers

in Southern Italy. Our results are qualitatively and quantitatively invariant.

and relationships with low-bargaining-power customers.

5.1 The 2014 Reform

To study whether the real effects of trade credit are consistent with our theory, we exploit an arguably exogenous shock to suppliers' ability to provide trade credit. A reform in 2014 lowered the costs of purchasing and securitizing receivables for banks. The reform consisted of two pieces of legislation that changed the content of Law 130, which dated back to 1999. The Decreto Legge 145/2013 (*Decreto Destinazione Italia*), approved in December 2013 and converted into law in February 2014, established a separation between securitized trade credit and the rest of the debtor's assets, similar to what anti-recharacterization laws did in the U.S. (see, e.g., Favara, Gao and Giannetti, 2018). Thanks to the law change, any Special Purpose Vehicles (SPV) to which securitized receivables are conferred became senior relative to other creditors. Furthermore, Decreto Legge 91/2014 (*Decreto Crescita*), approved in June 2014 and converted into law in August of the same year, introduced two additional changes to Law 130. First, it increased flexibility in the possibility of securitizing receivables by relaxing a homogeneity requirement in the assets of SPVs. Second, it provided greater legal certainty on the repayment dates of portfolio loans and reduced issuance costs.

These reforms facilitating the sales of receivables should have increased the ability of suppliers to offer trade credit. As we show below, we find no evidence that the reform might have had an independent effect on the availability of financial loans, especially to small firms. Consequently, we can use the reform to explore the effects of the improved suppliers' ability to provide trade credit.

Our theory implies that financially constrained firms should have increased the supply of trade credit to high-bargaining-power customers thus increasing their sales to other, smaller firms. To evaluate these implications, we start testing whether the reform increased the provision of trade credit to high-bargaining-power customers. We estimate the following model:

$$TC_{f,s,t} = \beta_0 + \beta_1 \times \mathit{Large\ Customer}_{f,s,t} + \beta_2 \times \left(\mathit{Large\ Customer}_{f,s,t} \times \mathit{Reform}_t\right) + \theta\mathbf{X} + \eta_{s,t,i} + \varepsilon_{f,s,t}.$$

To simplify the interpretation, we convert the continuous measure of relative size into a dummy variable, *Large Customer*, equal to one if the customer is larger than the supplier, i.e., *Relative Size*>1. *Reform* is a dummy variable equal to one from July 2014 onwards, and equal to zero otherwise. In all specifications, the fixed effects, $\eta_{s,t,i}$, include not only the triple interaction between supplier, time and customer industry fixed effects, but also region fixed effects. The other variables are otherwise the same as in the earlier specifications. If, after the reform, high-bargaining-power customers are indeed able to obtain more trade credit from their suppliers, we expect that $\widehat{\beta}_2 > 0$.

The theory predicts that an improved ability to provide trade credit to high-bargaining-power customers in a downstream market should favor new relationships with low-bargaining-power customers in that market. To test this, we consider the number of new relationships that a supplier s starts at time t in the downstream market i. We also consider a supplier's growth of sales to relatively small customers. We test whether after the reform the propensity of a supplier to start new relationships and to sell to small customers is stronger in markets in which ex-ante suppliers have more high-bargaining-power customers, as captured by the Herfindahl index of the customers' employees in those downstream markets, *HHI*. We thus estimate the following equation:

$$\mathit{New\ Relationship}_{s,t,i} = \gamma_0 + \gamma_1 \times \mathit{HHI}_{s,t,i} + \gamma_2 \times \mathit{HHI}_{s,t,i} \times \mathit{Reform}_t + \eta_{s,t,i} + \epsilon_{s,t,i}.$$

The dependent variable, $\mathit{New\ Relationship}_{s,t,i}$, is a dummy variable equal to one if the supplier acquires at least a new, low-bargaining-power customer in the local downstream market

i during period t. In alternative specifications, we consider the growth of sales to low-bargaining-power customers of supplier s in the local downstream market i during period t. We define customers with low bargaining power as customers with less than 50 employees, or customers that are smaller than the supplier (i.e., such that *Relative Size*< 1). We capture heterogeneity in the presence of large customers in local downstream markets using the *HHI* of the supplier's customer base. A higher *HHI* captures the presence of large, potentially high-bargaining-power, customers in a downstream market; it allows us to test whether the use of trade credit following the reform fosters relationships and sales to small customers, i.e., $\widehat{\gamma}_2 < 0$, precisely in markets in which sales cannibalization may have been more pronounced due to the presence of high-bargaining-power customers.[18] The fixed effects, $\eta_{s,t,i}$, include not only the triple interaction between supplier, time and customer industry fixed effects, but also region fixed effects. To exclude contemporaneous shocks on local demand, in a few specifications, we also include interactions of region, time, and customer industry fixed effects. Standard errors are clustered at the supplier's local downstream market level.

We further test our theoretical mechanism that an increase in trade credit should induce high-bargaining-power customers to accept higher unit prices for their inputs. In the absence of transaction prices, we test whether input costs increase after the reform, especially for high-bargaining-power customers. We estimate the following model:

$$\begin{aligned} \textit{Input Costs}_{f,t} \quad = \pi_0 \quad & + \pi_1 \times \overline{\textit{Large Customer}}_{f,t} + \pi_2 \times \left(\overline{\textit{Large Customer}}_{f,t} \times \textit{Reform}_t\right) \\ & + \theta \mathbf{X} + \eta_f + \varepsilon_{c,t}. \end{aligned}$$

The dependent variable *Input Costs* is defined as the ratio between a customer's input costs over sales, and is measured using yearly balance sheet data. The variable $\overline{\textit{Large Customer}}$ is a dummy that takes value equal to one if the weighted average of *Relative Size* of firm f with respect to all its suppliers is larger than one. The weights are proportional to a

[18] Results are qualitatively similar to the ones we report hereafter if we use a dummy for the presence of a large customer in a downstream market instead of the *HHI*.

customer's purchases from a given supplier during the year. The specification tests whether an increase in trade credit provision to high-bargaining-power customers after the reform was accompanied by higher input costs, i.e., $\widehat{\pi}_2 > 0$. The specification also includes control variables for customers' characteristics, such as receivables, size measured by assets, and fixed effects (η_f) at the customer level. Finally, standard errors are clustered at the customer level.

5.2 Findings

Table IX tests whether suppliers are able to provide more trade credit to high-bargaining-power customers after the reform of 2014.

[Table IX About Here]

Consistent with our earlier findings, customers that are larger than their suppliers obtain significantly more trade credit. More importantly, the reform increases the availability of trade credit precisely for these high-bargaining-power customers, not for relatively smaller and presumably more financially constrained firms. The effect is not only statistically, but also economically significant: The sensitivity of trade credit provision to customers' bargaining power increases by 20% after the reform. This evidence suggests that, before the reform, suppliers faced financial constraints limiting their ability to provide trade credit.

Table X tests whether the increased provision of trade credit to relatively large customers affects positively the sales to small firms, as our theory would imply. In particular, in columns (1) to (4), we test whether supplier establish new relationships with relatively smaller customers.

[Table X About Here]

The negative sign on *HHI* suggests that, in downstream markets in which they have more concentrated sales, suppliers are less likely to start new relationships with small firms. After the reform, arguably thanks to the increased ability to provide trade credit to large customers, suppliers become more likely to establish new relationships with smaller firms. The results are robust in columns (2) and (4), in which we include interactions of location, time, and customer industry fixed effects in order to absorb demand shocks in local downstream markets. In columns (5) and (6), the results are equally robust if instead of new relationships, we consider the supplier's growth of sales to low-bargaining-power customers.

The findings in Table X are fully consistent with our theory. In particular, an increase in the ability to provide trade credit to large customers after the reform appears to have increased suppliers' ability to establish new relationships and to sell to low-bargaining-power firms.

[Table XI About Here]

The above interpretation requires that marginal costs increase for high-bargaining-power customers. Table XI tests this link considering customers' input costs. The interaction between our measure of $\overline{\textit{Large Customer}}$ and the *Reform* dummy is positive and statistically significant. This suggests that high-bargaining-power customers, which after the reform obtain more trade credit, indeed experience an increase in input costs of about 0.4 percentage points.

Finally, columns (3) to (6) consider a potential alternative mechanism. By enhancing the ability to use receivables as collateral, the reform might have relaxed financial constraints, especially for small firms. To evaluate this alternative explanation, we use the same specification as the one for input costs considering financial leverage and short-term financial leverage as dependent variables. We find no evidence that small firms are able to access more financial loans after the reform. If anything, the financial leverage of large firms increases to a larger extent. This evidence dispels any concerns that our results may be driven by a relaxation of financial constraints for small firms.

6 Conclusions

We propose a theory of trade credit to high-bargaining-power customers. By offering cheap trade credit to high-bargaining-power customers, suppliers can limit competition in the downstream market, an objective that they would not be able to achieve by simply granting uniform price discounts.

We test this conjecture using a unique registry from Italy, which allows us to match customers and suppliers. We find that suppliers offer more trade credit when customers have high bargaining power and fear the cannibalization of sales to other customers in the local downstream market. The number of competitors of a customer, which do not share the same supplier, do not help explain why high-bargaining-power customers receive more trade credit.

Consistent with the implications of our theory, suppliers' ability to offer trade credit affects the structure of downstream markets. Using a reform that increases the ability of financially constrained suppliers to provide trade credit, we show that arguably exogenous changes in trade credit provision increase suppliers' sales to relatively small firms in downstream markets. Thus, long from favoring large, high-bargaining-power firms, trade credit stimulates dynamic efficiency.

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Table I: Descriptive Statistics

Variable	Mean	25th Percentile	Median	75th Percentile	Standard Deviation	Min	Max	N
Panel A: Supplier Characteristics								
Size	279.04	21.00	74.00	140.00	1,721.18	1.00	30,593.00	19,623,468
Total Exposure Amount	38,762.33	438.66	1,933.54	8,259.48	212,926.51	0.00	3,731,653.75	14,049
Number of Customers	1,396.79	171.00	393.00	980.00	5,303.96	1.00	96,479.00	14,049
Number of Customers Within the Same Region-SIC	53.27	3.00	11.00	43.00	121.63	1.00	1,123.00	19,623,468
Share of Sales to Customers Within the Same Region-SIC	0.24	0.00	0.03	0.34	0.37	0.00	1.00	19,623,468
Panel B: Customer Characteristics								
Size Customer	112.41	4.00	10.00	29.00	1,219.09	0.00	142,414.00	19,552,258
Total Customer Exposure (>0)	103.82	0.39	1.68	9.18	1,955.58	0.00	545,716.06	5,245,599
Number of Suppliers	1.79	1.00	1.00	2.00	1.64	1.00	101.00	11,930,995
Panel C: Supplier-Customer Transactions								
New Sales	41.02	0.18	0.96	5.38	735.46	0.00	416,310.78	19,623,467
Dummy Use of Trade Credit	0.28	0.00	0.00	1.00	0.45	0.00	1.00	17,475,440
Ratio of Trade Credit in New Sales	0.16	0.00	0.00	0.06	0.33	0.00	1.00	17,475,440
Exposure Amount (>0)	69.86	0.37	1.52	7.62	1,242.87	0.00	416,310.78	7,795,505
Dummy Positive Exposure	0.40	0.00	0.00	1.00	0.49	0.00	1.00	19,623,174
Contractual Maturity (days)	61.38	31	58	77	49.07	0.00	4092	6,423,836
Delay (days)	28.60	0	0	10	65.75	0	240	6,508,316
Panel D: Supplier-Customer Characteristics								
Distance (km)	350.08	159.32	302.52	481.41	243.17	1.00	1,229.40	19,623,468
Potential Distance (km)	370.08	277.36	341.29	414.42	131.41	95.00	1,073.75	19,623,468
Relative Size	4.39	0.04	0.16	0.70	94.16	0.00	71,207.00	19,623,468

Pooled transaction and credit data at the customer-supplier-month level for the period from 2012.09 to 2016.08. The data contains 19,623,468 distinct customer-supplier-month observations, featuring 418,915 distinct customers, 672 distinct suppliers, and 1,146,747 distinct customer-supplier relationships. All variables are defined in Appendix 1.

Table II: Stylized Facts on Trade Credit Use - Credit Limits

	Ratio of Trade Credit in New Sales			Log Exposure
	(1)	(2)	(3)	(4)
Rolling Sum (3 Months)	0.004***	0.008***		
	(0.001)	(0.001)		
Sq. Rolling Sum (3 Months)		-0.005**		
		(0.002)		
Rolling Sum (6 Months)			0.009***	0.592***
			(0.001)	(0.076)
Sq. Rolling Sum (6 Months)			-0.006***	-0.375***
			(0.002)	(0.117)
Supplier*Time*Customer SIC FE	Yes	Yes	Yes	Yes
Location & Time FE	Yes	Yes	Yes	Yes
R-squared	0.295	0.296	0.296	0.396
N	17,475,406	17,475,406	17,475,406	19,623,446

We regress the ratio of trade credit in new sales in a given customer-supplier relationship during month t on the rolling sum of past purchases of the customer from that supplier. Rolling sums are defined over the 3-month and 6-month horizon at the customer-supplier level. The rolling sums are normalized to have mean 0 and standard deviation 1. The specification includes fixed effects, with standard errors clustered at the customer level. One star denotes significance at the 10% level, two stars denote significance at the 5% level, and three stars denote significance at the 1% level.

Table III: Stylized Facts on Trade Credit Use - Customer Input Costs

	Customer Input Costs			
	Ratio of Trade Credit in New Sales		Log Exposure	
	(1)	(2)	(3)	(4)
Trade Credit Granted	0.008***	0.005*	0.004***	0.003***
	(0.002)	(0.002)	(0.000)	(0.001)
Share of Suppliers		-0.013***		-0.039***
		(0.003)		(0.009)
TC Granted*Share of Suppliers		0.017*		0.002***
		(0.009)		(0.001)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Covariates	No	Yes	No	Yes
R-squared	0.749	0.781	0.750	0.781
N	787,882	578,717	787,882	578,717

We regress a firm's input costs on measures of trade credit usage. Using yearly balance sheet data, we define the dependent variable as the ratio of input costs relative to sales. From the transaction data, we compute for each customer a measure of *Trade Credit Granted* during the year. In columns (1) and (2), *Trade Credit Granted* is the share of new sales financed through trade credit. In columns (3) and (4), it is the logarithm of the total amount of trade credit received. The variable is then standardized to have mean 0 and standard deviation 1. *Share of Suppliers* is the ratio of total sales registered in the transaction data over one year relative to the input costs from the firm balance sheet during the same year. Other covariates include the logarithm of receivables and the logarithm of total assets. The specification includes fixed effects as indicated in the table, with standard errors clustered at the customer level. One star denotes significance at the 10% level, two stars denote significance at the 5% level, and three stars denote significance at the 1% level.

Table IV: Trade Credit Use and Bargaining Power

	Ratio of Trade Credit in New Sales			Dummy Use of Trade Credit				Log Exposure	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log Distance	0.002***	0.002***	0.001***	-0.001***	-0.001**	-0.002***	-0.037***	-0.035***	-0.032***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.004)	(0.004)	(0.005)
Log Mean Potential Distance	-0.077***	-0.077***	-0.076***	-0.053***	-0.053***	-0.058***	-0.258***	-0.257***	-0.326***
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.020)	(0.020)	(0.028)
Log Past Revenues	-0.005***	-0.005***	-0.012***	0.019***	0.019***	0.015***	0.569***	0.569***	0.577***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.002)	(0.002)
Log Current Revenues	0.016***	0.016***	0.018***	0.029***	0.029***	0.029***	0.148***	0.147***	0.105***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Customer Log Age	-0.006***	-0.007***		-0.007***	-0.008***		-0.087***	-0.103***	
	(0.000)	(0.000)		(0.000)	(0.000)		(0.004)	(0.004)	
Customer Operating Profits	-0.110***	-0.111***		-0.101***	-0.101***		-0.499***	-0.509***	
	(0.005)	(0.005)		(0.005)	(0.005)		(0.050)	(0.050)	
Relative Size	0.305***		0.034***	0.300***		.0524***	3.933***		0.832***
	(0.009)		(0.010)	(0.009)		(0.011)	(0.094)		(.111)
Relative Size Category 2		0.027***			0.027***			0.434***	
		(0.001)			(0.001)			(0.011)	
Relative Size Category 3		0.093***			0.085***			1.220***	
		(0.003)			(0.002)			(0.026)	
Supplier*Time*Customer SIC FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Customer FE	No	No	Yes	No	No	Yes	No	No	Yes
Location & Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.374	0.376	0.522	0.380	0.381	0.482	0.565	0.570	0.673
N	15,037,179	15,146,677	16,525,182	15,037,187	15,146,685	16,525,194	15,037,187	15,146,685	16,525,194

We relate different measures of trade credit use to the proxies for customer bargaining power, using pooled transaction and credit data at the customer-supplier-month level for the period from 2012.09 to 2016.08. All variables are defined in Appendix I. Mean potential distance in km has been divided by 1,000; we consider the natural logarithm of this variable in our empirical models. Relative Size has been divided by 100. The specification includes fixed effects, with standard errors clustered at the customer level. One star denotes significance at the 10% level, two stars denote significance at the 5% level, and three stars denote significance at the 1% level.

Table V: Trade Credit Use, Bargaining Power, and the Suppliers' Customer Base

	Ratio of Trade Credit in New Sales			Dummy Use of Trade Credit			Log Exposure		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log Mean Potential Distance	-0.077***	-0.077***	-0.076***	-0.053***	-0.054***	-0.060***	-0.262***	-0.267***	-0.344***
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.020)	(0.020)	(0.028)
Customer Base	-0.001	-0.001	0.003***	0.000	-0.000	0.009***	-0.013***	-0.022***	0.059***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.005)	(0.005)	(0.007)
Relative Size	0.249***		-0.021	0.193***		0.003	2.434***		-0.431***
	(0.014)		(0.014)	(0.014)		(0.015)	(0.151)		(0.153)
Relative Size Category 2		0.020***			0.009***			0.189***	
		(0.002)			(0.002)			(0.018)	
Relative Size Category 3		0.082***			0.064***			0.857***	
		(0.004)			(0.004)			(0.040)	
Relative Size*Customer Base	0.025***		0.025***	0.039***		0.023***	0.675***		0.573***
	(0.005)		(0.005)	(0.005)	(0.005)	(0.062)	(0.059)		
Relative Size Category 2*Customer Base		0.002***			0.007***			0.089***	
		(0.000)			(0.001)			(0.006)	
Relative Size Category 3*Customer Base		0.005***			0.008***			0.147***	
		(0.001)			(0.001)			(0.015)	
Supplier*Time*Customer SIC FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Customer FE	No	No	Yes	No	No	Yes	No	No	Yes
Location & Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.374	0.376	0.522	0.380	0.381	0.482	0.566	0.570	0.673
N	15,037,179	15,146,677	16,525,182	15,037,187	15,146,685	16,525,194	15,037,187	15,146,685	16,525,194

We relate different measures of trade credit use to the proxies for customer bargaining power, using pooled transaction and credit data at the customer-supplier-month level for the period from 2012.09 to 2016.08. Mean potential distance in km has been divided by 1,000; we consider the natural logarithm of this variable in our empirical models. Relative Size has been divided by 100. Additional control variables, whose coefficients are omitted, are *Log Distance*, *Log Past Revenues*, *Log Current Revenues*, *Customer Log Age*, and *Customer Operating Profits*. All variables are defined in Appendix I. The specification includes fixed effects, with standard errors clustered at the customer level. One star denotes significance at the 10% level, two stars denote significance at the 5% level, and three stars denote significance at the 1% level.

Table VI: Trade Credit Use, Bargaining Power, and Competition in Downstream Markets

	Ratio of Trade Credit in New Sales			Dummy Use of Trade Credit				Log Exposure	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log Mean Potential Distance	-0.078***	-0.078***	-0.076***	-0.053***	-0.057***	-0.060***	-0.263***	-0.268***	-0.344***
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.021)	(0.021)	(0.028)
Outside Customer Base	0.040**	0.034*	0.030	0.024	0.011	-0.002	0.021	-0.115	-0.219
	(0.018)	(0.018)	(0.024)	(0.020)	(0.020)	(0.026)	(0.175)	(0.175)	(0.236)
Customer Base	-0.000	-0.001	0.003***	0.001	-0.001	0.009***	-0.012**	-0.027***	0.056***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.006)	(0.006)	(0.007)
Relative Size	0.481***		0.041	0.257***		-0.068	2.522***		-0.662
	(0.052)		(0.055)	(0.048)		(0.056)	(0.498)		(0.567)
Relative Size Category 2		0.057***			0.034***			0.399***	
		(0.005)			(0.006)			(0.058)	
Relative Size Category 3		0.154***			0.089***			1.033***	
		(0.014)			(0.012)			(0.131)	
Relative Size*Customer Base	0.037***		0.027***	0.042***		0.020***	0.679***		0.566***
	(0.006)		(0.005)	(0.006)		(0.006)	(0.066)		(0.061)
Relative Size Category 2*Customer Base		0.004***			0.008***			0.100***	
		(0.001)			(0.001)			(0.007)	
Relative Size Category 3*Customer Base		0.008***			0.009***			0.155***	
		(0.001)			(0.001)			(0.017)	
Relative Size*Outside Customer Base	-0.035***		-0.009	-0.009		0.010	-0.013		0.033
	(0.008)		(0.008)	(0.007)		(0.007)	(0.072)		(0.079)
Relative Size Category 2*Outside Customer Base		-0.005***			-0.004***			-0.032***	
		(0.001)			(0.001)			(0.008)	
Relative Size Category 3*Outside Customer Base		-0.011***			-0.004**			-0.026	
		(0.002)			(0.002)			(0.020)	
Supplier*Time*Customer SIC FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Customer FE	No	No	Yes	No	No	Yes	No	No	Yes
Location & Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.374	0.375	0.522	0.380	0.381	0.482	0.566	0.570	0.673
N	15,037,179	15,146,677	16,525,182	15,037,187	15,146,685	16,525,194	15,037,187	15,146,685	16,525,194

We relate different measures of trade credit use to the proxies for customer bargaining power, using pooled transaction and credit data at the customer-supplier-month level for the period from 2012.09 to 2016.08. Mean potential distance in km has been divided by 1,000; we consider the natural logarithm of this variable in our empirical models. Relative Size has been divided by 100. Additional control variables, whose coefficients are omitted, are *Log Distance*, *Log Past Revenues*, *Log Current Revenues*, *Customer Log Age*, and *Customer Operating Profits*. All variables are defined in Appendix I. The specification includes fixed effects, with standard errors clustered at the customer level. One star denotes significance at the 10% level, two stars denote significance at the 5% level, and three stars denote significance at the 1% level.

Table VII: Maturity of Trade Credit

	Log Maturity				Maturity ≥ 120 Days			
	Contractual			Delay		Contractual		Delay
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log Mean Potential Distance	-0.046***	-0.080***	-0.081***	-0.126***	-0.004	-0.012***	-0.012***	-0.008*
	(0.010)	(0.014)	(0.014)	(0.023)	(0.003)	(0.004)	(0.004)	(0.004)
Customer Base	0.006**	0.018***	0.013***	-0.019***	0.001*	-0.000	-0.000	-0.003**
	(0.003)	(0.004)	(0.005)	(0.007)	(0.001)	(0.001)	(0.001)	(0.001)
Outside Customer Base			-0.024	-0.010			0.001	0.002
			(0.023)	(0.033)			(0.007)	(0.006)
Relative Size	0.358**	0.335**	1.338***	0.502	-0.024	-0.017	-0.018	0.292***
	(0.154)	(0.155)	(0.357)	(0.464)	(0.048)	(0.052)	(0.086)	(0.074)
Relative Size*Customer Base	0.184***	0.117**	0.224***	0.085	0.065***	0.054***	0.054**	0.018
	(0.046)	(0.050)	(0.055)	(0.074)	(0.017)	(0.018)	(0.022)	(0.012)
Relative Size*Outside Customer Base			-0.246***	-0.112			0.000	-0.044***
			(0.073)	(0.101)			(0.020)	(0.016)
Supplier*Time*Customer SIC FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Customer FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Location & Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.422	0.708	0.708	0.671	0.330	0.570	0.570	0.578
N	5,711,572	6,137,540	6,137,210	5,711,588	5,711,572	6,137,540	6,137,210	5,711,588

We relate different measures of trade credit maturity to the proxies for customer bargaining power, using pooled transaction and credit data at the customer-supplier-month level for the period from 2012.09 to 2016.08. The sample conditions on positive outstanding trade credit. The dependent variable in columns (1) to (3) is the log maturity in terms of weighted average number of days for repayment. The dependent variable in columns (5) to (7) is a dummy variable equal to 1 if the maturity of the trade credit exceeds 120 days, 0 otherwise. The dependent variable in column (4) is the logarithm of the number of days the payment is delinquent, and in column (6) it is a dummy variable equal to 1 if the payment is delinquent by more than 120 days, 0 otherwise. Mean potential distance in km has been divided by 1,000; we consider the natural logarithm of this variable in our empirical models. Relative Size has been divided by 100. Additional control variables, whose coefficients are omitted, are *Log Distance*, *Log Past Revenues*, *Log Current Revenues*, *Customer Log Age*, and *Customer Operating Profits*. All variables are defined in Appendix I. The specification includes fixed effects, with standard errors clustered at the customer level. One star denotes significance at the 10% level, two stars denote significance at the 5% level, and three stars denote significance at the 1% level.

Table VIII: Robustness Checks

	Ratio of Trade Credit in New Sales				Dummy Use of Trade Credit				Log Exposure			
	(1) HHI CB	(2) Non Tradables	(3) Length	(4) Customer*Time FE	(5) HHI CB	(6) Non Tradables	(7) Length	(8) Customer*Time FE	(9) HHI CB	(10) Non Tradables	(11) Length	(12) Customer*Time FE
Log Distance	0.002***	0.004***	0.002***	0.002***	-0.001***	-0.000	-0.001**	-0.001*	-0.037***	-0.035***	-0.029***	-0.031***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.004)	(0.005)	(0.004)	(0.005)
Log Mean Potential Distance	-0.077***	-0.074***	-0.077***	-0.074***	-0.053***	-0.048***	-0.053***	-0.058***	-0.259***	-0.253***	-0.260***	-0.336***
	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.020)	(0.028)	(0.020)	(0.032)
Customer Base	0.063***	0.005***	-0.001	0.003***	0.012***	0.003***	0.001	0.008***	0.221***	-0.001	-0.006	0.057***
	(0.004)	(0.000)	(0.000)	(0.001)	(0.004)	(0.000)	(0.001)	(0.001)	(0.038)	(0.005)	(0.005)	(0.007)
Relative Size	0.322***	2.232***	0.244***	-0.227	0.311***	2.130***	0.179***	-0.018	4.561***	38.885***	2.042***	-3.982**
	(0.012)	(0.200)	(0.014)	(0.157)	(0.011)	(0.189)	(0.014)	(0.164)	(0.116)	(2.077)	(0.147)	(1.631)
Relative Size*Customer Base	-0.243***	0.067	0.025***	0.234***	-0.419***	0.190**	0.038***	0.195***	-8.489***	3.190***	0.652***	5.002***
	(0.056)	(0.079)	(0.005)	(0.057)	(0.058)	(0.087)	(0.005)	(0.058)	(0.606)	(1.075)	(0.061)	(0.616)
Length			-0.001***				-0.002***				-0.050***	
			(0.000)				(0.000)				(0.000)	
Supplier*Time*Customer SIC FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Customer FE	No	No	No	Yes	No	No	No	Yes	No	No	No	Yes
Location & Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.374	0.379	0.374	0.623	0.380	0.393	0.380	0.609	0.565	0.567	0.571	0.736
N	15,037,179	7,405,292	15,037,179	9,783,126	15,037,187	7,405,300	15,037,187	9,783,135	15,037,187	7,405,300	15,037,187	9,783,135

We relate different measures of trade credit use to the proxies for customer bargaining power, using pooled transaction and credit data at the customer-supplier-month level for the period from 2012.09 to 2016.08. Mean potential distance in km has been divided by 1,000; we consider the natural logarithm of this variable in our empirical models. Relative Size has been divided by 100. Additional control variables, whose coefficients are omitted, are *Log Distance*, *Log Past Revenues*, *Log Current Revenues*, *Customer Log Age*, and *Customer Operating Profits*. In columns (1), (5), and (9), we measure a supplier's incentives to avoid sales cannibalization by high-bargaining-power customers using the Herfindahl index of its customers' employment (*HHI*). Columns (2), (6), and (9) consider only customers in non-tradable industries (such as transport, services, and retail). In columns (3), (7), and (11), we include a measure of the length of the relationship between the supplier and the customer as a control. Columns (4), (8), and (12) augment the baseline specification with customer*time fixed effects. The specification includes fixed effects, with standard errors clustered at the customer level. All variables are defined in Appendix I. One star denotes significance at the 10% level, two stars denote significance at the 5% level, and three stars denote significance at the 1% level.

Table IX: Reform - Effects on Trade Credit Provision

	Ratio of Trade Credit in New Sales		Dummy Use of Trade Credit		Log Exposure	
	(1)	(2)	(3)	(4)	(5)	(6)
Large Customer	0.030***		.0251***		.458***	
	(0.0012)		(.0013)		(.0147)	
Large Customer*Reform	0.006***	0.002**	.0122***	0.010***	0.083***	0.133***
	(0.0011)	(0.0010)	(0.0012)	(0.0011)	(0.0124)	(0.0107)
Supplier*Time*Customer SIC FE	Yes	Yes	Yes	Yes	Yes	Yes
Customer FE	No	Yes	No	Yes	No	Yes
Location & Time FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.375	0.523	0.381	0.484	0.569	0.678
N	15,146,677	16,737,912	15,146,677	16,737,912	15,146,677	16,737,912

We relate different measures for trade credit use to the proxies for customer bargaining power and the 2014 reform, using pooled transaction and credit data at the customer-supplier-month level for the period from 2012.09 to 2016.08. *Reform* is a dummy variable equal to 1 after July 2014, 0 otherwise. Additional control variables, whose coefficients are omitted, are *Mean potential distance*, *Log Distance*, *Log Past Revenues*, *Log Current Revenues*, *Customer Log Age*, and *Customer Operating Profits*. All variables are defined in Appendix I. The specification includes fixed effects, with standard errors clustered at the customer level. One star denotes significance at the 10% level, two stars denote significance at the 5% level, and three stars denote significance at the 1% level.

Table X: Reform - Suppliers' Relationships with Small Firms

	New Relationship				Sales Growth	
	Employment< 50		Relative Size< 1		Relative Size< 1	
	(1)	(2)	(3)	(4)	(5)	(6)
HHI	-0.150***	-0.146***	-0.145***	-0.139***	-0.097***	-0.126***
	(0.0011)	(0.0012)	(0.0011)	(0.0012)	(0.0028)	(0.0036)
HHI*Reform	0.008***	0.004***	0.009***	0.004***	0.013***	0.027***
	(0.0013)	(0.0014)	(0.0013)	(0.0013)	(0.0031)	(0.0040)
Supplier*Time*Customer SIC FE	Yes	Yes	Yes	Yes	Yes	Yes
Location & Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Location*Time*Customer SIC FE	No	Yes	No	Yes	No	Yes
R-squared	0.293	0.310	0.291	0.307	0.381	0.389
N	4,158,113	4,157,151	4,158,113	4,157,151	2,704,101	2,702,839

We relate measures of new trade relationships of the supplier to proxies for bargaining power in the local downstream markets. We collapse the data at the supplier-time-industry-geography level. The dependent variable in columns (1) to (4) is *New Relationship* is a dummy variable equal to 1 if the supplier acquires a new, low-bargaining-power, customer in the local downstream market. The dependent variable in columns 5 and 6 is the monthly growth of sales from small customers in the local downstream market. The proxy for low bargaining customers is alternatively defined as number of employees < 50 or relative size < 1. *HHI* is computed on the basis of the dispersion in the customer size distribution of the suppliers' local downstream market. For each customer in the suppliers' local downstream market we measure employment shares. *HHI* is the sum of the squared employment shares. *Reform* is a dummy variable equal to 1 after July 2014 and 0 otherwise. The specification includes fixed effects, with standard errors clustered at the supplier-time-downstream market level. One star denotes significance at the 10% level, two stars denote significance at the 5% level, and three stars denote significance at the 1% level.

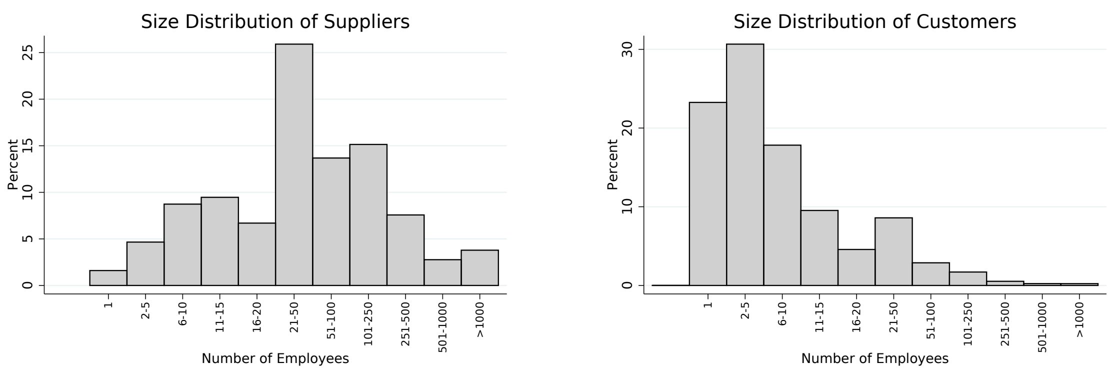
Table XI: Reform - Mechanisms

	Input Costs (1)	Bank Leverage (2)	Bank ST Leverage (3)
$\overline{\text{Large Customer}}$*Reform	.004***	0.001***	-0.000
	(0.001)	(0.000)	(0.000)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Covariates	Yes	Yes	Yes
R-squared	0.671	0.916	0.877
N	595,334	595,039	595,293

We regress the input costs and short term bank financing of a customer firm on the average size of the customer with respect to its suppliers ($\overline{\textit{Large Customer}}$). Using yearly balance sheet data for each customer we define the dependent variable as the ratio of production costs relative to sales. *Reform* is a dummy variable equal to 1 after July 2014, and 0 otherwise. Other covariates, whose coefficients are not reported, include the share of the supplier in the transaction data, log of payables, receivables and total asset base. The specification includes fixed effects as indicated in the table, with standard errors clustered at the customer level. All variables are defined in Appendix I. One star denotes significance at the 10% level, two stars denote significance at the 5% level, and three stars denote significance at the 1% level.

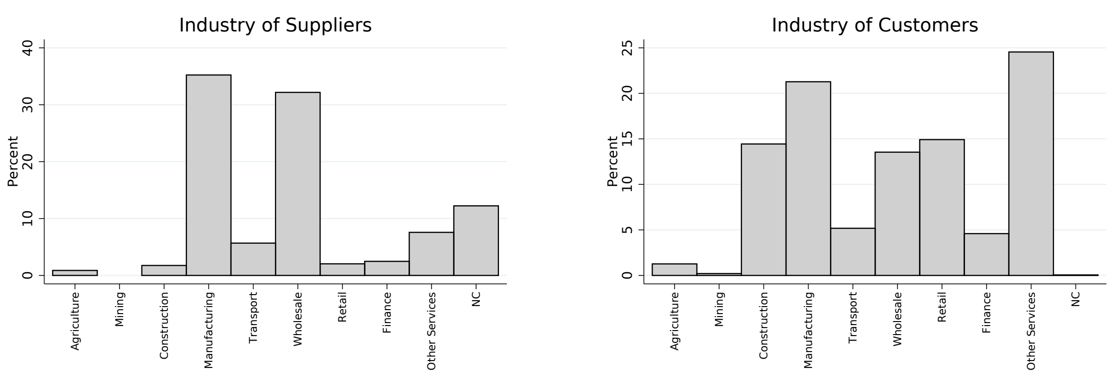
7 Figures

Figure 1: Size Distribution of Suppliers and Customers



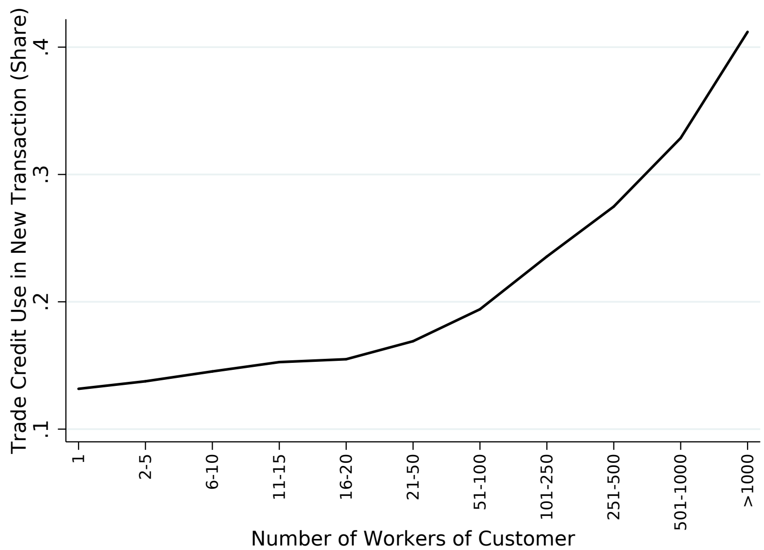
The figure plots the size distribution of suppliers (left panel) and customers (right panel). Size is measured in terms of the total number of employees and binned across 11 categories.

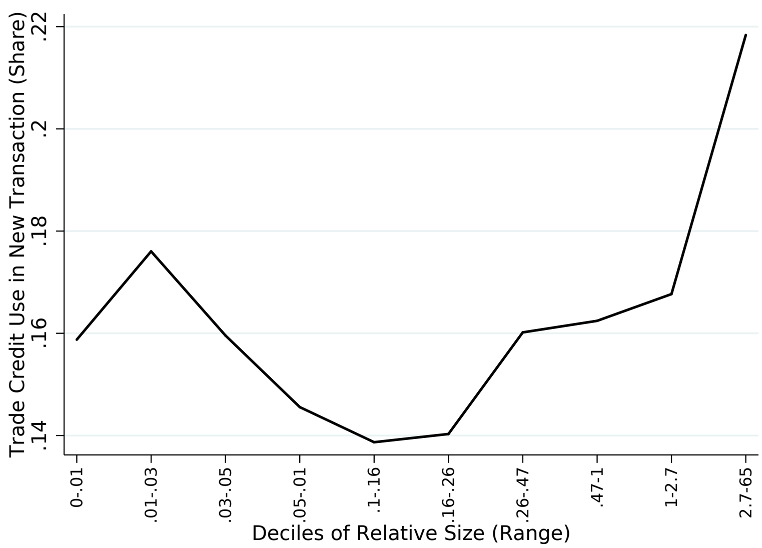
Figure 2: Activity Distribution of Suppliers and Customers



The figure plots the distribution of suppliers (left panel) and customers (right panel) across aggregate SIC codes.

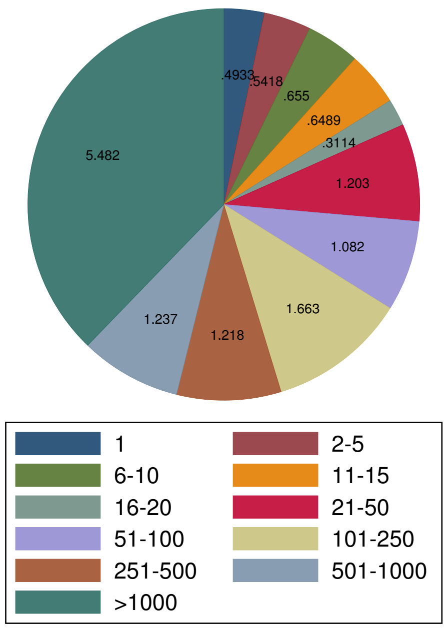
Figure 3: Trade Credit Provision Across Customers





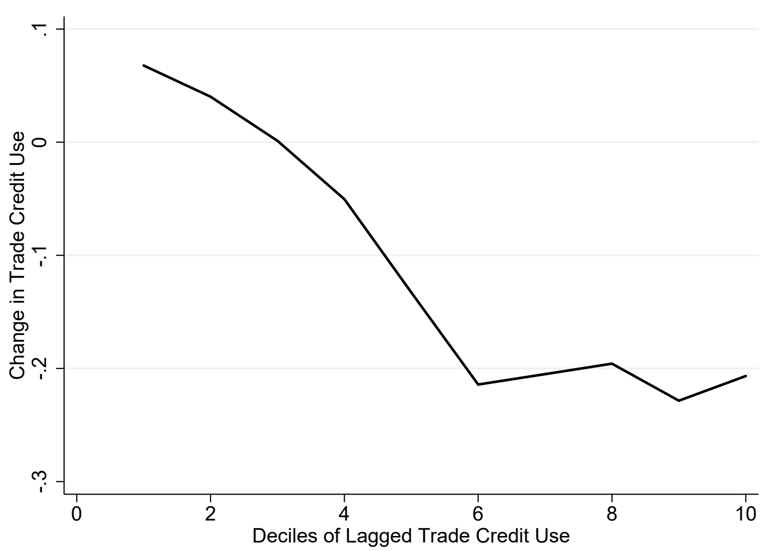
The figure plots the amount of trade credit provided as a function of firm size. The vertical axis in both panels is the ratio of trade credit used in the new transaction relative to the total amount of the transaction between a customer-supplier pair, defined at monthly frequency. In the top panel, the horizontal axis is the customer's number of employees. In the bottom panel, the horizontal axis is the ratio of customer total employment to supplier total employment.

Figure 4: Share of Aggregate Trade Credit Provision



The figure plots the total exposure of the suppliers in our sample to customers in different size classes.

Figure 5: Changes in Trade Credit between Transactions



The figure plots the percentage change in trade credit used between successive transactions (t and $t-1$), as a function of the intensity of trade credit in the preceding transactions ($t-1$).

Appendix I

Variables are defined in the following way:

- *Bank Leverage*: is the total debt with banks, divided by total assets.
- *Bank ST Leverage*: is the total short-term debt with banks, divided by total assets. Debt is defined as short-term if maturity is less than one year.
- *Current Revenues*: is the monthly value of new transactions between a supplier and a customer, in thousand Euro.
- *Customer Age*: is the difference between the year of operation and the year of birth of the customer firm.
- *Customer Base*: is the logarithm of the number of customers of a supplier in the customer's downstream market. The customer's downstream market is defined at the region and four-digit SIC code level.
- *Delay*: is the number of delinquency days, computed starting from the due date.
- *Customer Operating Profits*: is defined as the ratio of the customers' EBITDA relative to his total sales.
- *Distance*: Distance in km between supplier and customer ZIP code.
- *Dummy Use of Trade Credit*: is a dummy variable equal to one if the new transaction between a supplier and customer involves trade credit.
- *Dummy of Positive Exposure*: is a dummy variable equal to one if the monthly exposure between a customer and a supplier is positive.
- *Exposure*: is the total monthly credit extended by the supplier to a given customer, in thousand Euro.
- *HHI*: Herfindahl index of the customer base of the supplier in the downstream market. The customer's downstream market is defined at the region and four-digit SIC code level, and the associated concentration index computed in terms of customers' employment
- *Input Costs*: is the cost of material and services divided by total sales.
- *Large Customer*: is a dummy variable equal to one if the customer is larger than the supplier, i.e., *Relative Size*>1.
- *Length*: is the number of months since the first appearance of the customer-supplier link.
- $\overline{\textit{Large Customer}}$: is a dummy variable equal to one if the customer is on average larger than the supplier. Weighted average computed using the amount of transactions between a supplier and a customer as weights.
- *Mean Potential Distance*: average distance in km between the customer and all potential suppliers in the same four-digit SIC code (excluding the original supplier).
- *Maturity - Contractual*: is the agreed maturity of existing trade credit extended by a supplier to a given customer. It is computed as the logarithm of the number of days since delivery when a payment is due.
- *New Sales*: is the amount of new monthly transactions between a supplier and a customer, in thousand Euro. The logarithm of the variable is defined as *Log Current Revenues*.
- *New Relationship*: is a dummy variable equal to 1 if the supplier acquires a new, low-bargaining-power, customer in the local downstream market. Low-bargaining-power customers are defined as customers with fewer that 50 employees or customers with *Relative Size*<1 in alternative specifications. The customer's downstream market is defined at the region and four-digit SIC code level.

- *Non-Tradables*: is identified based on the CRIF SIC classification. We include transport, services, and retail sectors.
- *Number of Customers*: is the monthly number of distinct customers of each supplier.
- *Number of Suppliers*: is the monthly number of distinct suppliers of each customer.
- *Number of Customers Within the Same Region-SIC*: is the number of distinct customers within the same region, and the same four-digit SIC code.
- *Outside Customer Base*: is the logarithm of the number of firms in the customer's downstream market, which are not customers of the same supplier. The customer's downstream market is defined at the region and four-digit SIC code level.
- *Past Revenues*: rolling sum of all transactions between a supplier and a customer up to *t-1*.
- *Ratio of Trade Credit in New Sales*: is the ratio of trade credit used in a new transaction between the customer and the supplier, relative to the total amount of the transaction.
- *Relative Size*: is the ratio of the customer's number of employees relative to the supplier's number of employees. In the regression tables the variable is divided by 100.
- *Relative Size Category 1/2/3*: is a set of dummy variables. Category 1 is equal to 1 if the ratio of customer total employment to supplier total employment is strictly lower than 1. Category 2 is equal to 1 if the ratio of customer total employment to supplier total employment is between 1 and 10. Category 3 is equal to 1 if the ratio of customer total employment to supplier total employment is above 10.
- *Rolling Sum 3/6 Months*: rolling sum of all transactions between a supplier and a customer in the past 3/6 months.
- *Sales Growth*: is the monthly growth of sales from small customers in the local downstream market. Customers are considered small if *Relative Size*<1. The customer's downstream market is defined at the region and four-digit SIC code level.
- *Share of Sales of Customers Within the Same Region-SIC*: is the ratio between each customers' new transactions relative to the total sales within the customers' region and four-digit SIC code.
- *Share of Suppliers*: is the total sales registered in the transaction data over one year relative to the input costs from the firm balance sheet during the same year.
- *Size Customer*: is the customer's number of employees.
- *Size Supplier*: is the number of employees of the supplier.
- *Total Customer Exposure (>0)*: is the total (non zero) monthly exposure of customers across all of their suppliers, in thousand Euro.
- *Total Supplier Exposure Amount*: is the total monthly exposure of suppliers across all of their customers, in thousand Euro.

Appendix II

A.1 Proof of Lemma 1

The calculations for the derivation of q_A^d and q_B^d are standard given firms' cost structure, linear demand and Cournot competition.

To derive the threshold value of α below which firm B remains idle, we consider firm B's participation constraint given the realization of the demand shock α:

$$\begin{aligned}\pi_B(\delta;\alpha) &= (q_B^d(\delta;\alpha))^2 \geq K \\ &= \frac{1}{9}(\alpha - c - \delta)^2 \geq K,\end{aligned}$$

where both equalities follow from the linear demand. This constraint is binding iff $\alpha = \alpha^*(\delta, K) \equiv c + \delta + 3\sqrt{K}$. Accordingly, firm B will not produce for any $\alpha \in [\underline{\alpha}, \alpha^*(\delta, K)]$. ■

A.2 Proof of Proposition 1

Given equation (1), χ can be rewritten as

$$\int_{\underline{\alpha}}^{\overline{\alpha}} c\left(q_A^d(0;\alpha) + q_B(0;\alpha) - q_A^d(\delta;\alpha) - q_B^d(\delta;\alpha)\right) dF(\alpha) + \overline{U}.$$

Then, the total cost of providing the discount, χ, is larger than the direct cost $\overline{U}$ if the cannibalization of the quantity of firm B is larger than the additional purchases of firm A:

$$\begin{aligned}\chi \quad &> \quad \overline{U} \\ \iff \quad & \int_{\alpha^*(0,K)}^{\overline{\alpha}} \left(q_B^d(0;\alpha) - q_B^d(\delta;\alpha)\right) dF(\alpha) > \int_{\underline{\alpha}}^{\overline{\alpha}} \left(q_A^d(\delta;\alpha) - q_A^d(0;\alpha)\right) dF(\alpha). \qquad (5)\end{aligned}$$

We can rewrite equation (5) as

$$\begin{aligned}0 \quad < \quad & \left(\int_{\underline{\alpha}}^{\alpha^*(0,K)} q_A^d(0;\alpha) dF(\alpha) + \int_{\alpha^*(0,K)}^{\overline{\alpha}} q_A^d(0;\alpha) + q_B(0;\alpha) dF(\alpha)\right) \\ & - \left(\int_{\underline{\alpha}}^{\alpha^*(\delta,K)} q_A^d(\delta;\alpha) dF(\alpha) + \int_{\alpha^*(\delta,K)}^{\overline{\alpha}} q_A^d(\delta;\alpha) + q_B^d(\delta;\alpha) dF(\alpha)\right).\end{aligned}$$

Substituting the functional forms for the quantities of firms A and B (in Lemma 1), and rearranging, we obtain the condition in Proposition 1. ■