Cheap Trade Credit and Competition in Downstream Markets

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January 16, 2018

Abstract

Using a unique matched dataset of customers and suppliers, we provide evidence that suppliers offer trade credit to high-bargaining-power customers to ease competition in downstream markets in which they have a large number of other customers. Differently from price discounts, trade credit can target infra-marginal units and does not lower the marginal cost of the high-bargaining-power customers. In equilibrium, the latter do not steal market share from the competitors and the supplier can preserve profitable sales to low-bargaining-power customers. We show that empirically trade credit is not monotonically increasing in past purchases, as is consistent with our conjecture that it targets infra-marginal units. Our results are not driven by differences in suppliers' ability to provide trade credit, customer-specific shocks or endogenous location decisions.

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] Yet, it is still a puzzle for financial economists. Basically, all existing theories aim to explain why financially constrained firms rely on trade credit (e.g., Biais and Gollier, 1997; Burkart and Ellingsen, 2004). However, there is growing evidence that large firms, with relatively easy access to financial markets and lots of cash on their balance sheets, receive plenty of trade credit. Recent empirical studies suggest that large firms with bargaining power may squeeze smaller suppliers by pretending cheap trade credit (Murfin and Njoroge, 2014; Barrot, 2016; Breza and Liberman, 2017). Yet, it remains unclear why these high-bargaining-power customers would not simply pretend a lower price and why there exist plenty of trade credit between large suppliers and customers.

Using a novel dataset with unprecedented detail on trade credit provision by approximately 700 large suppliers, this paper puts forward and tests a new explanation for cheap trade credit to large customers with presumably weak financial constraints. We conjecture that trade credit is an instrument for suppliers to transfer surplus to high-bargaining-power customers without cannibalizing sales to low-bargaining-power, and hence high-profit-margin, customers. By lowering the price to high-bargaining-power customers, the supplier would lower these customers' marginal costs. This in turn would allow the customer to sell in the downstream market at a lower price and to acquire market shares. If the low-bargaining-power competitors in the downstream market are also clients of the same supplier, the supplier would be able to sell to a lower extent to customers from which it obtains higher profit margins. We show that by transferring surplus through cheap trade credit, the supplier is able to target infra-marginal units and to leave unaffected the marginal cost of the high-bargaining-power customers. Thus, from the point of view of the supplier, trade credit avoids the cannibalization of sales from other high-profit-margin downstream firms.

We also show that trade credit is preferable to cash transfers as it allows the transfer to

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

be conditional on the quantity transacted between customer and supplier. This is important if the supplier is financially constrained or wishes to stabilize profits. More in general, this feature of trade credit contracts is desirable if the surplus to be transferred is conditional on demand.

Our detailed data allow us to identify the mechanisms suggested by our model because for each supplier we observe many customers in a variety of downstream markets. We first provide some evidence that trade credit indeed appears to target infra-marginal units as a firm's amount of trade credit outstanding increases at a decreasing rate as the firm purchases incremental units. We then ask whether suppliers are more inclined to provide trade credit to customers that have high bargaining power and that compete with some of its other customers with low bargaining power in the downstream market.

We find that firms provide more trade credit to customers with greater bargaining power as measured by the average distance of the population of other potential suppliers. Similarly, we use the relative size of the customer and of the supplier as an alternative proxy for a customer's bargaining power. Consistent with the findings of previous literature, we find that relatively bigger customers obtain more trade credit. However, this effect appears entirely driven by relatively big customers that are surrounded by a larger number of competitors, which are customers of the same supplier. Big customers surrounded by competitors that do not share the same supplier do not receive more trade credit. 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. Since they are obtained by including interactions of supplier and time fixed effects, our findings cannot be driven by supplier characteristics. We even interact the supplier-time fixed effects with customer industries fixed effects, indicating that we are not capturing industries with different demand or repayment capabilities.

Our results are robust to a number of robustness tests. First, we verify that our findings are robust when we include customer fixed effects as well as interaction of customer and time

fixed effects. The robustness of our results dispels any concerns that input characteristics, supplier or customer industry's financial conditions may drive our findings.

We also explore whether our results may be due to reverse causality as for instance firms may locate close to potential suppliers if they have high demand for trade credit. The robustness of our results to the inclusion of customer fixed effects mitigates this concern. More in general, our results are robust if we exclude from the sample firms located in Southern Italy, which are likely to be further away from potential suppliers and may receive less trade credit and other forms of financing due to less efficient courts and enforceability concerns.

Our paper contributes to the trade credit literature. Existing literature highlights that relatively large firms, with access to external finance, are offered plenty of trade credit (Giannetti, Burkart and Ellingsen, 2011). 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 customers would not pretend price discounts. 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.

We also contribute to the industrial organization literature. Katz (1987), Inderst and Shaffer (2009), Inderst and Valletti (2009), O'Brien (2014) explore the effect of a supplier's

third degree price discrimination on competition and welfare in downstream markets without considering trade credit. In the spirit of Brander and Lewis (1986), we explore how financing affect competition. None of the papers in this literature however have considered the role of trade credit.

2 Data and Stylized Facts

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 to the register information on all their customers over time. 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 some balance sheet items, such as sales turnover. 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 at the beginning of the sample period for limited liability firms in CRIBIS/CRIF.

The customers in our dataset include individual buyers, unincorporated companies, and limited liabilities 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 20,818,823 customer-supplier monthly observations for a total of 672 suppliers and 439,937 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 (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; Murphin 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 different types of customers.

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

Table 1 shows the main characteristics of our final dataset. Panel A starts describing 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 also Figure 1 makes clear, however, there is large cross-sectional variation in the size of suppliers in our sample. As shown in Figure 2, suppliers and customers are also widely distributed across industries.

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 our proxies for customer bargaining power and 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 and have fewer than two suppliers reporting to the credit register. Figure 1 makes clear, however, there are some very large customers enabling us to explore

cross-sectional differences in bargaining power.

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 some trade credit, but also require a partial immediate payment. As we discuss below, this suggests that trade credit may be an efficient means for suppliers to target infra-marginal units avoiding to distort competition in the downstream market.

Finally, Panel D introduces some characteristics of customers and suppliers. 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 from CERVED, a dataset reporting all limited liabilities firms registered in Italy. Thus, consistent with the findings of Bernard, Moxnes and Saito (2015) and Carvalho, Nirei, Saito, and Tahbaz-Salehi (2016), customers tend to establish relationships with closer suppliers. In what follows, we use the mean distance of a customer's potential alternative suppliers as a proxy for the customer's bargaining power with respect to a given supplier.

As an alternative proxy for the relative bargaining power of customers and suppliers, more similar to the ones used in existing literature, we use the relative size of customers and suppliers. While most of customers are significantly smaller than their suppliers in our dataset (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

Figure 3 shows the extent to which trade credit is used in transactions with customers of different dimensions, as proxied 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 the extent to which the relative size of customer and supplier, again captured by their number of employees, is associated with trade credit use. The relationship appears non-monotonic. While customers that are significantly smaller than their suppliers are able to conclude a larger fraction of their purchases on credit than customers that are somewhat larger, as the customer size increases relative to that of the supplier an ever larger fraction of transactions involves trade credit. In fact, the customers that are largest in comparison to the suppliers are the ones that are able to perform most of their purchases on credit. This 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 the reasons highlighted in previous literature. However, the relative bargaining power between customer and supplier also matter and may be the reason why most of trade credit is awarded.

Table 2 describes another interesting feature of trade credit, which was previously undocumented. We regress the variable capturing the proportion of new purchases a customer is able to conclude on credit on the customer's past purchases, which we proxy using a rolling sum of past purchases over three or six months. The use of trade credit in new transactions increases with past sales before eventually being capped or even decreasing as captured by the negative coefficient of the quadratic term of the past purchases. We obtain a similar result when we use as a dependent variable the logarithm of a supplier's trade credit exposure with a given customer during a month. This evidence not only suggests similarities with credit line instruments, but also shows that there is an upper bound to the use of trade credit.

In what follows, we develop a simple model, which illustrates why suppliers may want to provide trade credit to high-bargaining-power customers and we derive a number of predictions that we bring to the data.

3 The model

Consider a (downstream) market with uncertain demand in which firm A and firm B (or a number of identical firms to which we refer as firm B for simplicity) are active.

For simplicity, we assume that the downstream market has linear demand and that firms compete à la Cournot. However, none of our results depends on these assumptions. As long as a firm's market share increases in the marginal cost of the competitor and decreases in its own marginal cost, the main trust of our analysis would go through independently from any assumption on the competition in the downstream market.

The aggregate demand in the downstream market is:

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

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

Firm A and firm B maximize profits simultaneously choosing the quantities q_A and q_B, respectively. If it decides to be active and enter the market, by choosing $q_B > 0$, firm B also has to pay a fixed cost of production K.

The supplier of firms A and B has to transfer firm A an exogenously determined surplus $\overline{U}$. One may think that firm A as a customer contributes to the creation of surplus for the supplier through technological and brand enhancement. Alternatively, firm A may have the option to integrate backward into the supply of the input and the supplier has to bribe it in order not to do so (as for instance in Katz (1987), who only considers price discounts). In either case, the supplier has to transfer surplus, $\overline{U}$, which for simplicity we consider exogenously given and independent from firms A and B's profits in the downstream market.

The supplier can transfer surplus by offering a discount δ on the prevailing market price or by using (cheap) trade credit (that is, funding at lower cost of capital than firm A would have access to). For simplicity, we take the prevailing market price of the input as determined

outside the model by competition with other potential suppliers.

The timing of events is the following. Before observing the realization of the demand shock, the supplier formulates public and simultaneous offers to the retailers (including any price discount, or trade credit, to firm A).[2] After observing the demand shock and the supplier's offers, firms A and B choose the quantities to purchase from the supplier and to offer in the market. If it does not enter, firm B purchases 0.

3.1 Cash 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. Throughout the analysis we assume that $\underline{\alpha} \geq c$. In equilibrium it will also have to be $\underline{\alpha} \geq c + \delta$, where δ is endogenously determined, to ensure that input demands (and supplies in the downstream market) are non negative.

Lemma 1 provides the equilibrium supply functions of firms A and B as a function of the realization of the demand shock, α.

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

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

and

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

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

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

[2]Given the setup of our problem, the supplier has no incentives to offer trade credit to firm B in equilibrium.

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:

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

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

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

The supplier sets the discount such that firm A enjoys a rent, independent from the downstream industry's profits, equal to $\overline{U}$. Thus, δ must satisfy the following condition:

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

This condition determines the equilibrium value of δ. Note that the problem is well defined for values of c such that, notwithstanding the discount, the supplier has positive marginal revenues. That is, $\delta < c$ implies an upper bound for the relevant values of $\overline{U}$.

Besides the direct cost $\overline{U}$, offering the discount to firm A may have additional indirect costs for the supplier, as it negatively affects the suppliers' revenues from firm B. To see this, we consider firm B's change in demand when firm A obtains a cash discount δ. Firm B's demand for $\delta > 0$ is $q_B(\delta;\alpha) = \frac{1}{3}(\alpha - \delta - c)$ for $\alpha > \alpha^*(\delta, K) > \alpha^*(0, K)$. Thus, by offering a cash discount δ the supplier has a total cost equal to:

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

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

The discount affects the marginal cost of firm A and makes it more aggressive in the downstream market. On the one hand, this implies that firm B is less likely to enter for relatively low level of demand ($\alpha \in [\alpha^*(0,K), \alpha^*(\delta,K)]$). When demand is relatively high ($\alpha > \alpha^*(\delta,K)$), firm B enters, but purchases relatively less from the supplier.

Ultimately, transferring $\overline{U}$ to firm A implies a cost equal to χ. The total cost of providing the discount, χ, is larger than $\overline{U}$ if the cost associated with the cannibalization of sales to firm B is larger than the additional purchases of firm A when it receives the discount. The following Proposition provides the relevant condition.

Proposition 2 *If the reduction in sales from firm B due to the increased competition created by the price discount is larger than the increase in sales to firm A allowed by the price discount, price discounts have indirect costs for the supplier.*

Proof. We obtain χ by comparing the expected revenues ($E_\alpha[R(\delta;\alpha)]$) of the supplier with and without price discounts:

$$\begin{aligned}
\chi &\equiv E_\alpha[R(0,\alpha)] - E_\alpha[R(\delta,\alpha)] \\
&= \left(\int_{\underline{\alpha}}^{\alpha^*(0,K)} c q_A(0;\alpha) dF(\alpha) + \int_{\alpha^*(0,K)}^{\overline{\alpha}} c(q_A(0;\alpha) + q_B(0;\alpha)) dF(\alpha) \right) \\
&\quad - \left(\int_{\underline{\alpha}}^{\alpha^*(\delta,K)} (c-\delta) q_A(\delta;\alpha) dF(\alpha) + \int_{\alpha^*(\delta,K)}^{\overline{\alpha}} (c-\delta) q_A(\delta;\alpha) + c q_B(\delta;\alpha) dF(\alpha) \right).
\end{aligned}$$

Therefore, the costs caused by the discount are larger than $\overline{U}$ if $\chi > \overline{U}$. Using the

expression for $\overline{U}$, the condition $\overline{U} < \chi$ can be written as:

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

Substituting the functional forms for the demands of firm A and firm B and rearranging, we obtain:

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

In expected terms, the condition compares the lower quantity caused by the discount for intermediate values of α (as resulting from the shift from a duopoly to monopoly, LHS), with the higher quantity due to the discount for the remaining values of α (RHS). ■

3.2 Trade Credit

Consistent with existing literature (e.g., Burkart and Ellingsen, 2004), we model trade credit as a credit limit conditional on the input purchase. Thus, if granted trade credit, firm A can make purchases on credit up to a limit $\overline{x}$, which will be optimally chosen by the supplier. This implies that firm A can purchase on credit up to q_A units of the input as long as $cq_A < \overline{x}$.

Trade credit can successfully transfer surplus to firm A if it is offered at a discount with respect to the firm's cost of capital. We denote the discount over the firm's cost of capital as ϕ. The discount is optimally determined by the supplier together with $\overline{x}$ in order to transfer surplus to firm A. The feasibility of a trade credit contract requires that $\phi < c$ as for the price discount. It will also have to hold that $\underline{\alpha} \geq c + \phi$, where ϕ is endogenously determined, for product market supplies to be non negative.

The supplier will have to choose ϕ and $\overline{x}$ in order to grant firm A an expected surplus of $\overline{U}$. Specifically, for given state of the world, determined by the realization of α, the actual

value of the transfer to firm A depends on the credit firm A actually uses given its total demand from the supplier.

Formally, the parameters of the trade credit contract will have to satisfy the following constraint:

$$\phi \int_{\underline{\alpha}}^{q_A^{-1}\left(\frac{\overline{x}}{c}\right)} q_A(0;\alpha)dF(\alpha) = \overline{U}, \tag{1}$$

where $q_A^{-1}(.)$ is the inverse of firm A's supply (demand for the input); $q_A^{-1}\left(\frac{\overline{x}}{c}\right)$ takes into account that firm A can purchase on credit, obtaining a subsidy ϕ per dollar spent, up to $\overline{x}$. Thus, the possibility to purchase on credit is available up to a level of the supply shock $\alpha = q_A^{-1}\left(\frac{\overline{x}}{c}\right)$.

The actual functional form of the demand function q_A depends also on the credit limit offered by the supplier and on whether this affects the marginal cost of firm A and the entry decision of firm B. It will be determined below in equilibrium.

At $t = 0$ the supplier offers a contract to firms A and B. With a trade credit limit of $\overline{x}$, the supplier's expected profits from firm A can be written as:

$$\pi_A = (c - \phi) \min\left\{\frac{\overline{x}}{c}, q_A\right\} + c \max\left\{q_A - \frac{\overline{x}}{c}, 0\right\}.$$

It is evident that the marginal cost of firm A is $c - \phi$ if it purchases an amount of input up to $\frac{\overline{x}}{c}$ and then c. Therefore, the crucial choice for the shape of firms A and B's demand is the level of the trade credit limit, $\overline{x}$, as this affects firm's A marginal cost and consequently firm B's entry decision and supply function.

A supplier, which is not financially constrained, can choose a trade credit limit of $\overline{x}$ and a value of ϕ that satisfies the (1). For instance, the supplier can offer trade credit up to an epsilon below the quantity that firm A purchases in the state of the world in which firm B is indifferent whether to enter or not: $\overline{x} \leq \frac{1}{3}\left(\alpha^*(0, K) - c\right)c$. By doing this, the supplier will not distort competition in the downstream market, as the trade credit subsidy does not

affect the marginal cost of firm A when also B enters.

Therefore, the equilibrium supply functions of firm A and B are, respectively:

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

and

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

Note that the threshold at which firm B enters is determined as in Lemma 1 and is $\alpha^{**}(\overline{x},K) = \alpha^{*}(0,K) \equiv c + 3\sqrt{K}$.

Therefore, if $\overline{x} \leq \frac{1}{3}(\alpha^{*}(0,K)-c)\,c$, trade credit is provided only up to quantities that are sold when the realization of $\widetilde{\alpha}$ is relatively small. For these levels of the aggregate demand shock, firm B is never active in the downstream market. Therefore, trade credit allows to transfer surplus without the cannibalization of sales to firm A.

Consider now the case in which the supplier is offering a trade credit limit $\overline{x} > \frac{1}{3}(\alpha^{*}(0,K)-c)\,c$. The supply functions of firm A and firm B are respectively:

$$q_A(\overline{x};\alpha) = \left\{ \begin{array}{cc} \frac{1}{2}(\alpha+\phi-c) & \alpha \leq \underline{\alpha}^{***}(\overline{x},K) \\ \frac{1}{3}(\alpha+2\phi-c) & \underline{\alpha}^{***}(\overline{x},K) < \alpha \leq \overline{\alpha}^{***}(\overline{x},K) \\ \frac{1}{3}(\alpha-c) & \overline{\alpha}^{***}(\overline{x},K) < \alpha \end{array} \right\}$$

and

$$q_B(\overline{x};\alpha) = \left\{ \begin{array}{cc} 0 & \alpha \leq \underline{\alpha}^{***}(\overline{x},K) \\ \frac{1}{3}(\alpha-\phi-c) & \underline{\alpha}^{***}(\overline{x},K) < \alpha \leq \overline{\alpha}^{***}(\overline{x},K) \\ \frac{1}{3}(\alpha-c) & \overline{\alpha}^{***}(\overline{x},K) < \alpha \end{array} \right\}.$$

where $\underline{\alpha}^{***}(\overline{x},K)$ is the threshold value of α above which firm B enters the market. Following the same steps as in Lemma 1, $\underline{\alpha}^{***}(\overline{x},K) = c+\phi+3\sqrt{K}$. Instead, $\overline{\alpha}^{***}(\overline{x},K)$ is the

value of α below which the supplier provides trade credit, and is equal to $\alpha = \overline{\alpha}^{***}(\overline{x}, K) \equiv c - 2\phi + 3\overline{x}/c$. Note that if $\overline{\alpha}^{***}(\overline{x}, K) < \underline{\alpha}^{***}(\overline{x}, K)$ firm B enters only for values of α such that firm A's marginal cost is c. In this case, the cannibalization of sales from firm B is strongest as firm B's demand is reduced to zero

For $\overline{x} > \frac{1}{3}(\alpha^*(0, K) - c)\, c$, the trade credit limit is so large that it affects states of the world in which the aggregate demand is such that firm B would enter if there were a level playing field. However, the trade credit subsidy effectively decreases the marginal cost of firm A up to levels of the aggregate demand $\overline{\alpha}^{***}(\overline{x}, K)$. Thus, firm B is less likely to enter and, if it enters, up to levels of the aggregate demand of $\overline{\alpha}^{***}(\overline{x}, K)$ it has a lower market share than in a situation in which firm A receives trade credit less than $\frac{1}{3}(\alpha^*(0, K) - c)\, c$. Thus for $\overline{x} > \frac{1}{3}(\alpha^*(0, K) - c)\, c$, trade credit involves cannibalization of sales for the supplier and may imply a cost above $\overline{U}$ precisely as the price discounts.

If the supplier were willing to sell any quantity to firm A on credit, the effects of trade credit on competition would be identical to those of cash discounts as firm A's marginal cost would be now $c - \phi$ and the supplier could suffer a loss due to the cannibalization of sales from firm B, analogous to χ. Reducing the trade credit limit and increasing correspondingly ϕ leaves unchanged the (expected) transfer to the customer and may lower any indirect costs due to the cannibalization of sales to firm B. This implies that the supply of firm B is not distorted if the transfer is made with trade credit up to $\frac{1}{3}(\alpha^*(0, K) - c)\, c$. Therefore, since the supplier aims to minimize the cost of transferring surplus to firm A, it may be preferable for the supplier to offer firm A a trade credit contract with limit $\overline{x} \leq \frac{1}{3}(\alpha^*(0, K) - c)\, c$ as long as it exists ϕ that satisfies (1).

3.3 Trade Credit vs. Cash Transfers

Trade credit can limit the distortions created by the transfer of surplus to a subset of customers because it targets infra-marginal units and can reduce or even eliminate any spillover effects on competition. The same effect could be achieved with a cash transfer. The latter

would however be completely independent of the actual quantity that is purchased. If the supplier is financially constrained for low realizations of the demand shock, when it sells small amounts of the input, or has higher cost of capital to fund the subsidy in these states of the world, the cash transfer is not efficient, and trade credit is the only solution.

A very financially constrained supplier may be compelled to transfer more surplus in high-demand states of the world because it faces a binding financial constraint when sales and consequently cash flows are low. This may be thought as a binding upper bound on ϕ. In this case, also a transfer using trade credit will imply some distortions. However, the expected distortion will be lower than with a cash discount as long as states of the world with high α are sufficiently likely.

3.4 Discussion

Our objective is to model trade credit to a downstream market in which a supplier has a main customer with bargaining power and 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. Our insight that trade credit is a way to transfer surplus to important customers without cannibalizing sales from other high profit margin customers is however much more general. Trade credit would yield the same benefits of targeting infra-marginal units and avoiding sale cannibalization if the important customer, firm A, was a larger buyer with a higher market share, independently from demand shocks, and the smaller customer firm B, always purchased smaller amounts of the inputs. Also in this case, a trade credit limit strictly lower that 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.

3.5 Empirical Implications

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

1. Sales are more likely to involve trade credit if customers have stronger outside options and high bargaining power, which in the model are captured by $\overline{U}$.

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. In downstream industries, small firms are relatively more profitable and grow faster following positive shocks if they share suppliers with larger competitors.

4 Methodology

The CRIBIS/CRIF credit register providing information on how a variety of suppliers offers trade credit to heterogenous customers across Italy is an ideal environment to test the model predictions.

Our empirical specifications involve regressing proxies for the use of trade credit in transactions between customer c and supplier s in month t on the two alternative proxies for customer bargaining power introduced in Section 2. We further differentiate the effect of customer bargaining power across different markets depending on whether the supplier has other customers whose sales could be cannibalized.

In practice, our tests are based on variations of the two following models:

$$\begin{aligned} y_{c,s,t} &= \alpha \times LogMeanPotentialDistance_{c,s,t} + \beta \times RelativeSize_{c,s,t} + \\ &\quad \gamma \mathbf{X} + \delta_{s,t,i} + \varepsilon_{c,s,t} \end{aligned}$$

and

$$\begin{aligned} y_{c,s,t} &= \alpha \times LogMeanPotentialDistance_{c,s,t} + \beta_1 \times RelativeSize_{c,s,t} + \\ &\quad \beta_2 \times InsideMarket_{c,s,t} \times RelativeSize_{c,s,t} + \gamma \mathbf{X} + \delta_{s,t,i} + \varepsilon_{c,s,t}, \end{aligned}$$

where $y_{c,s,t}$ captures alternative proxies for the use of trade credit. In different specifications, $y_{c,s,t}$ is either a dummy that takes value equal to one if the transaction involved at least some trade credit, or the proportion of the purchase value whose payment could be postponed during a month, or the total trade credit extended to customer c by supplier s during month t.

In the first model, we test whether on average transactions in which a customer has stronger outside options, because alternative suppliers of the same input as supplier s are closer, involve more trade credit. We define alternative suppliers on the basis of their 4-digit SIC code. We also test whether customers are able to use more trade credit when they are larger in comparison to their suppliers.

The second proxy for customer bargaining power differs between customers in the same location and that presumably compete within the same (downstream) market. Therefore, it can be used to test how a supplier provision of trade credit differs between customers with different bargaining power within the same region. On the basis of our model, we expect that more trade credit is used in transactions with high-bargaining-power customers when the supplier has many other customers competing in the same downstream market.

To identify the supply of trade credit, we include interactions of supplier, time and customer industry fixed effects, $\delta_{s,t,i}$. In particular, by using a within-supplier estimator, we hold constant the supplier capacity to offer trade credit and investigate how a supplier discriminates between different customers. Holding constant suppliers' characteristics is very important in our context, because trade credit is known to have a significant industry component, related to the nature of the good sold (Giannetti, Burkart, and Ellingsen, 2011).

We also interact supplier and time fixed effect with four-digit customer industry effects to account for the fact that the nature of customer-supplier relationships and the provision of trade credit may differ across industries. However, we do not use a within-customer estimator in our main tests not only because of the nature of our data, which present a limited number of suppliers per each customer, but also because customers are likely to have different demand for goods and consequently trade finance from different suppliers. This aspect of trade credit limits how useful a within-customer estimator is to achieve identification and 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). More importantly, obtaining trade finance is costless for customers as long as they can choose the timing of repayments to take advantage of eventual early payment discounts (Ng, Smith and Smith, 1999). Thus, the proportion of trade credit in new sales is to be considered supply-determined because trade credit is typically free fro the customer for at least 10 days.

Even though we do not think that differences in the demand for trade credit can drive our findings, especially because we focus on the differential provision of trade credit to relatively large customers, with presumably easier access to external finance, we show that our results are robust to the inclusion of several customer-level controls as well as to customer fixed effects and, in some robustness tests, interactions of customer and time fixed effects, dispelling any concerns that differences in demand matter.

4.1 Main Findings

Table III 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 customer's exposure to a given customer (columns 7 to 9).

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 distance in column 1 translates in 3 percentage points higher trade credit to sales, which is equivalent to about 10% of a standard deviation of the proportion of trade credit in new sales.

Also customers with higher relative size are able to perform a larger fraction of purchases on credit. In columns 2, 5, and 8, we sort firms in different groups depending on their relative size in comparison to the customers. A customer proportion of sales involving trade credit increases by nearly 10% if the customer is 10 times larger than the supplier. The effects is only 3% for customers whose size is between 1 and 10 times that of the supplier.

In columns 3, 6, and 9, we include a customer fixed effect. As is consistent with our theory, we continue to find that a customer gets more trade credit if its relative size increases during the sample period. Unsurprisingly, since most of the variation in our customer bargaining power proxies is cross-sectional, the effect of the relative size is reduced.

The effects we uncover are not only driven by the intensive margin as customer are more likely to be offered trade credit when their bargaining power and outside options improve. As a consequence, customers with higher relative size in comparison to the supplier have a larger credit exposure towards that supplier.

The remaining control variables provide interesting information. Suppliers appear to offer more trade credit to distant customers. This suggests that suppliers attempt to attract distant customers by offering better deals, an effect similar to the one highlighted in banking by Degryse and Ongena (2005). However, this effect is present only for the proportion of trade credit in new sales. Overall, suppliers are less likely to offer trade credit to distant customers and have a lower trade credit exposure suggesting that they demand earlier payments.

The ratio of trade credit to sales is not monotonically increasing in the past revenues that the suppliers obtained from a given customer. This is consistent with the evidence presented in the stylized facts and our theory that trade credit typically comes with a credit limit and therefore targets infra-marginal units. Also after controlling for the customer bargaining power, it appears that older and more profitable customers obtain less trade credit as is

consistent with earlier literature emphasizing the role of financial constraints.

The results in Table III provide support for the importance of customer bargaining power for the use of trade credit. Table IV tests the more specific implications of our theory: whether trade credit may be a way of transferring surplus to high-bargaining-power customers without cannibalizing sales to other customers with less bargaining power. For doing so, we explore whether trade credit is relatively more used when a supplier has many customers in the same market, which are potential competitors.

We define a firm's competitors as firms in the same four-digit SIC code located in the same region. Within this local markets, we measure the logarithm of the number of customers. Consistent with the predictions of the model, an increase in the number of customers in the same region and industry increases the extent to which a supplier uses trade credit with high-bargaining-power customers. Also in this case, the effect is monotonically increasing in the extent of the customer bargaining power, as shown by the interaction terms.

Importantly, Table V shows that this is not the case for the number of firms in the same region and industry, which are not client of the same supplier. Suppliers appear to provide less trade credit when an important customer is surrounded by competitors that are not its own customers. While we do not observe the transaction price, on the basis of our theory, we surmise that by providing the input at a lower price rather than trade credit, the supplier favors its important client acquisition of market share. More importantly, this indicates that there is nothing peculiar to the location or the industry driving trade credit. Instead, competition in the downstream market between firms served by the same supplier seems to matter.

4.2 Robustness

Table VI presents a number of robustness tests for our main finding. First, since the definition of local downstream market is crucial to test our theory, we vary the geographical units from 20 Italian regions to about 100 Italian provinces. The results in columns 1, 4 and 7 we

include these finer sets of fixed effects. Our results appear invariant when we use the finer definition of local markets.

Since one of our proxies for customer bargaining power is based on the geography of potential suppliers, in columns 2, 5, and 8, we ask 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 rates and weaker enforcement of laws. We repeat our tests excluding all customers located in Southern Italy. Our results are qualitatively and quantitatively invariant.

Finally, in columns 3, 6, and 9, we include interactions of customers and time fixed effects. While the direct effect of one of our proxies for customer bargaining power, Relative Size, loses significance and even changes sign in column 9, the conclusions of our model continue to be fully supported. When a supplier has a larger number of customers that compete in the same local downstream market, the supplier provides relatively more trade credit.

5 Conclusions

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

We test this conjecture using an unique matched customer-supplier registry from Italy. We find that trade credit use in a customer-supplier relationship increases when the customer has high bargaining power and the supplier has a larger number of customers in a local downstream market. The number of competitors of the customers, which do not share the same suppliers, do not help explain why high-bargaining-power customers receive more trade credit.

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6 Tables

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	1721.18	1.00	30593.00	19,623,468
Total Exposure Amount	38762.33	438.66	1933.54	8259.48	212926.51	0.00	3731653.75	14049
Number of Customers	1396.79	171.00	393.00	980.00	5303.96	1.00	96479.00	14049
Number of Customers Within the Same Region-SIC	53.27	3.00	11.00	43.00	121.63	1.00	1123.00	19,623,468
Share of Sales of 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	1219.09	0.00	142414.00	19,552,258
Total Customer Exposure (>0)	103.82	0.39	1.68	9.18	1955.58	0.00	545716.06	5245599
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	416310.78	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	1242.87	0.00	416310.78	7,795,505
Dummy of Positive Exposure	0.40	0.00	0.00	1.00	0.49	0.00	1.00	19,623,174
Panel D: Supplier-Customer Characteristics								
Distance (KM)	350.08	159.32	302.52	481.41	243.17	1.00	1229.40	19,623,468
Potential Distance (KM)	370.08	277.36	341.29	414.42	131.41	95.00	1073.75	19,623,468
Relative Size	4.39	0.04	0.16	0.70	94.16	0.00	71207.00	19,623,468

Note: 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 418915 distinct customers, 672 distinct suppliers, and 1146747 distinct customer-supplier relationships. All variables are defined in Appendix 1.

Table II: Stylized Facts on Trade Credit Use

	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	17,500,000	17,500,000	17,500,000	19,600,000

Source: 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: 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

Source: We relate different proxies for 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 1. 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 1,000. 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 IV: 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	-0.077***	-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)
Inside Market	-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*Inside Market	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*Inside Market		0.002***			0.007***			0.089***	
		(0.000)			(0.001)			(0.006)	
Relative Size Category 3*Inside Market		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

Source: We relate different proxies for 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 1. 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 1,000. 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 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 V: Trade Credit Use, Bargaining Power, and Competition in Downstream Markets: Placebo Tests

	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 Market	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)
Inside Market	-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*Inside Market	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*Inside Market		0.004***			0.008***			0.100***	
		(0.001)			(0.001)			(0.007)	
Relative Size Category 3*Inside Market		0.008***			0.009***			0.155***	
		(0.001)			(0.001)			(0.017)	
Relative Size*Outside Market	-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 Market		-0.005***			-0.004***			-0.032***	
		(0.001)			(0.001)			(0.008)	
Relative Size Category 3*Outside Market		-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

Source: We relate different proxies for 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 1. 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 1,000. 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 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.

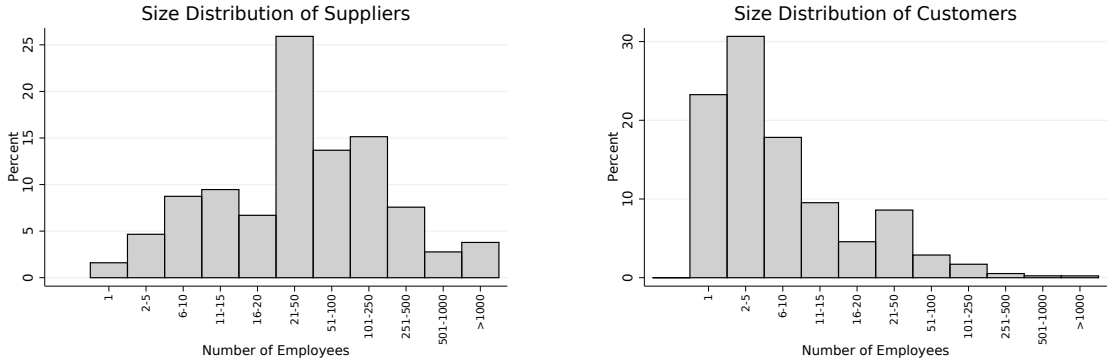
Table VI: Robustness Checks

	Ratio of Trade Credit in New Sales			Dummy Use of Trade Credit			Log Exposure		
	(1) Province Level	(2) No South	(3) Customer*Time FE	(4) Province Level	(5) No South	(6) Customer*Time FE	(7) Province Level	(8) No South	(9) Customer*Time FE
Log Distance	0.002***	0.002***	0.002***	-0.001***	-0.001	-0.001*	-0.037***	-0.032***	-0.031***
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.004)	(0.004)	(0.005)
Log Mean Potential Distance	-0.077***	-0.054***	-0.074***	-0.053***	-0.028***	-0.058***	-0.262***	-0.099***	-0.336***
	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.020)	(0.027)	(0.032)
Inside Market	-0.001	-0.001	0.003***	0.000	0.001**	0.008***	-0.013***	-0.007	0.057***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.005)	(0.005)	(0.007)
Relative Size	2.494***	2.680***	-0.227	1.930***	2.136***	-0.018	24.321***	25.171***	-3.982**
	(0.141)	(0.151)	(0.157)	(0.140)	(0.150)	(0.164)	(1.505)	(1.581)	(1.631)
Relative Size*Inside Market	0.252***	0.205***	0.234***	0.392***	0.297***	0.195***	6.751***	5.699***	5.002***
	(0.053)	(0.056)	(0.057)	(0.054)	(0.057)	(0.058)	(0.629)	(0.657)	(0.616)
Log Past Revenues	-0.005***	-0.006***	-0.007***	0.019***	0.017***	0.021***	0.569***	0.561***	0.643***
	(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***	0.017***	0.029***	0.029***	0.029***	0.148***	0.150***	0.132***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Customer Log Age	-0.006***	-0.005***		-0.007***	-0.006***		-0.088***	-0.079***	
	(0.000)	(0.000)		(0.000)	(0.000)		(0.004)	(0.005)	
Customer Operating Profits	-0.110***	-0.110***		-0.101***	-0.103***		-0.500***	-0.499***	
	(0.005)	(0.005)		(0.005)	(0.006)		(0.050)	(0.055)	
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	0.377	0.623	0.380	0.380	0.609	0.566	0.517	0.736
N	15,037,179	12,570,134	9783126	15,037,187	12,570,140	9783135	15,037,187	12,570,140	9783135

Source: We relate different proxies for 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 1. 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 1,000. 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), (4), and (7) geographical fixed effects are defined at the more disaggregate province level. Columns (2), (5), and (8) exclude customer firms in the south of Italy. Columns (3), (6), and (9) augment the baseline specification with customer*time fixed effects. 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.

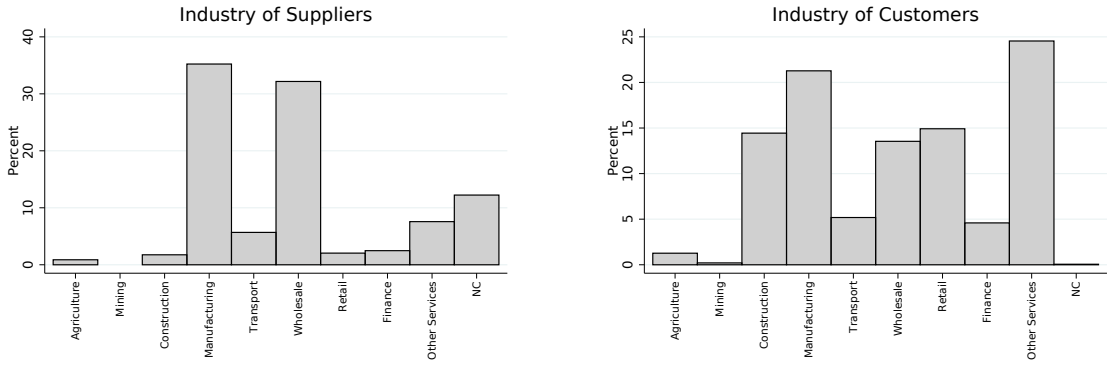
7 Figures

Figure 1: Size Distribution of Suppliers and Customers



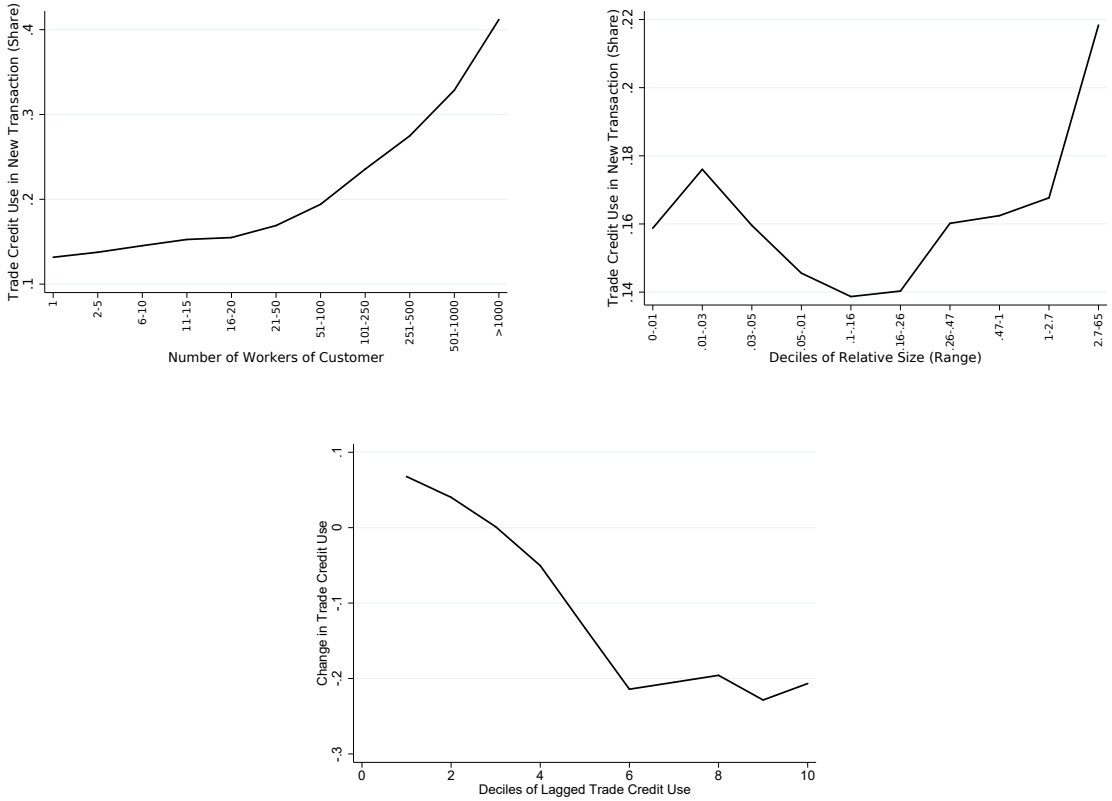
The figure plots the size distribution of suppliers (left panel) and customers (right panel). Size is measured in terms of the total employment and binned across 11 categories.

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 top panel of the figure plots the ratio of trade credit used in the new transaction relative to the total amount of the transaction, and is defined at the monthly frequency between a supplier and his customer. In the left panel, the horizontal axis is the ratio of customer total employment to supplier total employment. In the right panel, the horizontal axis is the customer's number of employees. The bottom panel plots the change in trade credit used between transactions, conditional on some trade credit use in the preceding transaction.

8 Appendix

Variables are defined in the following way:

- *Current Revenues(s,c,t)*: is the value of a new transaction between a supplier and a customer, in thousand Euro.
- *Customer Age(.,c,t)*: is the difference between the year of operation and the year of creation of the customer firm.
- *Customer Operating Profits(.,c,.)*: is defined as the ratio of the customers' EBITDA relative to his total sales.
- *Distance(c,d,.)*:: Distance in KM between supplier and customer ZIP code.
- *Dummy Use of Trade Credit(s,c,t)*: is a dummy variable equal to one if the new transaction between a supplier and customer involved trade credit.
- *Dummy of Positive Exposure(s,c,t)*: is a dummy variable equal to 1 if the monthly exposure between a customer and a supplier is positive.
- *Exposure(s,c,t)*: is the total monthly credit extended by the supplier to a given customer, in thousand Euro. In Table 1, it is aggregated across all its suppliers.
- *Mean Potential Distance (c,d,.)*: average distance in KM between the customer and all potential suppliers from the same 4 digit SIC code (excluding the original supplier).
- *New Sales(s,c,t)*: 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(s,c,t)*.
- *Number of Customers(s,.,t)*: is the monthly number of distinct customers of each supplier.
- *Number of Suppliers(.,c,t)*: is the monthly number of distinct suppliers of each customer.
- *Number of Customers Within the Same Region-SIC(s,.,.)*: is the number of distinct customers within the same region, and the same 4 digit SIC code.
- *Past Revenues(s,c,t-1)*: rolling sum of all transactions between a supplier and a customer up to t-1.
- *Ratio of Trade Credit in New Sales(s,c,t)*: 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(c,d,.)*: 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 1000.
- *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.
- *Share of Sales of Customers Within the Same Region-SIC(s,.,t)*: is the ratio between each customers' new transactions relative to the total sales within the customers' region and 4 digit SIC code.
- *Size Customer(.,c,.)*: is the customer's number of employees.
- *Size Supplier(s,.,.)*: is the number of employees of the supplier.
- *Total Customer Exposure (>0)(.,c,t)*: is the total (non zero) monthly exposure of customers across all of their suppliers, in thousand Euro.
- *Total Supplier Exposure Amount(s,.,t)*: is the total monthly exposure of suppliers across all of their customers, in thousand Euro.