Trade Credit, Relationship-specific Investment, and Product-market Power

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Abstract

The existing literature emphasizes the financing role of trade credit (TC) i.e., the notion that financially sound firms use TC to ease the credit constraints faced by weaker trading partners. We offer an alternative, but not mutually exclusive, perspective on TC serving as a commitment device. We develop a simple model in a setting with incomplete contracts and show that TC emerges as a guarantee that induces appropriate levels of relationship-specific investments (RSI) by the upstream firm. The model predicts that the TC provided by firms increases in (i) the level of their RSI, (ii) the bargaining strength of the downstream firms and the economic importance of the vertical relationship, and (iii) the cost and difficultly of verifying RSI. Our empirical results are strongly supportive of the model's predictions. Using the firm's R&D as a proxy for RSI, we examine a large panel of publicly listed firms and find that the level of TC they provide is increasing in their R&D, in measures of the competition in the industry, and in the economic importance of the vertical relationship. TC increases with information frictions such as measures of distance to downstream firms and decreases with indicators of firm transparency such as listing on the NYSE.

Keywords: TC, relationship specific investment, vertically related industries, market power, incomplete contracts
JEL Codes: *G10, G30, G32*

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1 Introduction

Trade credit entails bundling the sale of merchandise with credit to downstream firms. What are the potential benefits of such joint delivery? The existing literature (e.g., Petersen and Rajan (1994, 1997), Biais and Gollier (1997)) emphasizes the financing role of trade credit. The general notion is that firms tend to receive valuable information about their trading partners and, as a consequence, may be more willing than banks to provide short term financing to their downstream firms.[1] There is, however, more to trade credit than a financing function: the financing argument would, for instance, suggest a flow of credit from larger, less financially constrained firms to ones that were smaller and more credit constrained. Yet this is not evident in the data. As noted in Petersen and Rajan (1997), it is the larger firms that seek and provide more trade credit (accounts payable 11.6% and accounts receivable 18.5% of sales) than small firms (accounts payable 4.4% and accounts receivable 7.3% of sales). What explains the usage of trade credit by firms of all sizes – even when credit-constraints are not evident.

In this paper, we offer an alternative (though not mutually exclusive) perspective on trade credit (henceforth, TC) that is applicable to small and large firms. Our claim is that, in the absence of financial constraints, TC serves an incentive function. Our arguments are developed in the context of a simple model in which an upstream firm can make relationship specific investments (RSI) to ensure the intermediate good it supplies to a downstream firm is exactly what the downstream firm needs. In a Hart and Moore (1994) incomplete contract setting, we show that TC emerges as a form of guarantee when the RSI in the intermediate good is not readily apparent. The rationale is that if it is costly for the upstream firm to invest in RSI and the level of investment in RSI can only be ascertained by the customer firm over time – then the upstream firm has an incentive to underinvest in RSI. In this context, TC emerges as a device in which the delayed payment and risk of non-payment if the RSI has not been made, makes it incentive compatible for the upstream firm to invest appropriately. The level of TC that is provided will depend on the relative bargaining power of the firms as well as on how readily information about RSI investments becomes available.

[1] The fact that trading partners are willing to provide trade credit also serves as a positive signal and enhances a firm's ability to raise financing from other sources of capital.

Our model delivers a number of empirical predictions. These predictions do not flow easily from the financing explanation for TC and, hence, allow us to test for the empirical validity of our RSI-incentive approach. Further, our model predicts relations between TC and variables that are relatively easy to observe/measure. In contrast, the signaling models of TC (e.g., Long, Malitz, and Ravid (1993) and Lee and Stowe (1993)) predict the relation between TC and product quality, which is usually not observable and empirical tests thereof must use potentially noisy proxies for quality.[2]

The first prediction of our model is that the level of TC provided by the upstream firm, that is its account receivable, relates positively with its level of RSI investments. Our second prediction is that the greater the market power of the upstream firm, the less the TC it will provide to the downstream firm. This is generally consistent with the empirical finding in literature (e.g., Fabbri and Klapper, 2008) that relatively more powerful firms appear to receive more TC from their suppliers, while providing less to firms that are their own customers.[3] There are two reasons why this empirical evidence is not easily accounted if trade credit TC is primarily seen as a financing mechanism. The first is that according to this view, we should expect relatively more profitable, powerful firms to make *more*, rather than less TC available to their trading partners. The second is that it is hard to explain why stronger firms would utilize their bargaining strength to extract more TC. Why not simply negotiate for a higher (lower) price from customers (suppliers)?[4] We believe that our model offers an explanation for why the relative bargaining strengths of the supplier and customer firms can impact the level of TC being provided. We posit that the (relative) bargaining strength of the upstream firm affects its incentive for making RSI. The greater the bargaining power of the upstream firm, the larger is the share of the surplus it captures in its trading with the downstream firm. As

[2]In their empirical tests, Long, Malitz, and Ravid (1993) use, among other variables, firm age, size, sales turnover to proxy for product quality.

[3]This has not escaped the attention of the financial media. For instance, according to an analysis conducted for The Wall Street Journal "Firms with less than $500 million in annual sales, on the other hand, generally took longer to collect cash and paid their bills faster than in the same period a year ago." *Wall Street Journal, Aug 31, 2009*

[4]It is suggested, e.g., in Fabbri and Klapper (2008), that firms may find it difficult to charge different prices to different customers. This is possibly the case when goods are undifferentiated commodities for which there are publicly announced prices. However, such an explanation is less plausible for differentiated goods that do not have publicly announced prices.

a result, ceteris paribus, it is more costly for the upstream to deviate from making RSI and, hence, the less need for TC to serve as an incentive device.

Finally, in our theoretical framework, TC is the commitment mechanism used when there is uncertainty about the level of RSI made that is resolved only after experiencing the product. Therefore, the use of TC as a commitment device is expected to be less prevalent when it is easier to assess whether appropriate RSI has been made. For example, the use of TC to ensure RSI will be less likely when the downstream and upstream firms are in close proximity. Therefore, we would expect the positive relation between accounts receivables and RSI to be stronger when the downstream firm is geographically further away from its supplier. Also, we expect that when the upstream firm is relatively less known, the downstream firm is more likely to require TC as a RSI-commitment device. Our framework also implies that the use of TC as a commitment device to make RSI investments will be more likely when the economic linkages between firms are important.

For our empirical analysis we draw our data from two main sources. We start by collecting accounting information on all available firms in Compustat over the period 1997–2008. We then identify each firm's supplier- and customer-industry by using the *Use* tables from the Benchmark Input-Output (I-O) data published by the Bureau of Economic Analysis (BEA). In our analysis, the key dependent variables are the two measures of TC – accounts receivable (AR) and accounts payable (AP) and the two independent variables of interest are the RSI made by a firm (for the relationship between a pair of industries that are vertically related along the supply-chain) and the market power of a firm. We follow the literature (e.g., Kale and Shahrur (2007)) and measure RSI by the firm's research and development expenses (R&D), and, following Gaspar and Massa (2006), we measure the firm's market power (FMP) by its price-to-cost margin (Lerner Index), which is the ratio of operating profits to sales.[5]

We first examine the relation between a firm's TC levels, its level of RSI, and its market power. We find strong support for our predictions: when the upstream firm has low (high)

[5]Using R&D expenditure as the proxy for RSI is consistent with Armour and Teece (1980) who posit that greater the R&D expenditure in a vertical chain the greater is the likelihood of sophisticated interstage dependencies. Allen and Phillips (2000) argue that greater RSI are more likely in high-R&D industries. Finally, Levy (1985) suggests that high-R&D firms use specialized inputs that require RSI by supplier firms.

market power and high (low) RSI, it provides significantly more TC to downstream firms.[6] We next analyze the marginal impact of ease of monitoring and product quality uncertainty on the relation between the TC extended and RSI or FMP. Consistent with our prediction, we find that when the the supplier and the customer firms are located (feographically) closer – which may make it easier for the firm to monitor and/or obtain information on its supplier – the relation of RSI to TC is weaker. Similarly, for firms that are listed on the NYSE – that tend to have more information that is publicly available and are also more likely to be concerned about their own reputation – the relation between the TC extended and RSI or FMP is weaker. Next, we test whether the relation between TC and RSI and FMP is stronger when the economic linkage between the upstream and downstream industries is stronger. We use information from the Benchmark Input-Output tables published by the *Bureau of Economic Analysis*, to compute the the significance of the relation between the upstream and downstream firms. Our results indicate that the effects of RSI and FMP on TC are indeed stronger when economic dependence is greater.

In industries that produce differentiated goods and services, RSI assume greater importance than for those that produce commodities. Therefore, a downstream firm that obtains inputs from a differentiated industry will be more concerned about these RSI being made and will demand more TC as a result. Hence, we would expect that the relation of the firm's accounts receivable with its own *RSI* to be stronger for firms that operate in industries producing differentiated goods and services. Besides, by their very nature, industries producing differentiated goods and services will have more bargaining power than those producing commodities. Our empirical results are generally supportive of these predictions. We also conduct a number of robustness tests and show that our findings are robust to several sample restrictions. They are stronger, for instance, when the sample is confined to manufacturing industries. We also use instruments to correct for potential endogeneity and show that the results hold.

Since our paper proposes that TC is a mechanism used by a firm to commit to an appro-

[6]Using survey data, Ng, Smith, and Smith (1999) find that closer personal relationship between sales persons and the customer do not impact TC level. These authors infer from this finding that RSI is not a significant determinant of TC. The survey data in this study also offers mixed evidence with respect to the quality guarantee role of TC.

priately high level of RSI, it belongs to the set of papers that offer and/or test theories of TC based on a firm's real rather than financial operations.[7] There is some earlier literature that has proposed TC as a signal of the (product) quality of the upstream firm. One of the earlier papers in this genre is Smith (1987), who suggests that delayed payment allows the buyer the time to inspect the goods. Long, Malitz, and Ravid (1993) show that when the downstream firm cannot distinguish between the high- and the low-quality upstream producer of inputs, TC can be used as a dissipative signal of quality by the high-quality producer. The use of TC as a guarantee of higher product quality has also been modeled by Lee and Stowe (1993), who show that firms producing lower quality products offer cash discounts whereas high-quality goods producers charge higher prices and offer TC. We contribute to this literature by illustrating how TC emerges as an incentive compatible mechanism in an incomplete contracting framework that is used by the upstream firm to commit to a higher level of RSI. In our framework, however, there is no asymmetric information. We require only that in order to produce the correct input, the upstream firm needs to make the appropriate level of RSI and that this RSI can be ascertained by the downstream firm only after experiencing the product. In an incomplete contracting framework, we show that TC arises as an incentive compatible mechanism used by the upstream producer to commit to the appropriate level of RSI.

The empirical support for the quality gurantee role of TC is sparse and mixed. Long, Malitz, and Ravid (1993) provide evidence that variables that may potentially proxy for firm quality (firm age, size, and asset turnover) relate positively to the number of days sales represented by accounts receivable. The findings in Petersen and Rajan (1997), on the other hand, indicate that larger firms exhibit higher levels of both accounts payable and accounts receivable. Petersen and Rajan (1997, footnote 16) also find that the level of TC offered by wholesalers of durables is not significantly different from that of other wholesalers, which these authors interpret as evidence against the quality guarantee theory. Our empirical tests contribute to the literature by providing evidence that hgher levels of RSI and firm market power lead to higher and lower levels of TC, respectively. We also show how these relations become stronger (weaker) in subs-samples where the potential for TC to serve as an RSI commitment mechanism is greater

[7]This categorizationof the trade credit literature is proposed by Frank and Maksimovic (2005).

(smaller).

As noted earlier, TC has been viewed largely from a financing perspective in the existing literature. The argument is that firms, if they are financially strong and have ready access to short-term borrowing, might have an information advantage, as well as other relationship type considerations, to contribute to the financing of the their trading partners. Biais and Gollier (1997) develop an information based argument in a formal model, in which the provision of TC communicates good information and encourages bank financing. There are several pieces of empirical evidence that are generally supportive of the financing view: TC provision tends to be higher when the seller has greater access to external finance (Petersen and Rajan (1994, 1997)); industries that are more heavily reliant on TC tend to do relatively better in economies with less developed financial markets (Fisman and Love (2003)).[8] We view our approach as not necessarily mutually exclusive from the financing approach, other than to note that the financing argument is likely to be most relevant in the context of the small firms that have largely been studied in the empirical studies on TC. Our empirical suggest that the cross-sectional and time-series patterns are largely consistent with the approach that we have proposed.

Our paper also relates to studies that provide evidence that firms with greater bargaining strength/ market power appear to receive greater amounts of TC, while providing less to their own customers. Fabbri and Klapper (2008) study emerging economies and suggest that firms with more market power appear to receive more TC. As we have discussed there if TC is viewed as primarily a financing arrangement, there is no ready explanation for why stronger firms should extract, rather than provide, more TC. Our approach, on the other hand, makes a clear prediction that the level of TC provided declines in the firms market power and we supportive empirical evidence. Thus, our framework complements Fisman and Raturi (2004) who also argue that there should be a negative relation between market power and TC provided. These authors propose that buyer firms must bear a cost (relationship-specific investment) to

[8]The framework where TC is a financing mechanism cannot explain many empirical regularities. For example, Burkart and Ellingsen (2004) argue that if upstream firms have informational advantages in lending to the downstream firm, why is it that all their financing is in terms of inputs and not cash? These authors then go on to develop a model which shows that TC is the favored mechanism when inputs are not easily divertible; see Giannetti, Burkart, and Ellingsen (2009) for evidence supportive of this prediction. Uchida, Udell, and Watanabe (2007) study a sample of Japanese firms and do not find evidence thast trade creditors are relationship lenders. Marotta (2005) finds that TC levels are the same for credit rationed and credit non-rationed firms.

prove their credit-worthiness. Therefore, accepting TC makes sense to the buyer only if the relationship with the supplier is long-term. If the supplier has market power, then it will capture all the relationship surplus and, as a result, the buyer will not have any incentive to bear the RSI required to prove credit-worthiness. Thus the a supplier with greater market power will have lower accounts receivable.

The predictions and empirical findings in our paper are also related several other papers on TC. Our findings that the relations between TC and RSI and TC and FMP are stronger for firms supplying differentiated goods and for the manufacturing sector are consistent with Giannetti, Burkart, and Ellingsen (2009). Our finding that the relations of TC with RSI and FMP are more pronounced when the economic interdependence between the buer and supplier firms is greater is consistent with Wilner (2000) who argues that when bilateral relations are more important,TC is more likely than bank financing. Our findings on the importance of economic interdependence are also consistent with Cunat (2007).[9]

The paper is organized as follows. The next section presents a simple model in which TC is shown to be an incentive-compatible mechanism which ensures that the upstream firm makes the appropriate level of RSI. This section also derives the prediction on how TC relates to firm market power as well as comparative statics that form the basis of the empirical tests that ensue. Section 3 describes the data sources and the variables used in our empirical tests. Section 4 presents the empirical results and Section 5 concludes the paper.

2 A Simple Model of Trade Credit, Relationship-specific Investment, and Product-market Power

In this section, we develop a simple model of TC in the context of RSI by an upstream firm. In a Hart and Moore (1994) incomplete contract setting, we show that TC can emerge as a form of quality guarantee, when it takes time for the downstream firm to verify whether the upstream

[9]It has been argued in the literature that TC might be related to the nature of the merchandise being sold i.e., whether it requires RSI or is a differentiated good etc. An upstream firms may, however, not invest or underinvest in RSI unless it expects to be adequately compensated. Kim and Shin (2007) suggest a type of TC chain in which firms that are upstream tend to provide TC to their customers, that in turn provide TC to their own customers. An implication is that firms that receive TC are also likely to be provide it to their own customers. There is little empirical work related to this approach. Such a chain of TC provisions is not obviously indicated in our empirical results. For instance, firms with more market power appear to extract more TC from their suppliers, while providing less TC to their own customers in the chain.

firm has, indeed, invested in RSI. In effect, TC emerges as a flexible device to induce appropriate level of RSI – and may be employed even when the firm receiving TC is not cash constrained. We then analyze the impact of various factors such as industry competition, bargaining power and transparency issues on the TC-RSI relation.

2.1 Model Set-up

We consider a one period model with four dates $t = 0..3$. There are two firms A and B, where A is the upstream firm and B the downstream firm. To focus on issues other than credit constraints, it is assumed that both firms have access to adequate financing. For simplicity, the risk-free is normalized to zero, there is no discounting between the dates and all agents are assumed to be risk-neutral.

At date 0 firm A produces its 1 unit of the intermediate good, which we will label a widget. In producing the widget, A decides whether or not make a (lump sum) RSI of $e > 0$. The investment can represent, for instance, costs incurred in producing a widget specially designed for firm B. For expositional ease, all other production costs are normalized to zero. As described below, the RSI is expected to increase the value of the final good produced by the downstream firm. It is assumed that without the RSI, A's widget is equivalent to generic widgets that are readily available in the market at a price of P_0. The RSI is very specific and only firm B is in a position to benefit from the investment. Hence, no firm other than B would be willing to pay more than P_0 for the widget produced by A, whether or not the RSI has been made.

At date 1 the two firms bargain over the price and other terms under which the widget is sold to B. The relative bargaining strengths of the firms A and B are denoted by $1 - \beta$, β and are assumed to reflect the competitive conditions of their respective industries as well as the uniqueness of their products. The relative bargaining power of the firms will affect the price as well as credit terms at which the widget is sold.

It is assumed, as in Hart and Moore (1994), that contracts are inherently incomplete and that it is infeasible to write or enforce a contract that would ex-ante (i.e., prior to the production of the widget) specify the price and quality of good that is to be transferred at date 1. Hence, the price as well as any TC terms are settled as a result of bargaining that takes place at date

1. We denote by P_1 the price at which the widget is sold. Some of this payment is to be made at date 1 and the rest, representing the TC portion, at date 2. We assume that there is some small cost associated with A providing TC, which ensures that TC is employed only when it has positive benefits. The cost could reflect, for instance, the marginal cost of raising external capital to provide the TC and we denote it by ϵ per unit of TC provided.

Date 3 is the terminal date on which $B's$ output is sold. The value of $B's$ output depends on whether its input widget had received the RSI: with the investment the output produced by B has a value $\overline{V}$ while the value is $\underline{V}$ if the widget is generic or has not received the RSI. We normalize the value added by the RSI to 1 so that $\overline{V} - \underline{V} = 1 > e$. We also normalize the investment made by firm B to zero.

The function of the TC arrangements in the model is to induce RSI by firm A. We assume that whether the appropriate RSI has been made in producing the widget might not be evident to B at date 1., and that the RSI level in the widget may be ascertained for certain only at date 2, possibly when the widget begins to be employed in firm $B's$ production process. Specifically, at date 1 the RSI level in the widget is revealed with probability θ, while it is revealed for certain by date 2. While the RSI level in the widget cannot be contracted on, it is assumed that it is verifiable and contractible as to whether a widget has been delivered or returned (in part or whole) as well as any payments made in connection with the delivery or return of the widgets.

We also assume that any payments made at date 1 are hard to recover from A without significant costs. For simplicity, we assume that payments can be fully diverted by A and, hence, any arrangement that imposes costs on A for not making the RSI will need to be in form of denying payments – rather than seeking to recover earlier payments (or imposing additional penalties).

The use of TC as an incentive device that we discuss is based on the following straightforward mechanism: The widget is bought by B for price P_1 at date 1 unless it is revealed as lacking the RSI. If information is not forthcoming at date 1, then a portion of the payment, the TC, is withheld by B. At date 2, if firm B is satisfied about the RSI, it retains the full merchandise and pays off its TC. As noted above, it can be verified by outsiders as to whether the full

payment has been made if the widget is retained. However, firm B can also choose to return an appropriate fraction of the widget if it decides that the widget lacks appropriate level of RSI. The fraction of the widget returned is assumed to correspond to the fraction of the payment withheld in TC. The return of the fraction of the widget in lieu of TC is an enforceable contract according to our assumptions. Since the provision of TC entails some (small) costs, it follows that the TC that will be employed will be the least amount to provide A with the incentive to invest in RSI.

We now analyze the decision to undertake RSI and intermediate good prices in equilibrium and the use of TC, starting with the full information case i.e., $\theta = 1$.

2.2 Case with full information at date 1

We first consider the case in which the RSI level in the widget is known at the time of trade. In this case, the price P_1 at which the trade takes place will be determined as a result of bargaining, under the assumption that the RSI has been made. If there is no trade then firm A sells the widget in the market for a price of P_0. (From an ex-ante perspective the payoff of the firm if it does not sell to B is $P_0 - e$.) Similarly, if firm B does not purchase the input widget from A, its output is given by $\underline{V}$ and its payoff is $\underline{V} - P_0$. The total surplus value produced from the trade is 1, reflecting the fact that in the absence of trade, the total value to A and B is $\underline{V}$, while if trade does take place the total value is $\overline{V}$. If the bargaining power of A is $1 - \beta$, this will result in A receiving a fraction $1 - \beta$ of the surplus. Hence, the price P_1 will be given by:

$$P_1 = P_0 + (1 - \beta) \tag{1}$$

If this is the price at which the widget is expected to be sold, then at date 0, A will make the RSI e only if $P_1 - P_0 \geq e$ (since A can always obtain P_0 without the investment e). We make the assumption that $P_1 - P_0 = (1 - \beta) > e$. Since RSI level cannot be contracted upon, without this assumption A never invests in RSI.

The expression for P_1 indicates that the selling price is decreasing in the bargaining power of the downstream firm (β); it is increasing in the value added from the relationship specific investment. It is obvious that there is no role for TC in this scenario.

2.3 Case with incomplete information at date 1

This is the more interesting situation in which there is only a probability of θ that the downstream firm can learn of the RSI level in the widget at date 1. Given that there are some (small) costs to A associated with delaying payment, we are interested in finding the lowest amount of TC (i.e., delay in payment to A) that makes it incentive compatible for firm A to make the RSI. Any payments made to A at date 1 are, as discussed above, not recoverable by firm B.

There is no need for TC if the information arrival at date 1 is sufficiently likely i.e., the following condition is satisfied:

$$\theta(P_1 - P_0) = \theta(1 - \beta) \geq e \tag{2}$$

If equation (2) is satisfied, firm B pays fully for the widget at date 1 since the expected cost to A from not investing is sufficiently large, even if its investment is revealed with only some probability. Note that this is more likely to occur when the bargaining power of the downstream firm is lower. The economic rationale is that firm A has less reason to underinvest when it expects to capture a larger share of the value produced from the relationship specific investment.

When the above condition (equation (2)) is not satisfied, TC will emerge. Let us say that a fraction α of the payment P_1 is made at date 1 and the rest is promised at date 2, so $1 - \alpha$ is the measure of TC. As noted, we consider the case in which at date 2 firm B either pays $(1 - \alpha)P_1$ to A or returns a fraction $1 - \alpha$ of the widget that was delivered at date 1. When A receives the fractional widget it can sell it in the market at a price of P_0 per unit. Also, B can replace the fractional widget by a generic widget purchased in the market for P_0 (note that since the quality of the good is known to both A and B at date 2, they could also renegotiate a price of P_0 per unit for fractional widget, instead of it being returned to A).

The incentive compatibility condition for A to make the RSI investment at a cost of e requires that:

$$\begin{aligned} P_1 &\geq (1 - \theta)(\alpha)P_1 + \theta P_0 + (1 - \theta)(1 - \alpha)P_0 + e \\ &= (1 - \theta)(\alpha)P_1 + [1 - (1 - \theta)(\alpha)]P_0 + e \end{aligned} \tag{3}$$

The right hand side of equation (3) represents the expected payoff to A if the investment in RSI has not been made. With probability $(1-\theta)$ the RSI in the widget is not revealed and A receives αP_1, with $(1-\alpha)P_1$ as the TC expected to be paid at date 2. On the other hand, A receive P_0 with probability θ if the RSI in the widget is revealed or receives a fraction of the widget, worth $(1-\alpha)P_0$, in lieu of the TC at date 1. The costs of TC are taken to be positive, though very small, and are not explicitly included in the expressions.

Using equation (2), we can express equation (3) as:

$$P_1 - P_0 = (1-\beta) \geq \frac{e}{1-(1-\theta)(\alpha)} \tag{4}$$

or, after algebraic manipulation, as:

$$(1-\alpha)(1-\theta) \geq \left[\frac{e}{(1-\beta)} - \theta\right]. \tag{5}$$

A TC of amount $(1-\alpha)$ per unit of sales is required with a probability of $(1-\theta)$ i.e., when information about widget quality is not revealed at date 1. Hence, the left hand side of equation (5), $(1-\alpha)(1-\theta)$, represents the expected TC per unit of sales. Equation (5) will be satisfied as an equality, since it is not optimal to use more TC than necessary, given the small costs associated with its provision. Hence:

$$TC = (1-\alpha)(1-\theta) = \left[\frac{e}{(1-\beta)} - \theta\right] \tag{6}$$

Equation (6) above yields a number of interesting results regarding the provision of TC. We state these results in the proposition below, followed by a discussion of the underlying intuition and testable predictions.

Proposition 1: *It follows from equation (6) that the provision of TC is:*

1. *Expected to increase in e, the level of RSI.*

2. *Expected to increase in $(1-\beta)$, the bargaining power of the downstream firm. Likewise TC is decreasing in β, the bargaining power of the upstream firm.*

3. *Expected to decrease in θ, where θ indicates the ease with which good information about the upstream firm and its RSI becomes known to the downstream firm.*

2.4 Empirical Predictions

The theoretical framework that we have developed outlines a stylized strategic role for TC. The upstream firm is required to make RSI in producing the input for the downstream firm, but whether the appropriate RSI has been made can be verified by the downstream firm only subsequently by, say, physical inspection. In such a setting, the granting of TC by the supplier can serve as a relatively flexible and cost-effective mechanism that provides an incentive to the upstream firm to make the necessary RSI and produce an input specific to the buyer's needs.

We discuss briefly the intuition underlying the three predictions from Proposition 1. The first prediction of the model is immediately apparent. The TC commits the upstream firm to making RSI and, hence, we would expect the level of TC provided to be positively associated with its level of RSI. Our second prediction is that the greater the market power of the upstream firm, the less the TC provided to the downstream firm. The reason has to do with the fact that (relative) bargaining strength of the upstream firm affects the incentive it requires for making RSI. The greater the bargaining power of the upstream firm, the larger the share of the surplus it captures in its trading with the downstream firm. Ceteris paribus, it is more costly for the upstream to deviate from making RSI investments and, hence, the less need for TC to serve as an incentive device. Finally, in our theoretical framework, TC is the commitment mechanism used when there is uncertainty about product quality that is resolved only after experiencing the product. Therefore, the use of TC as a commitment device will be less prevalent when it is easier to assess product quality. Our framework also implies that the use of TC as a commitment device to make RSI will be more likely when the economic linkages between firms are important. When the downstream industry is the most important output industry for the firm, its bargaining power is lower. In such a case, we hypothesize that the positive relation between a firm's accounts receivables and the level of its RSI is stronger. Using similar reasoning, we also hypothesize that the positive relation between a firm's accounts payable and it's upstream supplier's RSI will be weaker when the upstream supplier is its most important input industry.

The next section describes the construction of our data sample as well as provides a de-

scription of the main variables used in the empirical analyses.

3 Data and Description of Variables

3.1 Data

We draw our data from two main sources. We start by collecting accounting information on all available firms in Compustat over the period 1997–2008. We then identify each firm's supplier- and customer-industry by using the *Use* tables from the Benchmark Input-Output (I-O) data published by the Bureau of Economic Analysis (BEA). These I-O data are matched with Compustat using the BEA's concordance table between NAICS industry codes and the I-O industries.[10] The 1997 Benchmark I-O table is matched with Compustat data over 1997–2001 and that from 2002 is matched with Compustat data over 2002–2008. For any given industry, there will be multiple supplier- and customer-industries, but we only pick the one that is most significant for the firm. The most significant supplier-industry is chosen as the one that the firm's industry derives the largest percentage of its total inputs from, and the customer-industry is chosen as the one that the firm's industry is the biggest provider of inputs to. Before conducting the empirical analyses, we trim the extreme one percentile observations of our two main dependent variables (AR and AP, defined below) as well as the two main independent variables (RSI and FMP, defined below). Besides this, we also winsorize the extreme one percentile observations of the firm-specific control variables that are used in all our regressions. This is done in order minimize the impact of outliers on our findings, without losing a significant enough portion of the sample.

3.2 Dependent Variables

The dependent variables in our analysis are the two measures of TC – accounts receivable and accounts payable. *Accounts Receivable (AR)* is the dependent variable when we analyze the relationship between the firm's industry and its most significant customer-industry. It is calculated as the logarithm of the firm's accounts receivable to sales ratio. Similarly, *Accounts*

[10] We start our sample in 1997 because the BEA's concordance table before 1997 matches the I-O industries with SIC industry codes instead of NAICS codes; using the 1997 and 2002 I-O tables helps us maintain uniform industry definitions throughout our sample.

Payable (AP), which is used in the analysis of the relationship between the firm's industry and its most significant supplier-industry, is the logarithm of the firm's accounts payable to sales ratio. All the data needed to compute these two variables are from Compustat. We also use *Change in Accounts Receivable (ΔAR)* as an alternative dependent variable, which is the logarithm of one plus the ratio of accounts receivables to its own lagged value.

3.3 Independent Variables of Interest

There are two main empirical constructs that are of interest as independent variables in our analyses – the RSI made by a firm (for the relationship between a pair of industries that are vertically related along the supply-chain) and the market power of a firm. Depending on the specification, we define these two variables in a few different ways. In the base case, where we analyze the TC extended by the firm, the *RSI* is measured by the firm's research and development expenses (R&D), calculated as a fraction of lagged assets (Kale and Shahrur (2007)). And the *Firm's Market Power (FMP)* is defined as its price-to-cost margin, which is measured by the ratio of operating profits to sales (Gaspar and Massa (2006)). When the dependent variable is the annual change in TC provided (i.e., ΔAR), then the corresponding independent variables are also defined as changes. *Change in Relationship-specific Investment (ΔRSI)* is the logarithm of one plus the ratio of RSI to its own lagged value. *Change in Firm's Market Power (ΔFMP)* is the logarithm of one plus the ratio of FMP to its own lagged value.

When the dependent variable is the amount of TC that the firm receives (i.e., AP), the two independent variables are measured at the level of the supplier-industry. *Supplier's RSI* is the median ratio of research and development expenditure to lagged assets in the supplier-industry. This median is calculated after converting all the missing firm-level R&D values within the industry to zero. *Supplier's Market Power (SMP)* is calculated as the Herfindahl Index of sales in that industry (Gaspar and Massa (2006)).[11] Our classification of industries is the same as the one used in the I-O tables to identify customer and supplier industries.

[11] The reason we use the median ratio in the supplier's industry is that the BEA's supplier-customer relationship data is at the industry level and allows us to identify only supplier- and customer-industries and not specific firms.

3.4 Control Variables

In our empirical tests, we control for several firm-specific control variables that are described here. *Firm Size* is the logarithm of the firm's sales. *Book Leverage* is the sum of long-term debt and debt in current liabilities, calculated as a fraction of assets. *Cash Holdings* is ratio of cash held by the firm to its lagged assets. *Market-to-Book* is the ratio of market equity to book equity. Market equity is simply the market capitalization of the firm's equity, i.e., a product of the shares outstanding and the closing price at the end of the fiscal year. Book equity is the sum of shareholders' equity and deferred taxes or income tax credits less preferred stock. *Return on Assets* is the income before extraordinary items as a percentage of lagged assets. *Tangibility Ratio* is the ratio of net property, plant, and equipment to assets. *Kaplan-Zingales Index* is defined as per Baker, Stein, and Wurgler (2003). It is equal to $3.139 \times$ (Book Leverage) $+ 0.283 \times$ (Tobin's Q) $- 1.002 \times$ (Cashflow) $- 39.368 \times$ (Dividends) $- 1.315 \times$ (Cash Holdings). *Tobin's Q* is the ratio of the sum of assets and market equity less book equity and deferred taxes to assets. *Cashflow* is the sum of income before extraordinary items and depreciation and amortization, calculated as a fraction of lagged assets. *Dividends* is the sum of dividends on common and preferred equity, calculated as a fraction of lagged assets. The other two component variables are defined above.

Table 1 reports the summary statistics for all the above variables.

4 Empirical Findings

4.1 TC as an Incentive to Increase the RSI and the Role of Market Power

In this section we test the empirical predictions of our model, listed in §2 above, and present our empirical results. Our hypothesis is that TC is demanded by the downstream firm in order to incentivize the upstream firm to make the necessary RSI. However, an upstream firm that wields market-power can mitigate this demand for credit from the downstream firm. We start by examining the impact of a firm's RSI and its market power on the amount of credit it provides. To this end, we estimate a regression where the dependent variable is the amount of TC that the firm extends downstream, i.e., the firm's level of accounts receivable. The

main explanatory variables of interest in this regression are the firm's RSI, which is proxied by its R&D expenses, and the firm's market power (FMP), which is measured by its Lerner Index. In addition, guided by the extant literature, we include several variables to control for other potential determinants of the level of TC that the firm extends. These firm-specific control variables include the firm's size (*Firm Size*), leverage (*Book Leverage*), growth prospects (measured by *Market-to-Book* ratio), the level of cash (*Cash Holdings*), operating performance (*Return on Assets*), fixed assets (*Tangibility Ratio*), and the severity of its financial constraints (measured by the *Kaplan-Zingales Index*). All these variables have been defined above as well as in the Appendix. Specifically, we estimate the regression model below:

$$AR_{i,t} = \alpha_1 + \beta_1 RSI_{i,t} + \beta_2 FMP_{i,t} + \gamma_1 \prime X_{i,t} + \delta_i + \phi_j + \psi_t + \epsilon_{i,t} \tag{7}$$

Besides the variables described above, we also include firm, industry, and year fixed-effects, denoted in (7) by δ_i, ϕ_j, and ψ_t respectively. (While this regression equation represents a firm fixed-effects estimator, we also estimate this panel regression using firm random-effects.) In Table 2, we present the results from a panel estimation of the above regression. The first two columns of Table 2 present fixed-effects estimates from models that include the level of either RSI or FMP along with all the control variables. The third column presents the fixed-effects estimates when the effect of both RSI and FMP is jointly determined. The results in these three columns offer strong support for the first two predictions of our model. The coefficient on RSI is positive and statistically significant in both the specifications (columns (1) and (3)), which is consistent with the hypothesis that a firm extends TC as a commitment device to making RSI. Consistent with the hypothesis that when a firm has market power, it has less of a need to offer TC, the coefficient on FMP is negative and statistically significant in column (3). (FMP on its own is not statistically significant in column (2) even though it is negative, as we predict.)

In order to test the hypothesis that the upstream firm's market power restricts the ability of the downstream firm to demand credit, we create two dummy variables: one which equals 1 when the FMP of the upstream firm is above the sample-median and equals 0 otherwise, and another complementary dummy variable, which equals 1 when the FMP is below the sample-median, and equals 0 otherwise. We then interact these dummy variables with RSI and replace

the level of RSI used in column (3) with these two interaction terms, denoted *RSI when FMP is Low* and *RSI when FMP is High*. The estimates from this panel regression are reported in columns (4) and (5), where the former controls for firm fixed-effects and the latter for firm random-effects. The findings in both columns tell a consistent story that the positive relation between accounts receivables and RSI is evident only when the firm's market power is weak. When the upstream firm has greater market power within its own industry, then the downstream firm is unable to use TC strategically as an incentive to ensure RSI. Therefore, the positive relation between RSI and accounts receivable breaks down when the upstream firm has greater market power.

The findings in Table 2 relate to the case when the firm is the upstream supplier that is offering the TC and making the RSI. Next, we confirm these results for the case when the firm under consideration is the downstream firm that receives TC from its supplier and this TC is the mechanism that provides the upstream firm with the incentive to make RSI. The firm's *Accounts Payable* measure the TC that it receives. However, since we do not know the identity of the upstream firms, we first identify the given firm's most important supplier industry from the *Use* tables published by the BEA under its I-O data and we then construct the measures of the *Supplier's RSI* and *Supplier's Market Power* for the overall industry that is identified as the biggest supplier. The most important supplier industry is identified as the one that provides the largest fraction of inputs to the given firm's industry. *Supplier's RSI* is the median ratio of R&D to lagged assets in the supplier industry and the *Supplier's Market Power* (SMP) is the Herfindahl Index of sales in the supplier industry. Our industry classification is based on the one used in the I-O tables; this allows us to define customer and supplier industries exactly like they are defined in the I-O tables. Besides these independent variables of interest, we also control for the same firm characteristics that we did in equation (7) above; these are *Firm Size*, *Book Leverage*, *Market-to-Book*, *Cash Holdings*, *Return on Assets*, *Tangibility Ratio*, and *Kaplan-Zingales Index*. This regression model can be depicted as:

$$AP_{i,t} = \alpha_2 + \beta_3 SupplierRSI_{i,t} + \beta_4 SMP_{i,t} + \gamma_2 \prime X_{i,t} + \delta_i + \phi_j + \psi_t + \epsilon_{i,t} \tag{8}$$

The notation is the same as that used in equation (7) above – besides the variables described

above, we control for firm, industry, and year fixed-effects, denoted in (8) by δ_i, ϕ_j, and ψ_t respectively. We present results from a panel estimation of the above regression in Table 3. The five models in Table 3 correspond to those presented in Table 2. Once again, while the above regression equation in (8) represents a firm fixed-effects estimator, we also estimate this panel regression using firm random-effects, in which case the error term will have a different form. The results in Table 3 show that the coefficient on *Supplier's RSI* is positive but not statistically significant in column (1). However, when we estimate the effect of *Supplier's RSI* and *Supplier's Market Power* together in column (3), we find *Supplier's RSI* to be statistically significant, which implies that the downstream firm demands more TC when it expects the upstream supplier to make the relationship-specific investments. The coefficients on *Supplier's Market Power* are negative and statistically significant in both columns (2) and (3), which is consistent with the hypothesis that when the upstream firm has market power, its need to extend TC is lower. As in Table 2, the last two Models in Table 3 test whether the downstream firm's ability to require TC is restricted when the *SMP* is high. For testing this, we create two dummy variables: one which equals 1 when the *SMP* of the upstream industry is above the sample-median and equals 0 otherwise, and another complementary dummy, which equals 1 when the *SMP* is below the sample-median, and equals 0 otherwise. We then interact these dummy variables with *Supplier's RSI* and replace the level of *Supplier's RSI* in column (3) with these two interaction terms, denoted *Supplier's RSI when SMP is Low* and *Supplier's RSI when SMP is High*. As is evident from the results in columns (4) and (5) of Table 3, the positive relation between the upstream industry's RSI and the TC received by the downstream firm only persists when the upstream industry is weaker in terms of market power. These findings confirm our working hypothesis that the downstream firm is less able to exploit TC as a strategic tool when the upstream industry has more market power.

While the results presented in Tables 2 and 3 above are supportive of our hypotheses, they only show evidence of a correlation between measures of TC and RSI and do not prove causality. This motivates us to modify the regression equation (7) by using first-differences. Specifically, we want to see whether *changes* in RSI and FMP have the predicted impact on a *change* in

AR, i.e.:

$$\Delta AR_{i,t} = \alpha_3 + \beta_5 \Delta RSI_{i,t} + \beta_6 \Delta FMP_{i,t} + \gamma_3 \prime X_{i,t} + \delta_i + \phi_j + \psi_t + \epsilon_{i,t} \quad (9)$$

$\Delta AR_{i,t}$ is calculated as logarithm of one plus AR_t/AR_{t-1}, $\Delta RSI_{i,t}$ is calculated as logarithm of one plus RSI_t/RSI_{t-1}, and $\Delta FMP_{i,t}$ is calculated as logarithm of one plus FMP_t/FMP_{t-1}. $\mathbf{X}$ includes the same firm characteristics that were used in the previous regressions. δ_i, ϕ_j, and ψ_t again represent the firm, industry, and year fixed-effects, respectively. The fixed-effects estimates of equation (9) are presented in Table 4. The results provide strong support for our hypotheses and are very consistent with those presented above. The coefficient on ΔRSI is positive and statistically significant in column (1) and that on ΔFMP is negative and significant in column (2). Our results are unchanged when we estimate these two effects jointly in column (3). More importantly, we find clear support for our claim that the positive relation between TC and RSI is stronger when the firm's market power is low. We test this by again generating two dummy variables that are similar to the ones used earlier. One dummy variable equals 1 when the ΔFMP of the upstream industry is above the sample-median and equals 0 otherwise, and the other complementary dummy, which equals 1 when the ΔFMP is below the sample-median, and equals 0 otherwise. We then interact these dummy variables with ΔRSI and the two interaction terms, denoted ΔRSI *when* ΔFMP *is Low* and ΔRSI *when* ΔFMP *is High*, replace the level of ΔRSI in column (3). These results are presented in columns (4) and (5) of Table 4, both of which show fixed-effects estimates, except in column (5), we also include the levels of *RSI* and *FMP* from year $t-1$. While the coefficients on both interaction terms are significantly positive in columns (4) and (5), the magnitude of the coefficient is larger when the ΔFMP is low. This provides some support for our hypothesis that TC can be used as a strategic tool, but it is more effective in inducing RSI by the upstream firm when the upstream firm has lower market power.

We proxy a firm's RSI by its R&D expenses. In our analysis thus far, we have included all those firms for which the value for R&D was not missing in Compustat. For many of the firms in Compustat, the R&D expense is either missing or reported as zero. To ensure that our results are not affected by these firms that report zero R&D expenses, we first confirm that

our results hold for the sub-sample of firms with strictly positive R&D. The first three columns in Table 5 present the results for this sample. We first estimate the relation between RSI and TC alone and find a strongly positive effect of RSI, as shown in column (1). In column (2), we estimate the effect of RSI as well as FMP on the TC extended, and we essentially find the same results as before – there is strongly positive effect of RSI and a strongly negative effect of FMP on AR. The results in column (3) also confirm the hypothesis that the positive relation between the TC extended and RSI made exists primarily when the firm's market power is weak. For a large number of firms in Compustat, the R&D expenses are reported as missing. We check whether including these firms alters our findings in any material way. We include these firms by assuming that firm-years with missing R&D expenses amount to a zero expenditure on R&D. We re-estimate the three regressions reported in columns (1)-(3) but now use this expanded sample, and present the results in columns (4)-(6) of Table 5. The results remain unchanged and indicate that accounts receivable relate positively with relationship-specific investment and negatively with market power, and that the positive relation with *RSI* is evident only when *FMP* is low. Overall, the analysis of these different samples confirms the robustness of our main results. For consistency, the rest of the analyses shown in subsequent tables are conducted using the positive-R&D sample only.

4.2 Effects of Information Availability and Ease of Monitoring

Does the easy availability of information about the upstream stream and/or the ease of monitoring the upstream firm influence the use of TC as a strategic tool? We argue that it does. Specifically, when it is easier for the downstream firm to obtain more information about the upstream firm and/or it is easier for it to monitor the upstream firm, then the above stated relation should be weaker. Our next set of results show this marginal impact of information availability and the ease of monitoring on the relation between the TC extended and *RSI* or *FMP*.

We identify three different proxies for the ease of information availability and monitoring. The first is geographic proximity between the supplier and the customer, which should make it easier for a downstream firm to monitor and/or obtain information about its supplier. We

operationalize geographic proximity on the basis of transportation costs, which are reported as a fraction of all inputs at the industry level and are obtained from the I-O tables published by the BEA. We assume that when transportation costs between the two industries are lower, then the downstream firm is closer to its supplier. In order to test for the impact of this geographic proximity, we create two dummy variables. The first dummy variable equals 1 when the "distance" thus proxied (by transportation costs as a fraction of all inputs) is above the sample-median and equals 0 otherwise; the second complementary dummy variable equals 1 when this "distance" is below the sample-median, and equals 0 otherwise. We then interact these two dummy variables with *RSI* and *FMP* to determine their effect on the TC extended by the firm. The first two columns of Table 6 present the findings from this analysis. From the coefficients in columns (1) and (2), we see that although the coefficients on *RSI* are positive and statistically significant in both cases, they are much stronger when the distance between the firm and its suppliers is large. This finding is consistent with our theoretical framework, which envisions TC from the upstream firm as a commitment mechanism to ensure that it makes the necessary relationship-specific investments to produce quality inputs for the downstream firm. When the supplier is nearby, the downstream firm may have other means to verify that the supplier is making the desired relationship-specific investments. As a result, there is less of a need to require TC in the presence of that alternative verification mechanism.

The need to require TC from the upstream firm in order to induce the appropriate relationship-specific investments will also be lower when there is more information available about that upstream firm and/or when the upstream firm has greater reputation concerns. This forms the basis for our next two proxies – firms that are listed on the NYSE and firms that are older than their industry peers typically have more information that is publicly available and are also more likely to be concerned about their own reputation. Therefore, we expect that the relation between the TC extended and *RSI* or *FMP* will be stronger when the firm is *not* listed on the NYSE or when the firm is younger. We present our findings from this analysis in columns (3) and (4) of Table 6 for NYSE-listing and in columns (5) and (6) of Table 6 for the firm's age. Consistent with our hypotheses and with the results described above, the coefficients on *RSI* are significantly positive and those on *FMP* are significantly negative only when the firm

is not listed on the NYSE or only when the firm is younger. In the other cases – when the upstream firm is listed on the NYSE or the upstream firm is older – these effects are statistically non-existent.

4.3 Significance of the Economic Linkage between the Supplier and the Customer

When the upstream industry provides a vital input to the downstream firm, then ensuring that the upstream firm makes the necessary quality-enhancing investments becomes important and, as a result, the role of TC as the mechanism to facilitate these investments also becomes more important. Our next set of tests explores this conjecture. Using information from the I-O tables published by the BEA, we identify the fraction of all inputs that the most important upstream industry provides to the downstream industry. Based on this fraction, we consider the supplier-customer relationship to be "significant" when this fraction is above its sample median.

We test for the role that this significance of economic linkage between the upstream and downstream industries plays in both, the TC extended and received by a given firm. When analyzing the accounts receivable of the firm, we classify its relationship with its largest customer industry as "significant" if the fraction of all inputs that this customer industry obtains from the given firm's industry is above the sample median. The fixed-effects estimates are reported in the first three columns of Table 7. The main explanatory variables of interest, *RSI* and *FMP*, are split into two by interacting them with a dummy variable that equals 1 if the relationship with the customer-industry is significant, and another complementary dummy variable that equals 1 when the relationship with the customer-industry is *not* significant. The coefficients on *RSI* in columns (1) and (3) are positive and statistically significant only when the supplier-customer relationship is significant. Congruently, the coefficients on FMP are negative and statistically significant in columns (2) and (3) only when the supplier-customer relationship is significant. These findings strongly support our conjecture that the downstream firm is especially concerned about the upstream firm's RSI when their economic relationship is significant.

We repeat the above analysis by focusing on the given firm as the downstream firm and

testing how the TC that it receives is affected by the significance of its relationship with its suppliers. Here we classify the firm's relationship with the supplier industry as "significant" if the fraction of all inputs that the most important supplier industry provides to the firm's industry is above the sample-median. The fixed-effects estimates are reported in the last three columns of Table 7 and the results confirm our previous findings. The significantly positive relation between *Supplier's RSI* and the firm's accounts payable is evident only when the customer-supplier relationship is significant. Similarly, the negative relation between the firm's accounts payable and *SMP* is significantly negative only when the customer-supplier relationship is significant. Overall, these findings confirm that the strategic use of TC to induce upstream firm's RSI is much more prevalent when the economic link between the upstream and the downstream industry is stronger.

4.4 Industries Producing Differentiated Goods and Services

Relationship-specific investments assume special importance for industries that produce differentiated goods and services in comparison with those that produce mere commodities. Therefore, a downstream firm that obtains inputs from an industry producing differentiated goods or services will be more concerned about these RSI being made, and will demand more TC as a result. So, we expect the positive relation between the firm's *RSI* and the TC that it extends to be stronger for firms that operate in industries producing differentiated goods and services. Besides, by their very nature, industries producing differentiated goods and services will have more bargaining power than those producing commodities. Therefore, again, the effect of *FMP* on the TC extended should be enhanced if the firm belongs to a differentiated industry. We use the schemes in Rauch (1999) to classify the firm as belonging to an industry producing differentiated goods and services. Rauch (1999) proposes two schemes, one leading to a "conservative" classification and the other to a "liberal" one. For completeness, we use both classification schemes in our analysis and present the findings in Table 8. First, the coefficients on *RSI* in columns (1) and (3) are significantly positive only for firms in industries producing differentiated goods and services. The coefficient on *FMP* is significantly negative for firms in both, differentiated as well as un-differentiated industries; however, the magnitude of the

coefficients under un-differentiated industries appears to be considerably larger than those for firms in differentiated industries. This happens because the differentiated industries by their very nature are the ones that add more value and may require more relationship-specific investments. As a result, the firm is unable to exploit its market power in mitigating the demand for TC from the downstream firm. In the un-differentiated industry, however, there is relatively less of a need to make relationship-specific investments and therefore, using the market power against the demand for TC from the downstream firm is easier.

4.5 Robustness Checks and Endogeneity

In this subsection, we check for the robustness of our results and also address concerns about the endogeneity of the main explanatory variables. As the first robustness check, we re-estimate the basic specifications on four different industry sub-samples and present the findings in Table 9. The first sub-sample excludes all the firms in regulated industries (specifically public utilities and financial services), and the results for this sub-sample are reported in the first two columns. The second sub-sample excludes firms in wholesale and retail industries, and the corresponding results are reported in columns (3) and (4) of Table 9. The third sub-sample consists only of firms within the manufacturing industries while the fourth sub-sample consists of firms within *non*-manufacturing industries. These results are reported in columns (5)-(6) and (7)-(8), respectively. Excluding firms in the regulated industries or wholesale and retail industries doesn't affect our results at all – not only do we find a positive impact of RSI and a negative impact of FMP on AR, but we also find that the positive relation between RSI and AR is prevalent only when the firm's market power is weak. Interestingly, the comparison of results obtained for the manufacturing and non-manufacturing industries reveals that our results are only present in the sub-sample of manufacturing industries. This consistent with the fact that manufacturing industries by the nature of their operations are more likely to use TC while non-manufacturing industries (such as agriculture or mining or real-estate industries) are less likely to use TC.

Finally, since the decision to offer TC and to make RSI are both made by the firm's management, it is possible that the relations that we have documented above are due to an unobservable

variable that affects both, the TC policies and the decision pertaining relationship-specific investments. In order to mitigate such endogeneity concerns, we estimate a two-stage least squares (2SLS) regression system. In the first stage, we either have the firm's *RSI* alone or have *RSI* as well as *FMP* as dependent variables. The first instrumental variable for *RSI* in the first stage is the median R&D in the same industry-year, where the median R&D is calculated after converting all the firm-year observations with missing R&D to zero. The second instrument for *RSI* is the fraction of firms that have positive R&D in that industry-year. The instrumental variable for *FMP* is the median price-to-cost margin for that industry-year. These industry-level variables should be relevant in determining a firm's *RSI* and *FMP* but should not affect the firm's TC policy except through their effect on *RSI* and *FMP*. In second-stage, we use the predicted values for these two variables and test for their effect on the firm's accounts receivable. We present the results from the second stage of the 2SLS in Table 10 for three different sub-samples: the first sub-sample consists of all firm-year observations with non-missing R&D in Compustat (columns (1) and (4)), the second sub-sample uses only strictly positive R&D firm-year observations (columns (2) and (5)), and finally, the third sub-sample contains the entire sample obtained by replacing missing R&D values with zeros. The regression models in (1), (2), and (3) only instrument *RSI* while the other three models instrument for both, *RSI* and *FMP*. As the results in the table indicate all our findings continue to obtain even after correcting for this potential endogeneity – instrumented RSI has significantly positive effect and instrumented FMP has a significantly negative effect on AR.

In summary, the findings from our analyses offer strong evidence for the predictions of our theoretical framework, which presents TC as a commitment device and predicts a positive relation between the granting of TC and the level of relationship-specific investments. Our findings also support the predicted negative relation between the TC provided and the firm's market power. Our results further highlight that these relations are stronger when it is more difficult to obtain information on and/or monitor the supplier firm, when the economic linkage between the supplier-customer industries is significant, and when the firm produces differentiated goods and services. We also present results from numerous tests that show that our findings are robust to several sample restrictions as well as to corrections for potential endogeneity.

5 Concluding Remarks

We develop a simple model of TC provision between vertically related firms in a context requiring relationship specific investments (RSI) by the upstream firm. In an incomplete contract setting, when investments in RSI can only be verified with delay, TC emerges as a quality guarantee that can induce appropriate levels of RSI. Hence, firms receiving TC are not necessarily cash constrained. The model predicts that the TC provided by firms increases in (i) the level of their RSI and (ii) the bargaining strength of the downstream firms. Our empirical results are strongly supportive of the model's predictions. Using the firm's R&D as a proxy for RSI, we examine a large panel of publicly listed firms and find that the level of TC they provide is increasing in their R&D as well as in measures of competition in the industry. These effects are stronger when the economic link between the upstream and downstream industries is stronger and when firms are in the manufacturing industry. Moreover, the hypothesized effects are stronger when verifying the RSI of the upstream firm is more costly and difficult, e.g., when the firm is located further away from the downstream firm. Overall, our results offer a new explanation for the role played by TC in a setting with incomplete contracts. Our results also explain the empirical peculiarity of dominant firms in the product market demanding TC instead of a price discount.

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Appendix: Variable Definitions

All the variables below are constructed using data items from Compustat, unless otherwise stated.

Dependent Variables:

- *Accounts Receivable (AR)* is the logarithm of accounts receivable to sales.
- *Accounts Payable (AP)* is the logarithm of accounts payable to sales.
- *Change in Accounts Receivable (ΔAR)* is the logarithm of one plus the ratio of accounts receivables to its own lagged value.

Primary Independent Variables:

- *Relationship-specific Investment (RSI)* is the ratio of research and development expenditure to lagged assets.
- *Firm's Market Power (FMP)* is calculated as the ratio of operating profits to sales (Gaspar and Massa (2006)).
- *RSI when FMP is Low (High)* is a variable that equals *RSI* when *FMP* is below (above) the sample's median *FMP*, and equals zero otherwise.

Firm-specific Control Variables:

- *Firm Size* is logarithm of sales.
- *Book Leverage* is the ratio of long-term debt and debt in current liabilities to assets.
- *Market-to-Book* is the ratio of market equity to book equity.
- *Cash Holdings* is the ratio of cash to lagged assets.
- *Return on Assets* is the income before extraordinary items as a percentage of lagged assets.
- *Tangibility Ratio* is the ratio of net property, plant, and equipment to assets.
- *Kaplan-Zingales Index* is constructed as per Baker, Stein, and Wurgler (2003). It is equal to $3.139\times$ (Book Leverage) $+0.283\times$ (Tobin's Q) $-1.002\times$ (Cashflow) $-39.368\times$ (Dividends) $-1.315\times$ (Cash Holdings).
- *Tobin's Q* is the ratio of the sum of assets and market equity less book equity and deferred taxes to assets.
- *Cashflow* is the sum of income before extraordinary items and depreciation and amortization, calculated as a fraction of lagged assets.
- *Dividends* is the sum of dividends on common and preferred equity, calculated as a fraction of lagged assets. The other two component variables are defined above.)

Other Independent Variables:

- *Supplier's RSI* is the median of the research and development expenditure to lagged assets ratio in the Supplier industry. This median is calculated after converting all the missing R&D values to zero, which thereby increases its number of observations in comparison with *RSI*.
- *Supplier's Market Power (SMP)* measures the supplier industry's market power and is calculated as the Herfindahl Index of sales in that industry (Gaspar and Massa (2006)).
- *Supplier's RSI when SMP is Low (High)* is a variable that equals *Supplier's RSI* when *SMP* is below (above) the sample's median *SMP*, and equals zero otherwise.
- ΔRSI is the logarithm of one plus RSI to its own lagged value.
- ΔFMP is the logarithm of one plus the ratio of FMP to its own lagged value.
- ΔRSI *when* ΔFMP *is Low (High)* is a variable that equals ΔRSI when ΔFMP is below (above) the sample's median ΔFMP, and equals zero otherwise.
- $\text{RSI}_{\text{Missing}R\&D=0}$ is constructed like *RSI*, except here the missing values of R&D are first converted to zero.
- $\text{RSI}_{R\&D>0}$ is also constructed like *RSI* above, except here it is done only using those observations that report a positive R&D figure in Compustat.
- *Distance Between Supplier-Customer* is a the fraction of costs that are spent on transportation of goods from the supplier industry to the customer industry (as reported in the BEA I-O tables).
- *NYSE* is a dummy variable that equals 1 if the given firm is listed on the NYSE.

Table 1: Summary Statistics. This table presents summary statistics of the main variables used in our analyses.

	Units	N	Mean	Median	Std. Dev.
Dependent Variables:					
Accounts Receivable (AR)	logarithm	17,235	-2.003	-1.801	0.899
Accounts Payable (AP)	logarithm	17,221	-2.597	-2.648	0.885
Change in Accounts Receivable (ΔAR)	logarithm	14,358	0.783	0.735	0.363
Primary Independent Variables:					
Relationship-specific Investment (RSI)	ratio	17,235	0.137	0.080	0.209
Firm's Market Power (FMP)	ratio	17,235	-0.366	0.058	1.630
Firm-specific Control Variables:					
Firm Size	logarithm	17,235	4.385	4.261	2.318
Book Leverage	ratio	17,235	0.213	0.082	0.415
Market-to-Book	ratio	17,235	3.424	2.195	8.404
Cash Holdings	ratio	17,235	0.289	0.131	0.569
Return on Assets	%	17,235	-22.624	0.494	84.639
Tangibility Ratio	ratio	17,235	0.170	0.124	0.152
Kaplan-Zingales Index		17,235	0.740	0.623	4.032
Other Independent Variables:					
Supplier's RSI	ratio	12,595	0.024	0.000	0.048
Supplier's Market Power (SMP)	Herfindahl	11,824	0.134	0.117	0.101
ΔRSI	logarithm	12,171	0.693	0.685	0.304
ΔFMP	logarithm	13,161	0.648	0.676	0.654
$\text{RSI}_{\text{Missing}R\&D=0}$	ratio	25,805	0.092	0.022	0.183
$\text{RSI}_{R\&D>0}$	ratio	14,892	0.159	0.100	0.217
Distance Between Supplier-Customer	ratio	17,235	0.012	0.007	0.024
NYSE	0/1	17,235	0.165	0.000	0.371

Table 2: Effect on Accounts Receivable. This table shows the base effects of the firm's relationship-specific investment as well as its market-power on the amount of trade credit that it extends. The dependent variable in these panel regressions is *Accounts Receivable (AR)* and the independent variables of interest are *Relationship-specific Investment (RSI)*, *Firm's Market Power (FMP)*, and *RSI when FMP is Low (High)*. Also included are several firm-specific control variables: *Firm Size*, *Book Leverage*, *Market-to-Book*, *Cash Holdings*, *Return on Assets*, *Tangibility Ratio*, and *Kaplan-Zingales Index*. All these variables are defined in the Appendix. Firm fixed- or random-effects as well as year and industry fixed-effects are also included.

INDEPENDENT VARIABLES	(1)	(2)	(3)	(4)	(5)
Relationship-specific Investment (RSI)	0.1955***		0.1922***		
	[4.48]		[4.37]		
Firm's Market Power (FMP)		-0.0225**	-0.0244**	-0.0237**	-0.0197***
		[-2.24]	[-2.48]	[-2.41]	[-2.58]
RSI when FMP is Low				0.2162***	0.1824***
				[4.69]	[4.44]
RSI when FMP is High				0.0853	0.0656
				[1.50]	[1.22]
Firm Size	-0.0051	0.0111	0.0150	0.0175	0.0274***
	[-0.37]	[0.78]	[1.08]	[1.25]	[4.19]
Book Leverage	-0.0846***	-0.0723**	-0.0791***	-0.0793***	-0.0797***
	[-3.01]	[-2.56]	[-2.78]	[-2.78]	[-3.27]
Market-to-Book	0.0016**	0.0017**	0.0016**	0.0016**	0.0018***
	[2.42]	[2.50]	[2.44]	[2.52]	[2.82]
Cash Holdings	-0.0101	0.0196	-0.0105	-0.0094	-0.0101
	[-0.76]	[1.62]	[-0.79]	[-0.71]	[-0.85]
Tangibility Ratio	-0.7141***	-0.6919***	-0.7225***	-0.7305***	-0.7538***
	[-6.49]	[-6.32]	[-6.50]	[-6.56]	[-8.92]
Kaplan-Zingales Index	-0.0011	-0.0014	-0.0009	-0.0009	-0.0025
	[-0.54]	[-0.67]	[-0.48]	[-0.46]	[-1.36]
Constant	-1.9506***	-2.0288***	-2.1044***	-2.1078***	-0.6533***
	[-25.60]	[-25.72]	[-5.72]	[-5.68]	[-21.66]
Observations	17,235	17,235	17,235	17,235	17,235
R-squared	0.06	0.06	0.09	0.09	
Firm Fixed-effects	Yes	Yes	Yes	Yes	
Firm Random-effects					Yes
Year Fixed-effects	Yes	Yes	Yes	Yes	Yes
Industry Fixed-effects			Yes	Yes	Yes

t-statistics using robust, firm-clustered standard errors are in brackets; *** p<0.01, ** p<0.05, * p<0.1

Table 3: Effect on Accounts Payable. This table shows the base effects of the supplier-industry's relationship-specific investment as well as its market-power on the amount of trade credit that the firm receives. The dependent variable in these panel regressions is *Accounts Payable (AP)* and the independent variables of interest are *Supplier's RSI*, *Supplier's Market Power (SMP)*, and *Supplier's RSI when FMP is Low (High)*. Also included are several firm-specific control variables: *Firm Size*, *Book Leverage*, *Market-to-Book*, *Cash Holdings*, *Return on Assets*, *Tangibility Ratio*, and *Kaplan-Zingales Index*. All these variables are defined in the Appendix. Firm fixed- or random-effects as well as year and industry fixed-effects are also included.

INDEPENDENT VARIABLES	(1)	(2)	(3)	(4)	(5)
Supplier's RSI	0.4277		0.5979*		
	[1.21]		[1.73]		
Supplier's Market Power (SMP)		-0.1864***	-0.1777***	-0.1745***	-0.1616***
		[-3.34]	[-3.23]	[-3.17]	[-3.01]
Supplier's RSI when SMP is Low				0.9629**	1.1350***
				[2.49]	[2.92]
Supplier's RSI when SMP is High				0.4625	0.5583
				[1.27]	[1.51]
Industry's Market Power				-0.0583	-0.0503
				[-0.61]	[-0.54]
Firm Size	-0.3517***	-0.3529***	-0.3546***	-0.3543***	-0.2493***
	[-20.76]	[-20.90]	[-20.95]	[-20.91]	[-28.40]
Book Leverage	0.1363***	0.1360***	0.1324***	0.1325***	0.1830***
	[3.77]	[3.75]	[3.78]	[3.78]	[5.67]
Market-to-Book	-0.0007	-0.0007	-0.0007	-0.0007	-0.0008
	[-0.94]	[-0.98]	[-0.91]	[-0.91]	[-1.08]
Cash Holdings	0.0632***	0.0628***	0.0625***	0.0625***	0.0807***
	[3.97]	[3.95]	[4.02]	[4.02]	[5.51]
Tangibility Ratio	0.3315***	0.3300***	0.3369***	0.3369***	0.3897***
	[2.95]	[2.94]	[2.97]	[2.97]	[4.42]
Kaplan-Zingales Index	0.0036	0.0035	0.0034	0.0034	0.0059**
	[1.34]	[1.31]	[1.27]	[1.28]	[2.34]
Constant	-1.1558***	-1.1261***	0.4882***	0.5116***	-1.9267***
	[-15.40]	[-15.08]	[3.61]	[3.65]	[-8.12]
Observations	21,427	21,427	21,427	21,427	21,427
R-squared	0.16	0.16	0.18	0.18	
Firm Fixed-effects	Yes	Yes	Yes	Yes	
Firm Random-effects					Yes
Year Fixed-effects	Yes	Yes	Yes	Yes	Yes
Industry Fixed-effects			Yes	Yes	Yes

t-statistics using robust, firm-clustered standard errors are in brackets; *** p<0.01, ** p<0.05, * p<0.1

Table 4: Changes in Dependent and Independent Variables. This table shows the effect of changes in the firm's relationship-specific investment and market-power on the change in the amount of trade credit it extends. The dependent variable in these panel regressions is ΔAR and the independent variables of interest are ΔRSI, ΔFMP, and Δ *RSI when* Δ *FMP is Low (High)*. Also included are several firm-specific control variables: *RSI* and its one-year lagged value, *FMP* and its one-year lagged value, *Firm Size*, *Book Leverage*, *Market-to-Book*, *Cash Holdings*, *Return on Assets*, *Tangibility Ratio*, and *Kaplan-Zingales Index*. All these variables are defined in the Appendix. Firm, year, and industry fixed-effects are also included.

INDEPENDENT VARIABLES	(1)	(2)	(3)	(4)	(5)
Δ RSI	0.1006***		0.1029***		
	[5.10]		[5.29]		
Δ FMP		-0.0333***	-0.0349***	-0.0232***	-0.0101*
		[-6.23]	[-6.31]	[-3.90]	[-1.83]
Δ RSI when Δ FMP is Low				0.1205***	0.1894***
				[5.62]	[8.45]
Δ RSI when Δ FMP is High				0.0807***	0.1665***
				[4.40]	[8.08]
Relationship-specific Investment (RSI)		0.5364***			
		[8.79]			
Firm's Market Power (FMP)	0.0077				
	[0.84]				
Lagged RSI					0.2974***
					[8.67]
Lagged FMP					-0.0873***
					[-9.09]
Firm Size	0.0711***	0.0853***	0.0702***	0.0702***	0.1216***
	[4.29]	[5.84]	[4.52]	[4.53]	[8.43]
Book Leverage	0.0628*	0.0254	0.0617*	0.0602*	0.0481*
	[1.90]	[0.86]	[1.89]	[1.84]	[1.85]
Market-to-Book	0.0026***	0.0022***	0.0025***	0.0026***	0.0021***
	[3.47]	[3.13]	[3.35]	[3.38]	[2.78]
Cash Holdings	0.1237***	0.0590***	0.1208***	0.1222***	0.0904***
	[7.70]	[3.47]	[7.54]	[7.63]	[6.39]
Tangibility Ratio	-0.6139***	-0.6596***	-0.6415***	-0.6490***	-0.6959***
	[-8.06]	[-8.73]	[-8.08]	[-8.19]	[-9.03]
Kaplan-Zingales Index	-0.0056*	-0.0036	-0.0056*	-0.0055*	-0.0044*
	[-1.68]	[-1.15]	[-1.70]	[-1.67]	[-1.70]
Constant	0.5420***	0.5165***	0.5874***	0.5993***	0.4150***
	[7.51]	[7.98]	[7.03]	[7.15]	[4.26]
Observations	11,060	11,060	11,060	11,060	11,060
R-squared	0.11	0.15	0.13	0.13	0.22
Firm and Year Fixed-effects	Yes	Yes	Yes	Yes	Yes
Industry Fixed-effects			Yes	Yes	Yes

t-statistics using robust, firm-clustered standard errors are in brackets; *** p<0.01, ** p<0.05, * p<0.1

Table 5: Only Positive-R&D and Missing-R&D sub-samples. Presented here is a robustness check for the results shown in Table 2. This table also tests for the effect of the firm's relationship-specific investment and its market-power on the amount of trade credit that it extends, except it's done in two different sub-samples. The first sub-sample (in columns (1)-(3)) consists of all observations with positive R&D only and the second sub-sample (columns (4)-(6)) includes all observations after converting the missing values of R&D to zero. The dependent variable in these panel regressions is *Accounts Receivable (AR)* and the independent variables of interest are *Relationship-specific Investment (RSI)*, *Firm's Market Power (FMP)*, and *RSI when FMP is Low (High)*. Also included are several firm-specific control variables: *Firm Size*, *Book Leverage*, *Market-to-Book*, *Cash Holdings*, *Return on Assets*, *Tangibility Ratio*, and *Kaplan-Zingales Index*. All these variables are defined in the Appendix. Firm, year, and industry fixed-effects are also included.

	RSI when R&D > 0			RSI with Missing R&D = 0		
INDEPENDENT VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Relationship-specific Investment (RSI)	0.2060***	0.1977***		0.1638***	0.1516***	
	[4.62]	[4.41]		[3.77]	[3.47]	
Firm's Market Power (FMP)		-0.0273***	-0.0266***		-0.0299***	-0.0296***
		[-2.67]	[-2.60]		[-3.34]	[-3.30]
RSI when FMP is Low			0.2231***			0.1651***
			[4.73]			[3.59]
RSI when FMP is High			0.0918			0.0896
			[1.62]			[1.57]
Firm Size	-0.0132	0.0139	0.0167	-0.0527***	-0.0295**	-0.0286**
	[-0.95]	[0.95]	[1.13]	[-4.26]	[-2.31]	[-2.24]
Book Leverage	-0.0899***	-0.0825***	-0.0831***	-0.0797***	-0.0745***	-0.0746***
	[-3.05]	[-2.76]	[-2.78]	[-3.34]	[-3.10]	[-3.10]
Market-to-Book	0.0016**	0.0016**	0.0016**	0.0021***	0.0020***	0.0021***
	[2.35]	[2.37]	[2.44]	[3.64]	[3.53]	[3.57]
Cash Holdings	-0.0196	-0.0190	-0.0180	-0.0091	-0.0098	-0.0093
	[-1.46]	[-1.41]	[-1.34]	[-0.67]	[-0.72]	[-0.68]
Tangibility Ratio	-0.6934***	-0.7022***	-0.7129***	-0.4869***	-0.4938***	-0.4960***
	[-5.84]	[-5.94]	[-6.01]	[-5.11]	[-5.24]	[-5.26]
Kaplan-Zingales Index	-0.0022	-0.0024	-0.0024	-0.0035*	-0.0038**	-0.0038**
	[-1.15]	[-1.29]	[-1.26]	[-1.95]	[-2.10]	[-2.09]
Constant	-1.6124***	-1.7604***	-1.7676***	0.1202	0.0285	0.0276
	[-3.95]	[-4.14]	[-4.10]	[1.06]	[0.25]	[0.24]
Observations	14,892	14,892	14,892	25,805	25,805	25,805

R-squared	0.09	0.10	0.10	0.07	0.08	0.08
Firm Fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes

t-statistics using robust, firm-clustered standard errors are in brackets; *** p<0.01, ** p<0.05, * p<0.1

Table 6: Effects of Information Availability and Ease of Monitoring. This table tests whether the main results shown in Table 2 are affected by the customer's lack of information about the given upstream firm. Specifically, does this lack of information enhance the effect of the upstream firm's relationship-specific investment and market-power on the amount of trade credit that it extends? This lack of information is measured in three ways – (i) (*Distance Between Supplier-Customer*), (ii) *NYSE* listing of the given (upstream) firm, and (iii) the given (upstream) firm's age relative to the sample median. (The *NYSE* dummy variable itself drops out from the regressions because we control for firm fixed-effects.) The dependent variable in these panel regressions is (*Accounts Receivable (AR)*) and the independent variables of interest are: *RSI or FMP when Distance is Large (Small)*, *RSI or FMP when the Firm is (not) NYSE-listed*, *RSI or FMP when the Firm is Younger (Older)*. Also included are several firm-specific control variables: *Firm Size*, *Book Leverage*, *Market-to-Book*, *Cash Holdings*, *Return on Assets*, *Tangibility Ratio*, and *Kaplan-Zingales Index*. All these variables are defined in the Appendix. Firm, year, and industry fixed-effects are also included.

INDEPENDENT VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
RSI when Distance is Large	0.2947***	0.2895***				
	[3.52]	[3.18]				
RSI when Distance is Small	0.1748***	0.1754***				
	[3.34]	[3.33]				
FMP when Distance is Large		-0.0427*				
		[-1.84]				
FMP when Distance is Small		-0.0396***				
		[-3.58]				
RSI when Firm is *not* NYSE-listed			0.2016***	0.2016***		
			[4.47]	[4.47]		
RSI when Firm is NYSE-listed			-0.1331	-0.1330		
			[-0.56]	[-0.56]		
FMP when Firm is *not* NYSE-listed				-0.0273***		
				[-2.67]		
FMP when Firm is NYSE-listed				-0.0247		
				[-0.21]		
RSI when Firm is Younger					0.3044***	0.3052***
					[5.72]	[5.70]
RSI when Firm is Older					0.1781**	0.1754**
					[2.23]	[2.08]
FMP when Firm is Younger						-0.0325***
						[-2.87]
FMP when Firm is Older						-0.0351

						[-1.18]
Distance Between Supplier-Customer	-0.1689	-0.1719				
	[-0.36]	[-0.37]				
Firm's Age					-0.0295***	-0.0295***
					[-5.77]	[-5.77]
Firm's Market Power (FMP)	-0.0400***		-0.0273***		-0.0330***	
	[-3.75]		[-2.67]		[-2.65]	
Firm Size	0.0394**	0.0394**	0.0141	0.0140	0.0177	0.0180
	[2.55]	[2.54]	[0.96]	[0.96]	[1.03]	[1.02]
Book Leverage	-0.0497	-0.0496	-0.0824***	-0.0824***	-0.0401	-0.0402
	[-1.62]	[-1.61]	[-2.76]	[-2.76]	[-1.17]	[-1.17]
Market-to-Book	0.0015**	0.0015**	0.0016**	0.0016**	0.0010	0.0010
	[1.97]	[1.99]	[2.39]	[2.39]	[1.34]	[1.35]
Cash Holdings	-0.0275*	-0.0276*	-0.0195	-0.0195	-0.0270*	-0.0271*
	[-1.77]	[-1.77]	[-1.44]	[-1.44]	[-1.84]	[-1.83]
Tangibility Ratio	-0.7762***	-0.7761***	-0.7021***	-0.7021***	-0.6820***	-0.6823***
	[-5.92]	[-5.92]	[-5.94]	[-5.92]	[-4.32]	[-4.32]
Kaplan-Zingales Index	-0.0037*	-0.0038*	-0.0025	-0.0025	-0.0005	-0.0005
	[-1.93]	[-1.93]	[-1.30]	[-1.30]	[-0.21]	[-0.22]
Constant	-0.9923***	-0.9923***	-1.7540***	-1.7526***	-1.7545***	-1.7621***
	[-4.89]	[-4.90]	[-4.12]	[-4.12]	[-7.27]	[-6.35]
Observations	12,995	12,995	14,892	14,892	9,523	9,523
R-squared	0.09	0.09	0.10	0.10	0.12	0.12
Firm Fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes

t-statistics using robust, firm-clustered standard errors are in brackets; *** p<0.01, ** p<0.05, * p<0.1

Table 7: Significance of the Economic Linkage between the Supplier and the Customer. This table tests whether the main results shown in Table 2 and 3 are affected by the significance of the relationship between the firm's industry and its main customer- or supplier-industry. Specifically, following the results reported in Table 2 – is the effect of the firm's relationship-specific investment and market-power on the amount of trade credit that it extends (i.e., accounts receivable) different if the firm's industry is the most important input industry for the customer? Next, following the results reported in Table 3, the exercise is repeated – is the effect of the supplier industry's relationship-specific investment and its market power on the amount of credit that the firm receives as accounts payable different if the supplier-industry is the most important input provider to the firm's industry? Each pair of supplier and customer industries is characterized by the percentage of the customer industry's input that comes from that supplier industry. This percentage number is used to define the *Relationship is Significant*, which is defined as a dummy variable equal to one if the percentage of input is above the sample-median, and zero otherwise. In the first three columns, the dependent variable is *Accounts Receivable (AR)* while in the next three columns, it is *Accounts Payable (AP)*. The independent variables of interest are the interactions of *Relationship-specific Investment (RSI)* and *Firm's Market Power (FMP)* with *Relationship is Significant*. Also included are several firm-specific control variables: *Firm Size*, *Book Leverage*, *Market-to-Book*, *Cash Holdings*, *Return on Assets*, *Tangibility Ratio*, and *Kaplan-Zingales Index*. All these variables are defined in the Appendix. Firm, year, and industry fixed-effects are also included.

	Dependent Variable: AR			**Dependent Variable: AP**		
INDEPENDENT VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
RSI when Relationship is Significant	0.2288***		0.2263***			
	[4.48]		[4.42]			
RSI when Relationship is *Not* Significant	0.1041		0.1122			
	[1.43]		[1.49]			
FMP when Relationship is Significant		-0.0351***	-0.0344***			
		[-2.86]	[-2.81]			
FMP when Relationship is *Not* Significant		-0.0242	-0.0265*			
		[-1.58]	[-1.69]			
Relationship-specific Investment (RSI)		0.1936***				
		[4.22]				
Firm's Market Power (FMP)	-0.0312***					
	[-2.93]					
Relationship with Customer is Significant	-0.0294	-0.0175	-0.0312			
	[-1.00]	[-0.59]	[-1.05]			
Supplier's RSI when Relationship is Significant				0.9051		1.4398**
				[1.52]		[2.27]
Supplier's RSI when Relationship is *Not* Significant				-0.9455		-0.8015
				[-1.04]		[-0.90]
SMP when Relationship is Significant					-0.8489*	-0.9989**

					[-1.92]	[-2.22]
SMP when Relationship is *Not* Significant					0.4548	0.5076
					[0.98]	[1.11]
Supplier's RSI					0.5365	
					[0.95]	
Supplier's Market Power (SMP)				-0.1913		
				[-0.58]		
Relationship with Supplier is Significant				-0.1116	0.2757**	0.0668
				[-0.95]	[2.43]	[0.49]
Firm Size	0.0172	0.0175	0.0175	-0.3274***	-0.3228***	-0.3246***
	[1.13]	[1.14]	[1.15]	[-7.61]	[-7.49]	[-7.54]
Book Leverage	-0.0805***	-0.0806***	-0.0799***	0.0358	0.0345	0.0396
	[-2.63]	[-2.60]	[-2.61]	[0.32]	[0.31]	[0.36]
Market-to-Book	0.0016**	0.0016**	0.0016**	0.0023	0.0024	0.0024
	[2.34]	[2.39]	[2.38]	[1.32]	[1.32]	[1.33]
Cash Holdings	-0.0166	-0.0155	-0.0168	0.0541	0.0548	0.0527
	[-1.23]	[-1.14]	[-1.24]	[1.52]	[1.55]	[1.48]
Tangibility Ratio	-0.7221***	-0.7211***	-0.7222***	0.1765	0.1799	0.1807
	[-5.94]	[-5.94]	[-5.95]	[0.57]	[0.58]	[0.59]
Kaplan-Zingales Index	-0.0023	-0.0023	-0.0023	0.0116	0.0117	0.0115
	[-1.20]	[-1.18]	[-1.22]	[1.48]	[1.48]	[1.46]
Constant	-2.1615***	-1.7428***	-1.7508***	0.8172***	0.6536***	0.8244***
	[-3.54]	[-4.20]	[-4.20]	[3.26]	[2.62]	[3.30]
Observations	14,365	14,365	14,365	3,399	3,399	3,399
R-squared	0.10	0.10	0.10	0.15	0.15	0.15
Firm Fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes

t-statistics using robust, firm-clustered standard errors are in brackets; *** p<0.01, ** p<0.05, * p<0.1

Table 8: Industries Producing Differentiated Goods and Services. This table compares the effects of the firm's relationship-specific investment and its market-power on the amount of trade credit that it extends in two different types of industries – those producing differentiated products and those producing standardized products. The classification of industries as "Differentiated" is based on Rauch (1999). In columns (1)-(3), we use the "conservative" classification and in columns (4)-(6) we use the "liberal" classification proposed by Rauch (1999). The dependent variable in these panel regressions is *Accounts Receivable (AR)* and the independent variables of interest are the interactions of *Relationship-specific Investment (RSI)* and *Firm's Market Power (FMP)* with the *Differentiated Industry* dummy. Also included are several firm-specific control variables: *Firm Size*, *Book Leverage*, *Market-to-Book*, *Cash Holdings*, *Return on Assets*, *Tangibility Ratio*, and *Kaplan-Zingales Index*. All these variables are defined in the Appendix. Firm, year, and industry fixed-effects are also included.

INDEPENDENT VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
RSI in Differentiated Industries (Conservative)	0.1906***		0.1955***			
	[3.52]		[3.57]			
RSI in Undifferentiated Industries (Conservative)	0.0977		-0.0247			
	[0.85]		[-0.19]			
FMP in Differentiated Industries (Conservative)		-0.0292***	-0.0307***			
		[-3.19]	[-3.34]			
FMP in Undifferentiated Industries (Conservative)		-0.0627**	-0.0721***			
		[-2.55]	[-3.09]			
Differentiated Industries (Conservative)	-0.1795	-0.1670	-0.9215***			
	[-0.55]	[-0.51]	[-4.54]			
RSI in Differentiated Industries (Liberal)				0.2234***		0.2277***
				[4.17]		[4.24]
RSI in Undifferentiated Industries (Liberal)				0.0618		0.0453
				[0.61]		[0.42]
FMP in Differentiated Industries (Liberal)					-0.0308***	-0.0320***
					[-3.14]	[-3.28]
FMP in Undifferentiated Industries (Liberal)					-0.0349*	-0.0391**
					[-1.85]	[-2.02]
Differentiated Industries (Liberal)				-0.4311**	-0.3956*	0.7779***
				[-2.02]	[-1.86]	[4.25]
Relationship-specific Investment (RSI)		0.1835***			0.1852***	
		[3.49]			[3.52]	
Firm's Market Power (FMP)	-0.0317***			-0.0321***		
	[-3.53]			[-3.58]		

Firm Size	0.0424***	0.0418***	0.0440***	0.0421***	0.0421***	0.0440***
	[2.84]	[2.82]	[3.07]	[2.82]	[2.81]	[3.09]
Book Leverage	-0.0554*	-0.0557*	-0.0533*	-0.0526*	-0.0554*	-0.0503*
	[-1.81]	[-1.83]	[-1.76]	[-1.73]	[-1.82]	[-1.68]
Market-to-Book	0.0020***	0.0020***	0.0020***	0.0020***	0.0020***	0.0020***
	[2.77]	[2.77]	[2.79]	[2.77]	[2.79]	[2.79]
Cash Holdings	-0.0152	-0.0148	-0.0159	-0.0170	-0.0150	-0.0171
	[-0.99]	[-0.97]	[-1.03]	[-1.13]	[-0.98]	[-1.12]
Tangibility Ratio	-0.6021***	-0.6003***	-0.6033***	-0.6068***	-0.6023***	-0.6044***
	[-5.55]	[-5.53]	[-5.50]	[-5.59]	[-5.57]	[-5.54]
Kaplan-Zingales Index	-0.0025	-0.0023	-0.0023	-0.0027	-0.0024	-0.0025
	[-1.22]	[-1.15]	[-1.15]	[-1.33]	[-1.22]	[-1.27]
Constant	-1.8720***	-1.8824***	-1.3522***	-1.6461***	-1.6796***	-3.0247***
	[-5.87]	[-5.90]	[-7.73]	[-8.10]	[-8.27]	[-15.63]
Observations	11,943	11,943	11,943	11,943	11,943	11,943
R-squared	0.08	0.08	0.09	0.08	0.08	0.09
Firm Fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed-effects			Yes			Yes

t-statistics using robust, firm-clustered standard errors are in brackets; *** p<0.01, ** p<0.05, * p<0.1

Table 9: Analyzing different industry groups. Presented here is another robustness check for the results shown in Table 2. This table also tests for the effect of the firm's relationship-specific investment and its market-power on the amount of trade credit that it extends, except it's done in four different industry-groups. The first sub-sample (in columns (1) and (2)) consists of all industries except utilities and financial services and the second sub-sample (in columns (3) and (4)) consists of all industries except wholesale and retail. The third sub-sample (in columns (5) and (6)) only analyzes the manufacturing industry and the fourth sub-sample (in columns (7) and (8)) only includes non-manufacturing industries. The dependent variable in these panel regressions is *Accounts Receivable (AR)* and the independent variables of interest are *Relationship-specific Investment (RSI)*, *Firm's Market Power (FMP)*, and *RSI when FMP is Low (High)*. Also included are several firm-specific control variables: *Firm Size*, *Book Leverage*, *Market-to-Book*, *Cash Holdings*, *Return on Assets*, *Tangibility Ratio*, and *Kaplan-Zingales Index*. All these variables are defined in the Appendix. Firm, year, and industry fixed-effects are also included.

	Excl. Uti. & Fin.		Excl. Wholesale & Retail		Only Manufacturing		Non-manufacturing	
INDEPENDENT VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Relationship-specific Investment (RSI)	0.1989***		0.1923***		0.1649***		0.2130***	
	[4.43]		[4.31]		[2.69]		[3.23]	
Firm's Market Power (FMP)	-0.0246**	-0.0270**	-0.0282***	-0.0303***	-0.0332***	-0.0348***	-0.0171	-0.0141
	[-2.32]	[-2.55]	[-2.75]	[-2.97]	[-2.71]	[-2.88]	[-0.89]	[-0.74]
RSI when FMP is Low		0.2261***		0.2202***		0.1850***		0.2484***
		[4.78]		[4.67]		[2.85]		[3.53]
RSI when FMP is High		0.0942*		0.0889		0.0907		0.0723
		[1.65]		[1.57]		[1.09]		[0.94]
Firm Size	0.0145	0.0179	0.0232	0.0262*	0.0283	0.0321*	-0.0035	-0.0046
	[0.95]	[1.20]	[1.58]	[1.83]	[1.53]	[1.80]	[-0.14]	[-0.18]
Book Leverage	-0.0833***	-0.0847***	-0.0783***	-0.0782***	-0.0653*	-0.0635*	-0.1128*	-0.1164*
	[-2.76]	[-2.81]	[-2.61]	[-2.61]	[-1.94]	[-1.88]	[-1.77]	[-1.84]
Market-to-Book	0.0016**	0.0017**	0.0016**	0.0017**	0.0020**	0.0020**	0.0001	0.0004
	[2.25]	[2.49]	[2.29]	[2.56]	[2.06]	[2.03]	[0.08]	[0.48]
Cash Holdings	-0.0190	-0.0180	-0.0187	-0.0181	-0.0445**	-0.0477**	-0.0137	-0.0135
	[-1.40]	[-1.33]	[-1.38]	[-1.34]	[-2.16]	[-2.31]	[-0.72]	[-0.70]
Tangibility Ratio	-0.6792***	-0.6920***	-0.6920***	-0.7181***	-0.5833***	-0.5911***	-1.0212***	-1.0055***
	[-5.79]	[-5.82]	[-5.94]	[-6.04]	[-4.56]	[-4.62]	[-4.21]	[-3.99]
Kaplan-Zingales Index	-0.0027	-0.0023	-0.0033*	-0.0030	-0.0040	-0.0044*	-0.0017	-0.0014
	[-1.45]	[-1.24]	[-1.78]	[-1.61]	[-1.61]	[-1.81]	[-0.62]	[-0.49]
Constant	-1.6172***	-1.4747***	-1.9344***	-1.8172***	-1.9671***	-1.1971***	-1.4330***	-0.2749
	[-24.77]	[-3.43]	[-24.28]	[-4.16]	[-19.12]	[-4.62]	[-13.88]	[-1.57]

Observations	14,793	14,793	14,776	14,776	10,173	10,173	4,719	4,719
R-squared	0.07	0.10	0.07	0.10	0.06	0.07	0.12	0.14
Firm Fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed-effects		Yes		Yes		Yes		Yes

t-statistics using robust, firm-clustered standard errors are in brackets; *** p<0.01, ** p<0.05, * p<0.1

Table 10: Instrumented Variable Regressions. This table addresses the potential endogeneity of the firm's *Relationship-specific Investment (RSI)* and the *Firm's Market Power (FMP)*, and therefore, instruments *RSI* as well as *FMP*. The instrument for *RSI* (*FMP*) is the median *RSI* (*FMP*) in the same industry-year. Columns (1) and (4) use all observations with non-missing R&D, columns (2) and (5) use only those with positive R&D, and finally, columns (3) and (6) use the full sample by converting missing R&D figures to zero. The dependent variable in these panel regressions is *Accounts Receivable (AR)* and the independent variables of interest are the *Relationship-specific Investment (RSI)* and the *Firm's Market Power (FMP)*. Also included are several firm-specific control variables: *Firm Size*, *Book Leverage*, *Market-to-Book*, *Cash Holdings*, *Return on Assets*, *Tangibility Ratio*, and *Kaplan-Zingales Index*. All these variables are defined in the Appendix. Firm, year, and industry fixed-effects are also included.

INDEPENDENT VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Instrumented Relationship-specific Investment (RSI)	1.5118***	1.4506***	1.3504***	1.0578**	1.1819**	0.8779***
	[3.78]	[3.20]	[3.99]	[2.48]	[2.36]	[2.64]
Firm's Market Power (FMP)	-0.0152***	-0.0182***	-0.0216***			
	[-2.98]	[-3.29]	[-4.76]			
Instrumented Firm's Market Power (FMP)				-0.2939***	-0.3277***	-0.1969***
				[-4.27]	[-4.36]	[-3.97]
Firm Size	0.0419***	0.0461***	-0.0092	0.2977***	0.3472***	0.1254***
	[3.44]	[3.06]	[-1.17]	[4.48]	[4.40]	[3.11]
Book Leverage	-0.1261***	-0.1519***	-0.1079***	-0.0358	-0.0577	-0.0598***
	[-5.85]	[-5.06]	[-6.34]	[-1.18]	[-1.55]	[-2.96]
Market-to-Book	0.0010*	0.0010*	0.0013***	0.0010*	0.0012*	0.0010**
	[1.93]	[1.84]	[2.76]	[1.77]	[1.93]	[2.12]
Cash Holdings	-0.2188***	-0.2258***	-0.1559***	-0.1613**	-0.1905**	-0.1102***
	[-3.44]	[-3.00]	[-3.76]	[-2.38]	[-2.28]	[-2.72]
Tangibility Ratio	-0.9250***	-0.8965***	-0.7000***	-0.9142***	-0.9675***	-0.6851***
	[-10.42]	[-8.94]	[-12.13]	[-9.45]	[-8.12]	[-11.73]
Kaplan-Zingales Index	0.0000	-0.0015	-0.0027**	-0.0024	-0.0045**	-0.0049***
	[0.02]	[-1.00]	[-2.35]	[-1.44]	[-2.45]	[-3.76]
Constant	-2.4631***	-2.1142***	-3.2157***	-4.1389***	-3.7194***	-4.4924***
	[-3.55]	[-3.01]	[-5.11]	[-4.73]	[-4.04]	[-5.59]
Observations	16,544	14,348	23,494	16,544	14,348	23,494
Weak Identification Test (F-stat)	34.70	23.93	60.41	15.72	11.97	26.93
Hansen's J (p-value)	0.27	0.24	0.21	0.45	0.33	0.44
Firm Fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes

Year Fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes

z-statistics in brackets; *** p<0.01, ** p<0.05, * p<0.1