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Are Trade Creditors Relationship Lenders? ^{*†}

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Abstract

Despite the importance of the hypothesis that trade creditors may act as relationship lenders, it has been virtually impossible to directly test this hypothesis because of a lack of data. We attempt to overcome this problem by using a relatively new Japanese database on small and mid-sized enterprises (SMEs) that contains information on the strength of the buyer-seller relationship. We find some evidence that trade creditors may be relationship lenders. However, we also find evidence that trade creditors may be financial statement lenders. Our results are generally quite sensitive to model specification in both our “quantity” and “terms of credit” regressions. Thus, our results can only be viewed as suggestive of the possibility that trade creditors acquire private soft information over time and use this information to set the terms of trade financing.

Keywords: Trade Credit, Relationship Lending, Credit Availability, Information Accumulation, Bank Loan

JEL classification code: , G32, G21, L14, L13, L22

I. Introduction

It is not surprising that trade credit has garnered considerable attention in the academic literature given its ubiquitous nature. It has been noted that its importance as a source of external finance may be even greater for SMEs than for larger firms (e.g., Mian and Smith 1992, 1994, Biais and Gollier 1997). It has also been noted that trade credit may be more important in countries where bank relationships are not strong, where financial markets are less developed, and where the legal system is weak (e.g., Breig 1994, Demirguc-Kunt and Maksimovic 2002, and Fisman and Love 2003). Nevertheless, even in developed countries such as Japan and the United States, SMEs depend heavily on trade credit: In Japan and the United States trade credit accounts for 30% and 32% of all debt extended to SMEs respectively.¹

Despite the abundance of articles on trade credit in the literature, there is very little agreement on the nature and motivation for the use of trade credit. There is no shortage of theories. Some theories of trade credit emphasize an operations-oriented motivation for trade credit while other theories emphasize a financial motivation. Many of the financial theories either explicitly or implicitly emphasize that trade creditors (i.e., product sellers) acquire private information about buyers that facilitates their extension of credit to these customers. In particular, some authors have argued that trade creditors acquire private information that is similar – in some cases, superior – to the information acquired by banks (e.g. Mian and Smith 1992, Biais and Gollier 1997, Cook 1999, Jain 2001, Cunat 2005, Miwa and Ramseyer 2005, Fabri and Menichini 2006). To the extent that trade creditors acquire soft information in order to monitor their customers and use this information to make credit decisions they act,

¹ The ratio for the Japan is from the 2002 Survey of the Financial Environment conducted by the Japanese Small and Medium Enterprise Agency. The ratio for the U.S. is from Berger and Udell (1998).

like banks, as relationship lenders.

This relationship lending view of trade credit has been a long standing hypothesis in the academic literature on the motivation of trade credit. Consider the following statement from the literature review contained in one of the earlier seminal papers on trade credit: “Monitoring of credit worthiness of an account debtor can occur as a by-product of selling if the manufacturer’s sales representative regularly visits the borrower (Mian and Smith 1992, p. 172).” One recent paper has argued that trade creditors are even better at monitoring (i.e., relationship lending) than banks noting that because “bankers seldom know their borrowers’ industries first-hand, they rely on guarantees and security interests [while because] trade partners know those industries well, they instead monitor their borrowers closely (Miwa and Ramseyer 2005, p.1).”

Despite the importance of the hypothesis that trade creditors act as relationship lenders, it has been virtually impossible to conduct a direct test because of a lack of data that have information on both 1) the terms of trade credit, and 2) the strength of the buyer-seller relationship. We overcome this problem by using a relatively new Japanese database on small and midsized enterprises (SMEs) that contains information on both 1) and 2) as well as information about the firm itself. In this paper we find some evidence that trade creditors may be relationship lenders in both our regressions for trade credit terms and for trade credit quantity. However, these results are not robust to alternative specifications. Interestingly we also obtain some evidence that trade creditors may be financial statement lenders, although this finding is likewise not robust. We view our results as suggestive of the possibility that trade creditors acquire private soft information as well as hard information over time and use such information to set the terms of trade financing. This should not, however, be interpreted

as being inconsistent with other theories of trade credit such as the operations-oriented theories of trade credit because these motivations for trade credit are not necessarily mutually exclusive.

The remainder of our paper is structured as follows. Section 2 offers a brief review of the literature on trade credit. Section 3 discusses our data and methodology. This discussion also highlights the advantage of our data set and the information it provides on the terms of trade credit and the strength of the buyer-seller relationship. Section 4 presents our results and Section 5 concludes.

II. The Literature on Trade Credit

Many different theories have been offered to explain the wide-spread use of trade credit with some empirical support for many of them. As noted in one recent paper, most theories of trade credit fit into one of two broad categories: theories based on real operations and theories based on financial aspects (Frank and Maksomovic 2005).² Real operations-based theories offer a variety of motivations including transaction cost minimization, price discrimination, and quality guarantees (e.g., Ferris 1981, Emery 1987, Brennan, Maksimovic and Zechner 1988, Long, Malitz and Ravid 1993, Emery and Nayar 1998).

Financial theories of trade credit take different forms. Many papers suggest that trade creditors may have certain advantages in contracting over bank lenders. Some papers argue that trade creditors have an advantage related to product collateral value. For example, this can arise if suppliers place a higher value on their product as collateral than banks or if trade suppliers have superior liquidation ability or a security interest in their product that

² For a more comprehensive literature review see Petersen and Rajan (1997) and Burkart, Ellingsen and Giannetti (2004).

dominates a bank's claim (e.g., Mian and Smith 1992, Frank and Maksomovic 2005, Santos and Longhofer 2003). One paper argues that trade creditors may make more concessions in renegotiation than banks because they incur sunk costs that are specific to their customers (Wilner 2000). Another paper argues that trade creditors may have a repayment enforcement mechanism that is superior to that of banks in that they can strategically withhold supplies (Cunat 2005). Some recent work also emphasizes creditor vulnerability to product diversion (Burkart and Ellingsen 2004, Burkart, Ellingsen and Giannetti 2004).

Many papers also argue that trade creditors acquire private information about their customers (e.g, Mian and Smith 1992, Biais and Gollier 1997, Cook 1999, Jain 2001, Cunat 2005, Miwa and Ramseyer 2005, Fabri and Menichini 2006). The information acquired by trade creditors need not be the same information that banks acquire. For example, one paper models banks and trade creditors as receiving different signals about buyer quality with banks being induced to lend based on the observed availability of trade credit (e.g., Biais and Gollier 1997). While the notion that trade creditors, like banks, accumulate information over time as the strength of the relationship grows (or as its breadth widens) is not explicitly modeled in the trade credit literature, this notion is consistent with the spirit of many of the information-based models of trade credit. Despite the lack of an explicit model, the hypothesis that trade creditors are relationship lenders (in the pure sense of linking the accumulation of private information with the strength of the relationship) is well established in the literature (e.g., Mian and Smith 1992, and Cunat 2005, Miwa and Ramseyer 2005).

There is also a literature that primarily focuses on whether trade credit and bank credit are substitutes with most but not all finding that they are (Meltzer 1960, Jaffee 1968, Ramey 1992, Marotta 1996, Cook 1999, Ono 2001, Tsuruta 2003, Uesugi and Yamashiro

2004). We will also investigate this issue by examining whether the length of the buyer-seller relationship has an effect on the terms of bank credit.

The only empirical evidence of which we are aware that links buyer-seller relationship strength with trade credit is indirect in the sense that firm age is used as proxy for the length of the relationship. While the typical empirical result has been that dependence on trade credit declines with age, one paper found that dependence on trade credit initially grows for new firms and then later levels off as a fraction of debt over the firm's life cycle (Cunat 2005). However, using age as a proxy may be problematic because the age of the firm could just as well be a proxy for publicly available information about the firm (e.g., Berger and Udell 1995). Our proxy for the relationship strength is considerably more powerful than firm age – the length of the relationship between the SME and its main supplier. Moreover, we are able to control for firm age which essentially allows us to control for publicly available information about the firm. In addition, we can also control for the availability of verifiable financial information in the form of audited financial statements.

In contrast to the paucity of data on the strength of the buyer-seller relationship discussed in the previous paragraph, there is a widely-held belief in the literature that the terms of trade credit are well known and, to lesser extent, uniform. In particular, it is generally assumed in the literature that trade credit is an extremely expensive form of external finance – considerably more expensive than bank loans. Typically the cost of trade credit is estimated in a mechanical way that assumes a standard pricing menu that features a discount for early payment and a final maturity. The terms most frequently described in the literature are a 2% discount in 10 days and a net (i.e., maturity) of 30 days (e.g., Petersen and Rajan 1994, 1995, 1997, Cunat 2005). These pricing terms make trade credit very expensive

during the 20 day period after the discount with an effective annual rate over 40%.

However, recent criticism in the literature has emphasized that this approach may be too simplistic (Miwa and Ramseyer 2005). These critics note that researchers on trade credit typically “offer little actual evidence on the usurious” terms of trade credit. For example, it appears from the Federal Reserve’s National Survey of Small Business Finance that two-thirds or more of suppliers do not offer discounts at all (see Petersen and Rajan 1994, Burkart, Ellingsen and Giannetti 2004). In addition, the “real” maturity may be significantly longer than the stated maturity.³ Most problematic, however, is the fact that the price of the underlying product is not observable to the empiricist. Thus, with information on this key element of the pricing menu, it is distinctly possible that trade credit is no more expensive than bank credit (Miwa and Ramseyer 2005).

Our survey data allow us to incorporate in our analysis the “real maturity” of trade credit. We argue that this is a notable improvement over the extant literature that has only analyzed the “stated maturity” (e.g., Burkart, Ellingsen and Giannetti 2004). Further, we feel that our variable based on the real maturity of trade credit likely better captures an overall tightening of credit terms.⁴

III. Data and Methodology

To examine the hypothesis that trade creditors are relationship lenders we exploit a unique data set from a survey of Japanese SMEs that contains information about the strength of the relationship that an SME has with its main supplier. Our data source is the Survey of

³ Lenders in the U.S. who factor accounts receivables or lend against accounts receivable under a factoring or asset-based loan contract do not generally consider an account as ineligible as collateral until the invoice is over 90 days old.

⁴ In future extensions of this research we will be able to construct a variable that also incorporates changes in the pricing of the goods.

the Financial Environment (SFE) that was conducted on November 2002 by the Japanese Small and Medium Enterprise Agency, which is affiliated with the Japanese Ministry of Trade, Economy, and Industry (METI). In many ways the SFE survey is similar to the Survey of Small Business Finance (SSBF) in the US. Like the SSBF the SFE asks about financing issues of SMEs in Japan as of October 31, 2002 including numerous questions about how respondent firms obtain their financing. Unlike the SSBF – and most importantly for our study -- the SFE also asks about the length of the relationship that an SME has with its main supplier.⁵

Our main empirical tests take the form:

$$\text{Terms of Trade Credit} = f(\text{strength of the buyer-seller relationship, firm and entrepreneur control variables, regional and bank controls}) \quad (1)$$

$$\text{Amount of Trade Credit} = f(\text{strength of the buyer-seller relationship, firm and entrepreneur control variables, regional and bank controls}) \quad (2)$$

From the survey we construct two variables for our proxies of terms of trade credit: SHORTEN and LENGTHEN. First, SHORTEN is a dummy variable that takes the value of 1 if the respondent SME answered “shortened” to the question on trade credit, “Over the past one year, did your company’s terms of payment change?”⁶ It seems likely that most respondents would interpret this question as referring to the “real maturity” trade credit, although there is some ambiguity that could lead some respondents to it more narrowly to mean just the stated maturity. Second, LENGTHEN is a dummy variable that takes the value

⁵ This data set has been used in several other studies of SME financing in Japan (see Kano et al. 2006).

⁶ The two alternative answers to the question were “unchanged” and “lengthened”.

of 1 if the respondent SME answered “lengthened” to the same question. Again, it seems most likely that respondents would interpret this as a lengthening in the “real maturity” of trade credit.

We also construct a dummy variable SHORTEN_TIGHT that takes the value of 1 if the respondent SME answered “shortened” to the question on trade credit, “Over the past one year, did your company’s terms of payment change?” and answered that this shortening resulted in a “tighter financial position”. In our view this combination of answers can best be viewed as describing a shortening in the “real maturity” of trade credit that materially affected the SME’s access to external finance.⁷

For Equation (2) we use a variety of alternative proxies to measure the amount of trade credit: TC_ASSET_RATIO is the ratio of trade credit to total assets; TC_LOAN_RATIO is the ratio of trade credit to total outstanding loans; TC_SHORT_RATIO is the ratio of trade credit to total outstanding short-term loans; and TC_TURNOVER is the trade credit turnover in days (i.e., (trade credit)/[(cost of goods sold per day)]).⁸ We note here that TC_TURNOVER could just as easily be interpreted as a measure of one of the terms of trade credit – the length of the real maturity dimension of the trade credit contract. To the extent that the actual payment time coincides with the real maturity terms offered by suppliers, TC_TURNOVER will be a good proxy for the real maturity. However, to the extent that a firm pays early or late (before or after the real maturity), it will not.

Our key independent variable, LENGTH_TC, is our proxy for the strength of the

⁷ We could not construct a comparable dummy variable LENGTHEN_EASY because of limited observations.

⁸ More precisely, in the Japanese context trade credit equals the sum of “notes payable” and “accounts payable”. Because notes payable and accounts payable are both credit extended by the supplier of goods to the buyer, they represent credit extended in conjunction with trade.

buyer-seller relationship. Specifically, LENGTH_TC is the length in years of the relationship between the SME and its main supplier. We use this variable to test our main hypothesis that trade creditors are relationship lenders. This variable is the exact counterpart to the variable most often used as a measure of the strength of the borrower-bank relationship in the bank lending literature (e.g., Petersen and Rajan 1994, Berger and Udell 1995, Berger et al. 2005). A finding of a negative (positive) coefficient on LENGTH_TC in our terms of trade credit tests (Equation (1)) when SHORTEN and SHORTEN_TIGHT (LENGTHEN) is our proxy for the terms of trade credit would support the hypothesis that trade creditors are relationship lenders. A finding of a positive coefficient on LENGTH_TC in our amount of trade credit tests (Equation (2) for any of our proxies) would also support the hypothesis.⁹

Another key independent variable relates to information verifiability. We use the same proxy here as used in Kano et al. 2006, a dummy variable representing the availability of audited financial documents. This dummy variable, AUDIT, takes the value of one if the SME's financial statements are either audited by certified public accountants or verified by licensed tax accountants. This variable tests for the possibility that trade creditors use the financial statement lending technology in deciding on the extension of, and terms of, trade

⁹ We note that, due to data limitations, the construction of our dependent and key independent variables are not entirely consistent with each other and this may bias our analysis against finding evidence that trade creditors are relationship lenders. The dependent variables reflect the overall terms of trade credit. They are best interpreted as the *average* terms of trade credit across all suppliers in our terms regressions, and the total amount of trade credit in our quantity regressions. However, our key independent variable is based on only the strength of the relationship with one trade supplier – the “main” supplier. To the extent that the main supplier, however, is the most important supplier in setting the *average* terms and the total supply of trade credit, we may be able to capture a statistical association between the trade credit and the strength of the buyer-seller relationship. The bias tends to go in one direction – a bias against finding that relationship strength matters. We note that the data give us an opportunity to significantly mitigate this problem based on additional information in the survey about the importance of the main supplier. In subsequent analysis we will exploit this additional information.

credit.¹⁰

Finally, as control variables, we include variables to represent: the firm's financial performance, firm characteristics, the entrepreneur's characteristics, industry dummies, and regional dummies.¹¹ These variables control for firm risk, industry performance and risk, and regional economic differences. We also control for the characteristics of the SMEs' main bank which may affect the dependence of the SME on trade credit. Details of these variables are found in the Data Appendix.

We also test in our analysis the possibility that trade credit and bank lending are complimentary activities. Specifically we test whether the strength of the buyer-seller relationship affects the terms of bank credit. Here our tests take the form:

$$\text{Terms of bank loans} = f(\text{strength of the buyer-seller relationship, firm and entrepreneur control variables, regional and bank controls}) \quad (3)$$

We use two alternative measures of the terms of bank loans: the bank loan interest rate and a dummy variable indicating whether the SME pledges collateral to its main bank. The loan interest rate, `SHORT_RATE`, is the highest annual short-term borrowing rate with

¹⁰ Recent literature on SME financing has departed from the earlier view that SME lending consists of only two lending technologies – relationship lending which commercial lenders use to lend to opaque SMEs, and transactions lending which commercial lenders use to lend to transparent SMEs. This new literature argues that there are many types of transactions lending technologies that commercial lenders can use to provide credit mostly to opaque SMEs including leasing, factoring, asset-based lending, equipment lending, real estate lending and financial statement lending (Berger and Udell 2002, 2006). These papers, however, argue that financial statement lending is necessarily associated with transparent borrowers because the audited financial statements make the borrower transparent. Our inclusion of audited financial statements as an independent variable controls for the possibility that trade creditors may, in fact, be financial statement lenders.

¹¹ Entrepreneur characteristics are defined by those of the firm's representative, which is usually a CEO.

terms less than one year from the main bank as of October 31, 2002. The collateral dummy, COLLATERAL, takes a value of one if the SME pledges collateral (property) to the main bank. Equation 3 investigates the possibility that the intensity of monitoring conducted by key suppliers affects the underwriting decision of bankers. A negative coefficient on the LENGTH_TC (the strength of the buyer-seller relationship) would be consistent with the view that emphasizes that trade creditors are superior monitors vis-à-vis banks (Cook 1999, and Miwa and Ramseyer 2005) and/or that banks rely on the monitoring of trade credit in extending and setting their terms of credit (Cook 1999, Biais and Gollier 1997).

IV. Results

Table 1 shows summary statistics for the dependent and independent variables used in our sample. Additional information about the distribution of our dependent variables for Equation (1), SHORTEN, SHORTEN_TIGHT, and LENGTHEN, are shown in Table A1. For our key dependent variable the average length of the relationship between the SME and its main supplier is 29 years. These data show that our sample firms are on average medium sized with average assets of 2.8 billion yen and with an average of 79 employees. The average firm age is forty-seven years old. Forty-five percent of firms are owner-managed (i.e., for forty-five percent of the sample firms, half of the shares are owned by the entrepreneur and individuals with the same family name as the entrepreneur's).

The regression results from our tests of Equation (1) are shown in Table 2. Turning first to the SHORTEN regression we note that the coefficient on the length of the buyer-seller relationship variable, LENGTH_TC, while negative is not statistically significant. Thus, we cannot reject the null hypothesis that the strength of the relationship does not affect the terms of credit (as proxied by SHORTEN which likely reflects changes in the real maturity of the

SME's overall trade credit).¹² This means that we do not find evidence that trade creditors are relationship lenders that accumulate soft information over time using SHORTEN as our measure of the terms of trade credit. That is, we do not find evidence that trade creditors have a comparative advantage in monitoring or, more generally, otherwise have a comparative advantage in access to private information as suggested in some of the literature on trade credit (e.g, Mian and Smith 1992, Biais and Gollier 1997, Cook 1999, Jain 2001, Cunat 2005, Miwa and Ramseyer 2005, Fabri and Menichini 2006). By implication this result, by itself, suggests that operations-oriented theories of trade credit may be more powerful than financial theories – at least those financial theories that rely on trade creditors acquiring private information about overall buyer quality.

Our other key independent variable is the availability of audited financial statements, AUDIT. The coefficient on this variable is likewise statistically insignificant. This suggests that trade creditors are not less likely to tighten credit for those firms that can provide verifiable financial information.

Turning to the other variables in the regression we find that other than the capital ratio and firm age the firm financial ratios and firm characteristics are not statistically significant. The negative coefficient on the capital ratio suggests that the financial condition of the firm may have some effect on the terms of trade credit. Not surprisingly it shows that firms whose leverage is large are more likely to incur a tightening of credit terms. The age variables indicate that older firms are more likely to suffer a tightening of credit terms than younger firms. This result does not lend itself to any easy interpretation. We would note here

¹² Again we emphasize here that our key independent variable is the length of the relationship with a single trade creditor, the SME's main supplier. The dependent variable, however, is a measure of overall tightening of trade credit. Thus, it is possible that we fail to reject the null hypothesis because the main supplier for many of the respondents does not supply a significantly large fraction of trade credit.

that because we have controlled for private information available to the supplier (through the buyer-seller relationship strength variable, LENGTH_TC), the age variables proxy for information that is publicly available to all creditors (see Berger and Udell 1995). Thus, the positive coefficient suggests that as more publicly available information becomes available about the firm, the more likely that trade creditors will tighten credit. However, the small coefficients indicate the effect is relatively small economically.

The negative coefficient on GENDER suggests that male owned firms are less likely to incur a tightening of trade credit than female-owned firms. Other characteristics of the entrepreneur that may capture the level of human capital are not significant. One other variable is notable. The positive coefficient on ALL_SERVICE suggests that SMEs in the services industry are more likely to incur a tightening of trade credit terms. This may reflect that service firms are more opaque although the lack of statistical significance on any of the tangible asset variables seems to contradict this interpretation.

In the second regression in Table 2 the dependent variable is LENGTHEN. In some sense this alternative specification of Equation (1) can be viewed as the mirror of the first regression where SHORTEN was the dependent variable. However, these may not necessarily be symmetric tests – that is, a meaningful lengthening of the real maturity may not necessarily be the inverse equivalent of a meaningful shortening (at least in the view of the respondent). Regarding the key coefficient, the relationship strength LENGTH_TC, the result is the same: statistical insignificance. Again, here we do not find evidence to support the hypothesis that trade creditors are relationship lenders.

The third equation in Table 2 has SHORTEN_TIGHT as its dependent variable. This is a somewhat stronger version of the first equation where the respondent firm indicates that

not only was the maturity of trade credit shortened, but in addition this shortening had “tightening” effect on its financial condition. The results here are qualitatively similar to the first regression with SHORTEN as the dependent variable. In particular, the two key independent variables, LENGTH_TC and AUDIT are both insignificant.

Now we turn to Equation 2 in Table 3 where the dependent variable is the quantity of trade credit measured in a variety of different ways. Again our alternative dependent variables are TC_ASSET_RATIO, TC_LOAN_RATIO, TC_SHORT_RATIO, and TC_TURNOVER where the last ratio is the trade credit turnover in days. In all four regressions the coefficient on the relationship strength variable, LENGTH_TC, was positive and statistically significant – at least at the 10% level. It is interesting to note that this result is robust across all four specifications. The different specifications capture in the dependent variable alternative measures of trade credit availability. For example, while the numerator of the dependent variable, the amount of trade credit, is the same in each of the first three regressions, the denominators are quite different. Together, these findings show that longer trade credit relationships are associated with more trade credit relative to short term loans, all loans (short and long term), and relative to all sources of funding (debt plus equity). Moreover, the fourth regression suggests something even stronger: that firms draw on more trade credit because trade creditors extend credit on *more favorable terms* to customers with longer relationships. That is, the fourth regression suggests that the substitution of trade credit for other forms of financing is in part driven by a willingness on the part of trade creditors to extend trade credit on better terms for customers with longer relationships. This interpretation stems from the fact that the trade credit turnover (TC_TURNOVER) is a measure of the *real maturity* of trade credit. That is, TC_TURNOVER is a point in time

estimate of the length of time that the firm is taking to pay its trade obligations.

The coefficient on AUDIT was positive in all four quantity regressions but statistically significant in only two. This is weakly suggestive that verifiable information is associated with more trade credit. This provides some evidence that trade creditors may also be financial statement lenders. The coefficients on some of the control variables are interesting. The coefficient on LIQUIDITY (the liquidity ratio) is positive and significant in three of the specifications. The exception is the TC_SHORT_RATIO. One interpretation of this combination of results is that *ceteris paribus* suppliers are more willing to extend trade credit the lower the effective “advance rate” is on short term assets (i.e., accounts receivable plus inventory). This is analogous to how asset-based lenders calibrate loan advances against accounts receivable and inventory.¹³ The sign on the CAPRATIO (=capital)/(total asset) is not consistent across specifications nor is it always statistically significant. GENDER is always negative and is statistically significant in the TC_ASSET_RATIO regression but insignificant in the other three specifications. The negative and significant finding in the TC_ASSET_RATIO is inconsistent with the findings on GENDER in the SHORTEN and SHORTEN_TIGHT regressions. AGE is statistically significant in only one specification and it flips sign in the other regressions.

Summarizing the quantity regressions we find evidence to support the hypothesis that trade creditors are relationship lenders in that the coefficient on our proxy for the strength of the relationship is always positive and significant at least at the 10% level. These results are inconsistent with our findings on Equation 1.

As we noted earlier our measure of relationship length is not consistent with our

¹³ See Udell (2004) chapter 6 for a discussion of the calibration of advances against accounts receivable and inventory in an asset-based loan context.

measures of the terms of trade credit and the amount of trade credit. Specifically, the length of the trade credit relationship pertains only to the firm's "main supplier", while our measures of terms of trade credit and the amount of trade credit pertain to all trade credit. To address this problem we exploit another question in the survey that asks firms how dependent they are on their "main supplier". To exploit this information we narrowed the sample to only those firms with 60% dependence. This has the virtue of allowing for a much closer connection between relationship strength and the terms and quantity of trade credit. That is, for this subsample the terms and quantity of trade credit are substantially determined by the trade creditor on whom we have information about the strength of the relationship. There is, unfortunately, a trade-off in using this subsample. Only about 13 percent of the firms were greater than 60 percent dependent on their main supplier, so that we have smaller number of observation. In addition, in our terms tests (Equation (1)) we only have enough observations to test SHORTEN.

The results for these additional tests are shown in Table 4 for the terms tests and Table 5 for the quantity tests. Overall, with respect to relationship strength the results are the opposite of what we found in the larger sample. Specifically, the length of the trade credit relationship was highly significant and negative in the SHORTEN regression indicating that stronger relationship are associated with a lower likelihood of rationing. However, in the quantity regressions relationship strength was not significant in any of the regressions. Interestingly, the results on AUDIT are stronger and consistent with the full sample tests, again providing some evidence that trade creditors may be financial statement lenders.

We now turn to our final analysis to investigate whether trade credit and bank lending may be complimentary activities. Our tests of Equation (3) are shown in Table 6.

Specifically, we investigate the possibility that the terms with which bankers lend to SMEs are favorably affected by the intensity of monitoring conducted by key suppliers. This view of bank lending basically emphasizes that trade creditors are superior monitors vis-à-vis banks (Cook 1999, and Miwa and Ramseyer 2005) and/or that banks rely on the monitoring of trade creditors in extending and setting their terms of credit (Cook 1999, Biais and Gollier 1997). A finding of a negative coefficient on LENGTH_TC in our interest rate regression and collateral regression would support this hypothesis. The coefficient, however, is not statistically significant in either regression.

V. Conclusion

We examine a longstanding hypothesis in the academic literature that views trade creditors as relationship lenders who acquire soft private information about their customers over time and use this information to set the terms and the amount of credit that they are willing to extend. A recent taxonomy of the SME credit underwriting suggests that relationship lending is one of many lending technologies that can be deployed in extending credit to opaque SMEs (Berger and Udell 2006). Evidence suggests that some banks, particularly small banks, have a comparative advantage in SME credit underwriting using the relationship lending technology (e.g., Stein 2002, Scott 2004, Berger, Miller, Petersen, Rajan and Stein 2005). Some researchers on trade credit have explicitly argued that suppliers might also act as relationship lenders through intensive monitoring of their borrowers including recent work in this area (e.g., Cunat 2003 and Miwa and Ramseyer 2005).

Despite the importance of the hypothesis that trade creditors act as relationship lenders, it has been virtually impossible to directly test the hypothesis because of a lack of

data that have information on both 1) the terms of trade credit, and 2) the strength of the buyer-seller relationship. We attempt to overcome this problem by using a relatively new Japanese database on small and mid-sized enterprises (SMEs) that contains information on both 1) and 2) as well as, among other things, information about the firm itself.

We conduct two types of tests, “terms tests” and “quantity tests”. The first set of tests investigates whether the strength of the buyer-seller relationship affects the terms of trade credit and the second set of tests investigates whether the strength of the buyer-seller relationship affects the quantity of trade credit. We find some evidence that trade creditors may be relationship lenders in both of these tests. However, the evidence is not robust to alternative specifications. Interestingly, we also find evidence that trade creditors are also financial statement lenders. Again, however, these results are not robust to alternative specifications.

On balance our results can be viewed as only suggestive of the possibility that trade creditors acquire private soft information over time and use this information to set the terms of trade financing. This should not be interpreted as being inconsistent with other theories of trade credit, such as the operations-oriented theories, because these motivations for trade credit are not necessarily mutually exclusive with the relationship lending motivation for trade credit.

Data Appendix

[Control variables]

Firm-specific controls

- Financial statement numbers and ratios

SIZE: total asset

LIQUIDITY: liquidity ratio = liquid (current) assets / total assets

CAPRATIO: stockholders equity/total assets (= 1- leverage)

PPMARGIN: pretax profit margin

- Firm characteristics

PROPERTY: property/total assets

BUILDING: buildings/total assets

MACHINERY: machinery/total assets

VEHICLE: vehicles/total assets

TOOL: tools/total assets

LAND: land/total assets

FAGE: firm age

FAGE2: square of FAGE

EMPLOYEE: the number of employees

OWNER: (dummy) owner or family members have more than half shares

- Entrepreneur characteristics

GENDER: (dummy) the entrepreneur is male

HOUSING: (dummy) the entrepreneur has his/her own house

EDUCATION: (dummy) the entrepreneur graduated a college/university/graduate school

AGE: entrepreneur's age

Industry dummies

CONSTRUCT: construction

All_SERVICE: service

Regional dummies

HOKKAIDO: Hokkaido prefecture

TOHOKU: Tohoku region

KITAKANTO: North Kanto area

CHUBU: Chubu area

KANSAI: Kansai area

CHUGOKU: Chugoku area

SHIKOKU: Shikoku area

KYUSHU: Kyushu area

Bank-specific controls*

BTASSET: bank's total asset

BTLOANR: loan to asset ratio = total loans / total asset

BLIQUIDITY: liquid asset index = bank's liquid asset / total asset

BCAPR: bank's capital asset ratio = bank's book capital/asset ratio

BCAPR2: square of BCAPR

BBIS: BIS capital asset ratio

BBIS2: square of BBIS

BROA_N = (Net business profit ("Gyoumu Jun-eki" in Japanese)) / BTASSET

ACQUIRE: (dummy) the bank involved a merger as an acquirer: This dummy equals 1 when the firm reports that its main bank experienced a merger with a smaller bank in the past five years

ACQUIRED: (dummy) the bank involved a merger as an acquired: This dummy equals 1 when the firm reports that its main bank experienced a merger with a larger bank or a bank with a similar size in the past five years

HELD: (dummy) the bank is a subsidiary of a bank holding company

BNPL_RATE: bad loan ratio = (loans to legally bankrupt companies + past due loans + renegotiated loans) / total assets

BLOSS: ratio of loan loss provision to total asset

* In order to examine different effects from bank characteristics, we then linked this survey data to bank balance sheet data. For banks under the Banking Act, the data are available from the Nikkei NEEDS Company (Bank) Data File issued by Nihon Keizai Shimbun, Inc. For Shinkin banks, Financial Statements of Shinkin Banks from the Kin-yu Tosho Consultant Corporation is used. These data are as of March 31, 2002, the end of the fiscal year 2001. We dropped firms whose main bank is either Mizuho Bank or Mizuho Corporate Bank. These two banks were established on April 1, 2002 as a result of a three way merger among Industrial Bank of Japan, Daiichi Kangyo Bank, and Fuji Bank. Thus, for those firms that reported one of the two Mizuho banks as their main bank as of October 31, 2002, we cannot know which of the three banks was their main bank. Note that the Japanese banks' financial closing date that is the most recent from the survey date is March 31, 2002, the end of FY 2001. Firms that reported Resona Trust Bank as their main bank are also dropped since it is a bank that had succeeded the Daiwa Bank's trust account. A trust account is for trust service, which cannot be compared with commercial banking service as is represented by a banking account. For other trust banks, measures for their financial health are defined based on their ledger accounts related to banking activities.

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Table 1: Descriptive statistics

		N	Mean	Std. Dev.	Min	Max
Trade Credit Terms	SHORTEN	1747	0.06	0.25	0	1
	LENGTHEN	1747	0.02	0.15	0	1
	SHORTEN_TIGHT	1747	0.02	0.15	0	1
	LENGTHEN_EASY	1747	0.01	0.09	0	1
Trade Credit Ratios	TC ASSET RATIO	1396	0.22	0.18	0	1.55
	TC LOAN RATIO	1331	1.33	4.13	0	86.66
	TC SHORT RATIO	1205	3.37	10.12	0	164.49
	TC TURNOVER	1389	134.88	2,257	0	84144.12
Length of relationships	LENTGH TC (year)	1747	28.65	14.55	1.00	97.00
Bank Credit Terms	SHORT_RATE (%)	1747	2.09	1.05	0	9.999
	COLLATERAL	1691	0.81	0.39	0	1
Firm characteristics	SIZE (thousand yen)	1747	2,783,968.00	5,657,275.00	2,337.00	88,000,000.00
	EMPLOYEE (person)	1747	78.54	137.47	2.000	2934.00
	FAGE (year)	1747	47.13	26.04	3	378.00
	OWNER	1747	0.45	0.50	0	1

Table A1 Terms of Trade Credit

	SHORTEN=1 and LENGTHEN=0	SHORTEN=0 and LENGTHEN=1	SHORTEN=0 and LENGTHEN=0	Total
SHORTEN_TIGHT=0	71	43	1,590	1,704
SHORTEN_TIGHT=1	42	0	1	43
LENGTHEN_EASY=0	113	29	1,591	1,733
LENGTHEN_EASY=1	0	14	0	14
Total	113	43	1,591	1,747

Table 2 Trade Credit Term Regressions

Dependent variable		SHORTEN			LENGTHEN			SHORTEN_TIGHT		
		dF/dx	Robust Std. Err.	P> z	dF/dx	Robust Std. Err.	P> z	dF/dx	Robust Std. Err.	P> z
Main independent variable	LENGTH_TC	-0.0004	0.0004	0.333	0.000	0.0002	0.669	0.000	0.0001	0.672
	AUDIT	-0.0036	0.0099	0.712	-0.003	0.0040	0.376	0.002	0.0033	0.609
Firm's financial numbers	log(SIZE)	0.0008	0.0042	0.845	-0.002	0.0016	0.274	0.000	0.0013	0.905
	LIQUIDITY	0.0260	0.0544	0.633	-0.025	0.0206	0.221	0.000	0.0181	0.995
	CAPRATIO	-0.0223 *	0.0123	0.068	-0.016 ***	0.0050	0.000	-0.012 ***	0.0048	0.002
	PPMARGIN	-0.0380	0.0498	0.445	-0.008	0.0119	0.502	-0.025 *	0.0163	0.079
Firm's characteristics	BUILDING	-0.0752	0.0688	0.275	-0.018	0.0247	0.476	0.002	0.0214	0.923
	MACHINERY	-0.0589	0.0827	0.477	-0.004	0.0233	0.858	-0.044	0.0336	0.201
	VEHICLE	-0.3433	0.2217	0.124	-0.153	0.1494	0.348	-0.156	0.0995	0.111
	TOOL	0.0909	0.1947	0.640	-0.128	0.1457	0.392	0.071	0.0495	0.132
	LAND	0.0187	0.0671	0.780	-0.010	0.0253	0.698	0.004	0.0223	0.857
	FAGE	0.0017 ***	0.0006	0.005	0.000 **	0.0002	0.041	0.000 **	0.0002	0.041
	FAGE2	0.0000 **	0.0000	0.033	0.000	0.0000	0.210	0.000	0.0000	0.115
	EMPLOYEE	-0.0001	0.0001	0.214	0.000	0.0000	0.124	0.000	0.0000	0.376
	OWNER	-0.0122	0.0104	0.239	0.009 **	0.0046	0.049	-0.001	0.0034	0.833
Entrepreneur's characteristics	GENDER	-0.1011 **	0.0675	0.035	0.002	0.0121	0.906	-0.034 *	0.0330	0.080
	HOUSING	-0.0043	0.0165	0.791	-0.008	0.0088	0.282	0.006	0.0036	0.182
	EDUCATION	0.0037	0.0114	0.750	-0.001	0.0047	0.868	-0.002	0.0041	0.697
	AGE	-0.0005	0.0006	0.418	0.000	0.0002	0.525	0.000	0.0002	0.546
Industry dummies	CONSTRUCT	-0.0044	0.0160	0.790	0.008	0.0079	0.229	0.010	0.0098	0.235
	All SERVICE	0.0451 ***	0.0141	0.001	-0.002	0.0045	0.731	0.029 ***	0.0093	0.000
Regional dummies	HOKKAIDO	-0.0102	0.0252	0.709	-0.002	0.0101	0.870	0.004	0.0118	0.729
	TOHOKU	0.0231	0.0270	0.341	0.052 ***	0.0307	0.002	0.021 *	0.0172	0.059
	KITAKANTO	0.0552	0.0558	0.209	0.026	0.0307	0.179	0.025	0.0346	0.248
	CHUBU	0.0107	0.0202	0.580	0.008	0.0110	0.357	0.014 *	0.0108	0.084
	KANSAI	-0.0099	0.0176	0.597	0.015	0.0149	0.165	0.001	0.0073	0.874
	CHUGOKU	0.0456 *	0.0329	0.090	-0.007	0.0073	0.504	0.017	0.0150	0.101
	SHIKOKU	0.0238	0.0361	0.454	-0.003	0.0100	0.779	0.023	0.0243	0.143
	KYUSYU	0.0234	0.0308	0.388	0.006	0.0122	0.578	-0.004	0.0065	0.654
Bank-specific controls	log(BTASSET)	0.0102	0.0086	0.235	0.001	0.0027	0.767	0.001	0.0022	0.734
	BTLOANR	0.2558	0.2349	0.274	-0.038	0.0944	0.682	-0.051	0.0735	0.484
	BLIQUIDITY	0.4098	0.2595	0.112	-0.031	0.0958	0.747	0.009	0.0778	0.903
	BCAPR	-4.0673 *	2.2458	0.070	1.698 *	1.0178	0.090	-1.455 **	0.7048	0.020
	BCAPR2	39.1846	24.6634	0.112	-9.587	10.3641	0.360	12.870 *	7.0761	0.051
	BBIS	0.1083	0.8678	0.901	-0.091	0.3177	0.774	0.479 *	0.2896	0.076
	BBIS2	-2.8935	3.7032	0.436	-0.512	1.2284	0.673	-2.297 **	1.1386	0.029
	BROA_N	-1.1927	2.7120	0.659	0.649	0.8281	0.434	0.341	0.8650	0.699
	ACQUIRE	0.0276	0.0313	0.311	0.001	0.0118	0.961	0.001	0.0086	0.897
	ACQUIRED	0.0570 **	0.0338	0.037	0.004	0.0108	0.657	0.015	0.0141	0.128
	HELD	-0.0218	0.0220	0.358	0.009	0.0114	0.344	-0.009	0.0061	0.179
	BNPL_RATE	-0.5155	0.3470	0.137	0.240 *	0.1320	0.064	0.004	0.1043	0.966
	BLOSS	0.0448	0.1403	0.750	0.071	0.0683	0.279	0.024	0.0551	0.650
Number of observations		1747			1747			1747		
Wald chi2		68.66			161.890			124.050		
Prob > chi2		0.0058			0.0000			0.0000		
Pseudo R2		0.0764			0.164			0.1928		

Notes: ***, **, and * represent that the estimated coefficient is significant at a 1%, 5%, and 10% level, respectively.

Table 3 Trade Credit Quantity Regressions

Dependent variable		TC_ASSET_RATIO			TC_LOAN_RATIO			TC_SHORT_RATIO			TC_TURNOVER		
		Coef.	Std. Err.	P> t	Coef.	Robust Std. Err.	P> z	Coef.	Robust Std. Err.	P> z	Coef.	Robust Std. Err.	P> z
Intercept	Intercept	0.0241	0.2229	0.914	-5.9167	7.0117	0.399	18.5269	17.0234	0.277	23.2359	90.1377	0.797
Main independent variable	LENGTH_TC	0.0010 ***	0.0003	0.001	0.0168 *	0.0088	0.057	0.0434 *	0.0246	0.078	0.2861 *	0.1543	0.064
	AUDIT	0.0125	0.0080	0.116	0.5132 **	0.1996	0.010	1.2430 *	0.6460	0.055	3.8774	4.1834	0.354
Firm's financial numbers	log(SIZE)	-0.0048	0.0037	0.200	0.034	0.0992	0.735	-0.439	0.3114	0.159	6.438 **	3.0443	0.035
	LIQUIDITY	0.4976 ***	0.0452	0.000	4.453 ***	0.8231	0.000	4.558	4.0081	0.256	86.151 ***	18.0953	0.000
	CAPRATIO	-0.1879 ***	0.0319	0.000	0.847 ***	0.3016	0.005	-3.071	4.0422	0.448	-34.836 ***	7.6522	0.000
	PPMARGIN	-0.0027	0.0451	0.953	-0.242	0.4032	0.549	3.219	2.6019	0.216	17.434	16.9822	0.305
Firm's characteristic s	BUILDING	-0.0007	0.0473	0.989	0.076	0.6885	0.912	0.701	4.6771	0.881	-30.612	23.1808	0.187
	MACHINERY	0.0090	0.0527	0.864	-0.355	0.8143	0.663	-1.123	5.0792	0.825	16.180	27.9768	0.563
	VEHICLE	-0.0475	0.1244	0.703	-0.768	1.5097	0.611	8.871	12.7567	0.487	-57.143	42.4912	0.179
	TOOL	-0.2095	0.1385	0.131	-3.060	2.3783	0.198	-5.949	7.6590	0.437	13.580	129.1154	0.916
	LAND	0.1125 **	0.0465	0.016	0.007	0.6923	0.992	-2.886	4.3604	0.508	48.163 ***	16.2722	0.003
	FAGE	-0.0002	0.0003	0.459	-0.007	0.0055	0.178	-0.034 **	0.0168	0.041	0.176	0.1093	0.108
	FAGE2	0.0000	0.0000	0.229	0.000	0.0000	0.938	0.000	0.0000	0.205	-0.001 ***	0.0004	0.001
	EMPLOYEE	0.0000	0.0000	0.797	0.002	0.0014	0.225	0.003	0.0027	0.243	-0.030 **	0.0129	0.018
	OWNER	-0.0116	0.0087	0.180	-0.581 **	0.2519	0.021	-0.119	0.7008	0.866	-5.469	4.2954	0.203
Entrepreneur's characteristic s	GENDER	-0.0589 **	0.0264	0.026	-0.161	0.3832	0.675	1.222	1.3904	0.379	-6.635	9.6755	0.493
	HOUSING	-0.0093	0.0136	0.494	-0.002	0.3987	0.995	0.707	1.0215	0.489	-4.657	5.3469	0.384
	EDUCATION	0.0187 **	0.0091	0.039	0.353 *	0.2057	0.086	0.232	0.6453	0.719	7.427 **	3.7632	0.049
	AGE	0.0003	0.0004	0.436	-0.003	0.0093	0.759	-0.052	0.0405	0.195	0.317 **	0.1571	0.044
Industry dummies	CONSTRUCT	-0.0292 ***	0.0102	0.004	0.868 **	0.4067	0.033	0.233	1.0126	0.818	-9.795 **	4.1043	0.017
	All SERVICE	0.0412 ***	0.0092	0.000	0.774 ***	0.2157	0.000	1.199 *	0.7008	0.087	1.988	5.6880	0.727
Regional dummies	HOKKAIDO	-0.0026	0.0208	0.902	1.374	0.8831	0.120	-2.358	2.7076	0.384	-10.776	8.1758	0.188
	TOHOKU	0.0017	0.0184	0.928	0.114	0.3682	0.758	-1.722	2.2980	0.454	-11.877	7.9005	0.133
	KITAKANTO	0.0191	0.0276	0.490	0.740	0.6992	0.290	-0.156	2.1749	0.943	-2.053	8.1538	0.801
	CHUBU	0.0042	0.0138	0.759	0.610	0.4113	0.138	-0.422	1.6281	0.795	-2.554	5.2734	0.628
	KANSAI	0.0192	0.0148	0.194	0.332	0.4785	0.487	0.347	1.6692	0.835	16.860	10.9055	0.122
	CHUGOKU	0.0022	0.0181	0.905	0.053	0.2831	0.851	-1.069	1.7613	0.544	-10.389	9.1738	0.258
	SHIKOKU	0.0023	0.0221	0.918	0.422	0.3564	0.237	-0.816	1.5164	0.591	-11.638	11.1169	0.295
	KYUSYU	-0.0121	0.0188	0.521	0.430	0.4259	0.313	-0.484	1.8795	0.797	7.933	17.5175	0.651
Bank-specific controls	log(BTASSET)	-0.0133 **	0.0065	0.041	0.092	0.1238	0.459	-0.427	0.3264	0.191	-4.896 *	2.6839	0.068
	BTLOANR	0.0637	0.1678	0.704	3.498	6.5706	0.595	-5.480	15.0072	0.715	42.727	72.9102	0.558
	BLIQUIDITY	0.0556	0.1906	0.770	5.810	7.9539	0.465	9.762	22.5548	0.665	26.727	85.3586	0.754
	BCAPR	-0.0923	1.7915	0.959	-85.916 *	46.0588	0.062	-123.645	115.7130	0.286	-568.091	734.7853	0.440
	BCAPR2	-31.3376	19.0551	0.100	753.397	488.1863	0.123	769.556	1115.3510	0.490	2382.108	7524.6170	0.752
	BBIS	1.9066 ***	0.6432	0.003	11.634	10.5424	0.270	-22.387	38.5006	0.561	163.971	314.8370	0.603
	BBIS2	-1.8934	2.4919	0.447	-120.170 **	59.6010	0.044	-60.511	162.5426	0.710	-477.290	1028.2640	0.643
	BROA_N	-1.3815	2.0997	0.511	21.946	62.5844	0.726	104.221	99.9579	0.297	-168.649	1006.8660	0.867
	ACQUIRE	-0.0329 *	0.0197	0.095	-0.227	0.7557	0.764	-1.128	1.6897	0.504	-0.820	7.4986	0.913
	ACQUIRED	-0.0149	0.0154	0.334	-0.526	0.4814	0.275	-1.046	1.1775	0.374	-4.992	5.4800	0.363
	HELD	0.0220	0.0172	0.203	0.705	0.9122	0.440	2.276	1.5928	0.153	1.084	6.5156	0.868
	BNPL_RATE	0.3012	0.2695	0.264	-2.955	5.4393	0.587	-4.996	16.0493	0.756	-165.104	208.2306	0.428
	BLOSS	0.1106	0.0721	0.125	1.418	2.9864	0.635	8.036 *	4.4801	0.073	68.606 *	38.5270	0.075
Number of observations		1318			1260			1138			1316		
F value		16.8000			3.4600			1.5400			5.5300		
Prob > F		0.0000			0.0000			0.0161			0.0000		
R-squared		0.4070			0.0999			0.0577			0.0954		

Notes: ***, **, and * represent that the estimated coefficient is significant at a 1%, 5%, and 10% level, respectively.

**Table 4 Trade Credit Term Regressions
(for Firms with High Dependence on the Main Supplier)**

Dependent variable		SHORTEN		
		dF/dx	Robust Std. Err.	P> z
Main independent variable	LENGTH_TC	-0.0010 ***	0.0006	0.003
	AUDIT	0.0027	0.0057	0.668
Firm's financial numbers	log(SIZE)	-0.0082 ***	0.0045	0.002
	LIQUIDITY	0.0686 **	0.0492	0.050
	CAPRATIO	-0.0041	0.0145	0.766
	PPMARGIN	-0.1560	0.1047	0.115
Firm's characteristics	BUILDING	0.0094	0.0431	0.826
	MACHINERY	0.1077 **	0.0660	0.018
	VEHICLE	-0.2596 *	0.1867	0.088
	TOOL	0.4648 ***	0.2943	0.007
	LAND	0.0541	0.0506	0.187
	FAGE	0.0030 ***	0.0017	0.000
	FAGE2	0.0000 ***	0.0000	0.001
	EMPLOYEE	-0.0002 ***	0.0001	0.001
	OWNER	-0.0076	0.0068	0.212
Entrepreneur's characteristics	GENDER	-0.1244	0.2607	0.280
	HOUSING	0.0094	0.0072	0.229
	EDUCATION	0.0078	0.0076	0.212
	AGE	-0.0012 ***	0.0007	0.000
Industry dummies	CONSTRUCT	-0.0141 **	0.0095	0.020
	ALL_SERVICE	0.0160	0.0121	0.103
Regional	NORTH	0.0364	0.0409	0.173
	CHUBU	0.0167	0.0279	0.422
	KANSAI	-0.0023	0.0113	0.851
	SOUTH	0.0217	0.0375	0.411
Bank-specific controls	log(BTASSET)	0.0038	0.0047	0.401
	BTLOANR	-0.0532	0.1134	0.645
	BLIQUIDITY	-0.0945	0.1403	0.492
	BCAPR	-3.0488 *	1.9916	0.065
	BCAPR2	25.0133	18.2554	0.160
	BBIS	1.0229 **	0.7412	0.050
	BBIS2	-3.6459 *	2.1821	0.056
	BROA_N	3.4180 **	2.3314	0.024
	ACQUIRE	-0.0064	0.0062	0.472
	ACQUIRED	-0.0045	0.0095	0.710
	HELD	-0.0028	0.0129	0.838
	BNPL_RATE	0.0078	0.2147	0.971
	BLOSS	0.3851 **	0.3074	0.050
Number of observations		225		
Wald chi2		60.85		
Prob > chi2		0.0107		
Pseudo R2		0.3565		

Notes: ***, **, and * represent that the estimated coefficient is significant at a 1%, 5%, and 10% level, respectively.

NORTH=HOKKAIDO+TOHOKU+KITAKANTO.

SOUTH=CHUGOKU+SHIKOKU+KYUSHU.

**Table 5 Trade Credit Ratio Regressions
(for Firms with High Dependence on the Main Supplier)**

Dependent variable		TC_ASSET_RATIO			TC_LOAN_RATIO			TC_SHORT_RATIO			TC_TURNOVER		
		Coef.	Std. Err.	P> t	Coef.	Robust Std. Err.	P> z	Coef.	Robust Std. Err.	P> z	Coef.	Robust Std. Err.	P> z
Intercept	Intercept	1.2821 **	0.5059	0.013	-1.5703	6.7545	0.817	62.8773	98.0023	0.523	220.9408	186.0451	0.237
Main independent variable	LENGTH_TC	-0.0002	0.0009	0.821	-0.0034	0.0133	0.799	0.0936	0.1021	0.361	-0.0354	0.3967	0.929
	AUDIT	0.0569 **	0.0247	0.023	0.9322 ***	0.3191	0.004	2.1046	2.9691	0.480	21.8354 ***	7.8437	0.006
Firm's financial numbers	log(SIZE)	-0.0100	0.0113	0.379	0.026	0.1251	0.836	-0.634	1.3346	0.636	2.413	4.1346	0.561
	LIQUIDITY	0.4711 ***	0.1329	0.001	4.597 ***	1.6383	0.006	40.310 **	17.9143	0.027	64.450	48.1856	0.184
	CAPRATIO	-0.2754 ***	0.0614	0.000	0.113	0.8094	0.889	-7.259	4.9538	0.146	-84.622 ***	21.8593	0.000
	PPMARGIN	0.0488	0.2257	0.829	-1.884	2.3416	0.423	33.879	25.0033	0.179	259.128 *	134.2074	0.056
Firm's characteristics	BUILDING	0.0417	0.1284	0.746	2.384	1.7192	0.168	55.409 **	25.0829	0.030	-9.441	56.9880	0.869
	MACHINERY	0.0593	0.1705	0.729	3.245	2.0590	0.118	68.664 *	35.5084	0.056	64.926	75.5819	0.392
	VEHICLE	-1.8687 ***	0.6588	0.005	-18.116 **	9.1004	0.049	428.523	286.3159	0.138	-425.332	256.9589	0.101
	TOOL	1.7603 **	0.7978	0.029	14.914	9.6191	0.124	301.071 ***	100.8143	0.004	-31.165	253.2479	0.902
	LAND	0.2574 **	0.1274	0.046	1.962	1.5722	0.215	40.820 *	20.7354	0.052	51.748	52.5864	0.327
	FAGE	-0.0012	0.0032	0.708	-0.007	0.0308	0.825	0.069	0.2603	0.791	-0.423	0.9588	0.660
	FAGE2	0.0000	0.0000	0.674	0.000	0.0003	0.620	-0.001	0.0021	0.714	0.005	0.0073	0.523
	EMPLOYEE	0.0004 *	0.0002	0.067	0.002	0.0024	0.309	-0.010	0.0286	0.724	0.061	0.0625	0.331
	OWNER	-0.0068	0.0269	0.800	0.247	0.3554	0.489	3.169	3.0299	0.298	1.349	8.4447	0.873
Entrepreneur's characteristics	GENDER	-0.0764	0.0917	0.407	-1.548	1.1270	0.172	-9.622	7.1085	0.179	-6.763	23.6171	0.775
	HOUSING	-0.1063 **	0.0409	0.011	-1.093	0.8294	0.190	-2.877	3.3474	0.392	-36.081 **	17.8520	0.046
	EDUCATION	-0.0206	0.0342	0.547	-0.511	0.4761	0.285	0.204	3.6538	0.956	-12.687	10.4873	0.229
	AGE	-0.0013	0.0013	0.329	-0.010	0.0135	0.464	-0.376 **	0.1895	0.050	-0.041	0.4411	0.926
Industry dummies	CONSTRUCT	-0.1048 ***	0.0387	0.008	-0.608	0.4608	0.189	-0.019	3.8175	0.996	-20.004	13.6609	0.146
	ALL_SERVICE	0.0127	0.0316	0.690	0.327	0.2935	0.267	1.985	3.9469	0.616	-12.255	10.1729	0.231
Regional dummies	HOKKAIDO	-0.0546	0.0703	0.439	-0.754	0.7979	0.347	-6.702	7.0174	0.342	-1.062	22.0718	0.962
	TOHOKU	-0.0320	0.0582	0.584	-0.450	0.7462	0.548	-14.059 *	7.2354	0.055	-7.099	17.1246	0.679
	KITAKANTO	-0.0600	0.0727	0.411	0.268	1.1353	0.814	-8.397	9.9200	0.399	-26.347	19.8661	0.187
	CHUBU	-0.0385	0.0501	0.443	-1.170	0.7981	0.146	-8.957	8.2002	0.277	-8.559	14.7576	0.563
	KANSAI	-0.0215	0.0560	0.702	-1.170	0.9372	0.214	-2.945	6.8994	0.671	21.380	18.3904	0.247
	CHUGOKU	0.0085	0.0712	0.905	0.158	0.6014	0.793	-14.249 *	8.0595	0.080	-0.226	18.3268	0.990
	SHIKOKU	-0.0548	0.0637	0.391	-0.243	0.6411	0.705	-8.168	8.1786	0.320	-13.630	17.3302	0.433
	KYUSYU	-0.0389	0.0620	0.532	-0.779	0.8367	0.354	-9.123	5.5487	0.103	-20.878	17.1487	0.226
Bank-specific controls	log(BTASSET)	-0.0292 *	0.0168	0.084	0.181	0.2154	0.402	0.938	1.6232	0.565	-6.891	6.5365	0.294
	BTLOANR	-1.0230 **	0.3923	0.010	-2.983	5.2958	0.574	-86.592	87.5726	0.325	-176.667	151.4020	0.246
	BLIQUIDITY	-0.4848	0.4627	0.297	2.410	5.8401	0.681	13.048	111.1526	0.907	-9.398	187.8261	0.960
	BCAPR	0.5518	7.0664	0.938	-106.595	134.1242	0.428	-572.188	608.4126	0.349	2762.095	2287.4190	0.230
	BCAPR2	-49.9167	71.1597	0.484	1131.540	1283.6510	0.380	4530.719	7394.1760	0.542	#####	#####	0.183
	BBIS	4.1597	2.5602	0.107	54.571	34.6197	0.118	23.710	198.6733	0.905	-244.660	622.8706	0.695
	BBIS2	-13.4657	9.9894	0.180	-330.110 **	150.7393	0.031	-1168.202	811.2394	0.153	1359.657	2508.3300	0.589
	BROA_N	1.0770	5.0018	0.830	-119.610 *	66.8610	0.076	-177.288	580.5617	0.761	1537.930	1508.1890	0.310
	ACQUIRE	-0.0167	0.0594	0.778	1.590 *	0.8847	0.075	1.524	5.1813	0.769	-29.218 **	14.1480	0.041
	ACQUIRED	-0.0389	0.0616	0.529	-0.911	0.5842	0.122	2.628	5.6050	0.640	-7.111	16.2842	0.663
	HELD	0.0108	0.0560	0.848	0.121	0.8807	0.891	-11.930 *	7.0587	0.094	10.483	18.8927	0.580
	BNPL_RATE	1.1130	0.9635	0.250	33.134 *	18.2059	0.071	60.128	108.1656	0.580	429.303	264.4761	0.107
	BLOSS	-0.0046	0.5690	0.994	-3.816	6.6086	0.565	-13.039	56.9055	0.819	151.647	169.3037	0.372
Number of observations		161			155			137			160		
F value		5.4500			2.3000			1.4100			2.9400		
Prob > F		0.0000			0.0003			0.0875			0.0000		
R-squared		0.5978			0.4878			0.4992			0.4372		

Notes: ***, **, and * represent that the estimated coefficient is significant at a 1%, 5%, and 10% level, respectively.

Table 6 Bank Loan / Trade Credit Regressions

Dependent variable		SHORT_RATE			COLLATERAL			
		Coef.	Std. Err.	P> t	dF/dx	Robust Std. Err.	P> z	
Intercept	Intercept	9.5048 ***	1.3885	0.000				
Main independent variable	LENGTH_TC	-0.0018	0.0015	0.221	0.0001	0.0007	0.908	
	AUDIT	-0.0678	0.0465	0.145	0.0259	0.0176	0.139	
Firm's financial numbers	log(SIZE)	-0.1154 ***	0.0204	0.000	0.016 **	0.0073	0.026	
	LIQUIDITY	-0.4443 *	0.2411	0.066	-0.205 **	0.0983	0.036	
	CAPRATIO	-0.8381 ***	0.2061	0.000	-0.134 **	0.0550	0.016	
	PPMARGIN	-0.2747	0.2745	0.317	-0.179	0.1498	0.234	
Firm's characteristics	BUILDING	-0.5006	0.3190	0.117	0.146	0.1289	0.256	
	MACHINERY	-0.4414	0.3489	0.206	-0.323 ***	0.1257	0.010	
	VEHICLE	0.3920	0.5880	0.505	-0.266	0.2710	0.325	
	TOOL	1.7935 *	0.9194	0.051	0.872 *	0.5299	0.100	
	LAND	0.2537	0.2888	0.380	0.559 ***	0.1319	0.000	
	FAGE	0.0010	0.0016	0.525	0.005 ***	0.0007	0.000	
	FAGE2	0.0000	0.0000	0.935	0.000 ***	0.0000	0.000	
	EMPLOYEE	-0.0007 ***	0.0002	0.005	0.000	0.0001	0.911	
OWNER	0.0966 *	0.0503	0.055	0.068 ***	0.0182	0.000		
Entrepreneur's characteristics	GENDER	-0.1766	0.1420	0.214	-0.034	0.0557	0.577	
	HOUSING	0.0575	0.0843	0.495	0.059 **	0.0313	0.039	
	EDUCATION	-0.1536 ***	0.0538	0.004	-0.055 ***	0.0190	0.004	
	AGE	-0.0001	0.0025	0.981	-0.002 *	0.0010	0.060	
Industry dummies	CONSTRUCT	0.1659 **	0.0645	0.010	-0.058 **	0.0289	0.033	
	All_SERVICE	0.0818 *	0.0492	0.097	-0.066 ***	0.0233	0.003	
Regional dummies	HOKKAIDO	-0.2271 *	0.1305	0.082	-0.018	0.0504	0.709	
	TOHOKU	-0.1747 **	0.0885	0.048	0.010	0.0377	0.790	
	KITAKANTO	0.0130	0.1834	0.944	-0.091	0.0717	0.147	
	CHUBU	-0.2051 ***	0.0693	0.003	-0.004	0.0327	0.906	
	KANSAI	-0.1080	0.0694	0.120	0.030	0.0285	0.329	
	CHUGOKU	-0.1742	0.1236	0.159	-0.023	0.0462	0.607	
	SHIKOKU	-0.3670 ***	0.0923	0.000	0.016	0.0452	0.733	
KYUSYU	-0.2393 **	0.1094	0.029	0.033	0.0369	0.416		
Bank-specific controls	log(BTASSET)	-0.2277 ***	0.0400	0.000	-0.032 **	0.0141	0.025	
	BTLOANR	-3.3164 ***	1.0517	0.002	0.088	0.3553	0.805	
	BLIQUIDITY	-4.1134 ***	1.1422	0.000	0.038	0.4089	0.926	
	BCAPR	24.7752 *	13.6674	0.070	7.090 *	4.1070	0.083	
	BCAPR2	-272.5380 **	137.9727	0.048	-77.180 *	43.3720	0.075	
	BBIS	1.7263	3.8130	0.651	-1.242	1.5169	0.412	
	BBIS2	4.7622	13.6780	0.728	9.876 *	5.8612	0.091	
	BROA_N	34.6644 ***	11.3359	0.002	6.971	5.1407	0.176	
	ACQUIRE	0.0306	0.1267	0.809	-0.021	0.0411	0.600	
	ACQUIRED	0.1618 *	0.0951	0.089	0.003	0.0353	0.943	
	HELD	-0.0953	0.1343	0.478	0.038	0.0349	0.293	
	BNPL_RATE	2.3235	1.5303	0.129	0.784	0.5890	0.183	
BLOSS	-1.5612	1.6267	0.337	0.171	0.2235	0.444		
		Number of observations			1747	Number of observations		1691
		F value			13.760	Wald chi2		258.26
		Prob > F			0.0000	Prob > chi2		0.0000
		R-squared			0.2414	Pseudo R2		0.2189

Notes: ***, **, and * represent that the estimated coefficient is significant at a 1%, 5%, and 10% level, respectively.