

The Relationship between Trade Credit and Loans: Evidence from Small Businesses in Japan

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ABSTRACT

Much of the existing literature on the relationship between trade credit and loans focuses solely on how a reduction in loans affects the use of trade credit. In this paper, we additionally investigate if a reduction in trade credit is offset by an increase in loans. Using a unique firm-level dataset of small Japanese businesses, we find the following: (1) as the lending attitude of financial institutions worsens, firms significantly decrease their use of trade credit, and (2) a reduction in trade credit, due to a decline in sales, leads to a reduction in the amount of loans extended. Our results provide evidence that small firms in Japan view trade credit and loans as complementary debt instruments. The primary implication of these findings is that bank-dependent small businesses may find their financing severely constrained in the event of major adverse shocks to real or financial activity.

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I. INTRODUCTION

What are the sources of financing for small and medium-sized firms (SMEs)? In contrast to large firms, the financing options of SMEs are limited, as they generally do not have broad access to bond and equity markets. In addition to loans from financial institutions, particularly banks, SMEs also depend heavily on trade credit. During commercial transactions, goods and services are often purchased on credit. In this case, since liabilities such as accounts and bills payable accrue until settlement, the purchasing firm temporarily borrows the goods and services from the supplier. This type of financing is known as trade credit because it is an extension of credit by a trading partner, not by a financial institution.

Trade credit plays a key role in firms' short-term financing and accounts for a considerable portion of a firm's liabilities. For instance, in Japan at the end of fiscal year 2002, the trade payables (total of accounts and bills payable) and trade receivables (total of accounts and bills receivable) share of total assets for non-financial corporations stood at 13.7% and 16.6%, respectively. The corresponding ratio of short-term (financial institution) loans to total assets was 15.7%.^{1,2} Understanding the relationship between trade credit and loans, therefore, is crucial to not only understanding the short-term financing decisions of SMEs, but also to understanding how changes in financing impact the real activity of these firms.

Previous empirical investigations of the trade credit-loan relationship have primarily examined whether trade credit dampens or amplifies shocks to financial institutions. For instance, in a seminal paper, Meltzer (1960) focuses on periods of tight money and shows that companies with ample cash flow extend trade credit to firms that have been adversely affected by the reduction in bank lending. These studies, however, simply look at one "direction" of the relationship between trade credit and loans – that is, the implication of shocks to loans on the use of trade credit. For a more thorough understanding of the relationship, one must consider not only how disturbances to loans affect firm use of trade credit, but also how disturbances to trade credit affect the use of loans. For instance, firms facing financial difficulties due to a drop in trade credit often seek assistance from their main banks. At the same time, as much of the literature discusses, companies that are denied loans from banks are often able to survive because of "eased" access to trade credit, for example, an extension of a bills' settlement date. In this paper, we examine the differing impact of shocks to bank loans and shocks to trade credit on the short-term financing mix of Japanese SMEs in an effort to determine whether trade credit and loans are substitutes or complements.

The exact nature of the relationship between these instruments is particularly relevant for the Japanese economy. The collapse of the bubble economy in the early 1990s forced banks to contract. If trade credit were a substitute for bank loans, an increase in trade credit usage could have partially offset the decline in lending, which would have lessened the real impact of the financial contraction. If, on the other hand, trade credit were a complement to loans, the behavior of trade credit would have amplified the impact of the financial contraction on small firms. Only by studying both sides of the relationship is it possible to determine whether trade credit acted as a buffer during Japan's recent economic downturn.

Using the firm-level data of the Small and Medium Enterprise Agency's Survey of Financial Environment, our main results are as follows:

- When financial institutions' lending attitude worsens, we observe a large decline in both trade credit and loans.
- When trade credit declines, because of weak sales, loans also decline.

These results imply that for small businesses in Japan, trade credit and loans extended by financial institutions are not substitutes. The fact that trade credit and loans commove, or are unrelated at best, means that bank-dependent SMEs are seriously credit constrained. We expect these constraints to be most severe during recessions initiated by problems in the banking sector.

This paper is organized as follows. We outline the benefits of trade credit usage in Section II. In Section III, we review the existing literature, and highlight the importance of analyzing the mutual interaction between trade credit and loans. We provide a description of the firm-level data in the Survey of Financial Environment in Section IV. In Section V, we first discuss our empirical methodology, and then confirm a complementary relationship between trade credit and loans by simultaneously estimating the determinants of both credit instruments. Section VI contains a discussion of the implications of our results for the Japanese economy. Section VII concludes.

II. THE BENEFITS OF TRADE CREDIT USE

Why do the companies that purchase goods and services accept financial assistance from their trading partners, rather than turning to professional lenders? In this section, we discuss the benefits of this arrangement for both suppliers and recipients of trade credit.³

A. Benefits to Supplying Firms

Companies that supply goods and services have several advantages over financial institutions in terms of providing credit to their client firms.

- Ability to obtain accurate credit risk information: supplier firms, through daily commodity transactions, are in a unique position to know, in detail, how the purchasing firms are being managed. Because of their closeness to the purchasing business these firms are, at times, quicker in sensing a possible bankruptcy relative to financial institutions, which assess a borrower's credit risk based on its financial statements.⁴
- Ability to assess the purchasing firm's inventory: supplying companies also gain information about the purchasing firm's inventory through their daily transactions. Additionally, they should be better informed than financial institutions about the market for that inventory. Thus, in the case of a default, supplying firms may reduce their losses through accurate inventory assessment, so long as they are able to secure the inventory.⁵
- Pressure applied to demand repayment: in cases where the suppliers are the sole providers of certain goods and services to the purchasing firm, they can use the threat of stopping the flow of supplies to ensure prompt repayment.
- Increased demand from firms affected by credit rationing: by extending trade credit,

even to risky firms, who are more likely to be credit rationed, suppliers can boost their sales.

B. Benefits to Purchasing Firms

Reduced transaction costs for the purchasing firm are a benefit of trade credit over loans. Because of such benefits, the larger the transaction volume, the more frequently trade credit is used.

- Reduction in transaction costs: uncertainties about cash flow, lead firms to hold cash, which incurs an opportunity cost. There is a sizable benefit in reducing this cost by using trade credit and having the flexibility in setting settlement dates.
- Merits of delaying payment: given a choice between settling immediately in cash or in using credit, if the payment amount is the same, the purchaser will buy on credit.⁶ In Japan, the settlement amount for accounts and bills payable usually remains fixed until the due date, in which case the advantages of utilizing trade credit may increase.⁷

III. EXISTING LITERATURE

In Section III-A, we briefly review the existing literature. In Section III-B, we discuss the importance of analyzing the mutual interaction between trade credit and loans.

A. Previous Research

The relationship between trade credit and loans extended by financial institutions has interested economists for quite some time. There are a number of theoretical explanations for how trade credit is determined. Petersen and Rajan (1997) discuss several of the most prominent theories. The financial advantage hypothesis stresses the informational superiority of non-financial firms over financial institutions in making loans or extending trade credit. Non-financial firms are better at acquiring more accurate and updated credit risk information on borrower firms through their daily commodity transactions. Based on the idea of financial advantage, Smith (1987), Frank and Maksimovic (1998), and Bond (2004) posit theoretical models of trade credit. The price discrimination hypothesis, in contrast, emphasizes sales. Non-financial companies provide trade credit, or loans, to high credit risk firms, firms that have been rationed by credit markets, in order to increase their sales.⁸ Finally, under the transaction cost reduction hypothesis, trade credit enables firms to bundle various payment commitments into one by synchronizing their payment dates, and, thereby, reduce transaction costs.⁹

The seminal empirical study on trade credit is Meltzer (1960). He uses aggregated data by firm size to conclude that in times of monetary contraction, companies with ample cash flow extend trade credit to firms that suffer from the negative impact in bank lending. Most subsequent studies support the idea of a substitutional relationship between trade credit and bank lending. For example, using industry-level data, Herbst (1974) finds that financial variables, which include bank loans, have a negative influence on the amount of account payables outstanding.

Some studies, however, have not been as “positive” about the ability of trade credit to substitute for bank loans. Nadiri (1969) analyzes data from the U.S. manufacturing industry and finds that trade credit decreases during times of tight money. Oliner and Rudebusch (1996) show that there is no clear difference between a decline in bank lending and that of total borrowing, including trade credit. Further, Gertler and Gilchrist (1993) argue that the effects of monetary policy on firm financing are more dependent on firm size, rather than on the difference between bank loans and trade credit.

It is worth noting that the majority of these studies rely on aggregated data. It is only quite recently that analyses based on firm-level data have appeared. Nilsen (2002), for instance, uses balance sheet panel data from large-sized companies in the U.S. and shows that trade payables increase after monetary contractions among those firms without bond ratings. Additionally, Blasio (2003) examines the financial data of relatively large Italian firms and estimates an inventory investment function. He maintains that trade credit does substitute for bank loans since in times of monetary tightening it is the amount of trade receivables net trade payables, rather than cash, that constrains inventory investment. While these papers analyze firm-level data of large-sized corporations, Petersen and Rajan (1997) investigate the financing choices of SMEs. This is crucial, as it is generally believed that SMEs have limited access to capital markets, and are bank loan and trade credit dependent. Petersen and Rajan (1997) conduct a cross-sectional analysis of micro data from the National Survey of Small Business Finances.¹⁰ They find that the use of trade credit increases when firms are unable to borrow from financial institutions.

There have also been several interesting empirical studies dealing specifically with Japan. Ono (2001) finds that the ratio of trade payables to trade receivables rises when banks ease their lending attitude, which is evidence of a complementary relationship between the two instruments. Similarly, Takehiro and Okusa (1995) show that, for large companies, there is a positive partial correlation between banks’ lending attitudes and trade payables. Tsuruta (2003), on the other hand, employs a panel data set of 80,000 firm observations covering five years, and finds that an increase in interest rates leads to an increase in trade payables, indicating that trade credit and bank lending are substitutes. Finally, Ogawa (2003) concludes that while large and medium-sized companies view trade credit and bank loans as substitutes, small businesses view them as complements. This implies that for Japanese firms in the 1990s, the smaller the company, the less likely it was that increased trade credit usage could compensate for a decline in bank credit.

B. The Interaction of Trade Credit and Loans

As has been discussed, the majority of existing studies on the trade credit-loan relationship have focused on the impact of changes in monetary policy, and banks’ lending attitude on trade credit. The implicit assumption is that shocks to bank lending are transmitted to the market for trade credit. In other words, changes in bank lending occur first, then, trade credit responds. Is it appropriate, however, to only consider one direction of the relationship between trade credit and bank loans? To develop a better understanding of the short-term financing decisions of firms it is necessary to also investigate how changes in trade credit impact the market for bank loans.

First, consider the fact that financial market participants, at trading companies and financial institutions, regard the causality as running both ways.¹¹ Companies that are unable to borrow from financial institutions sometimes ask their trading partners to extend the payment deadline for a bill, or to increase the ratio of purchases made on credit.¹² It is also true, however, that purchasers experiencing financing problems due to a decline in trade credit, receive loans from financial institutions. Of course, it is more likely that the financial institution will extend the loan if it has an established relationship with the company in question. Moreover, because there is no early payment discount in Japan, it is difficult to control the price of trade credit by altering this part of the agreement. In contrast, the interest rate on loans is clearly more flexible than the trade credit price. In terms of renegotiation, it is possible that loans can respond more flexibly than trade credit to exogenous shocks.

Secondly, problems in the financial sector, including the massive amount of non-performing loans, were not the only reasons for the recent slump in the Japanese economy. Compounding the weakness in the financial sector were problems in the real sector, such as low productivity growth and damage to the mutual bonds of trust amongst companies. It is, therefore, necessary to discuss how shocks to the real economy affect loans extended by financial institutions through changes in trade credit.

IV. DATA

In Section IV-A, we discuss the data employed in our study. Section IV-B defines the variables of interest.

A. Data Description

We employ the Small and Medium Enterprises Agency (SMEA) of Japan's Survey of Financial Environment (SFE) for the years 2002 and 2003. The data are collected by the Research Division of the SMEA. For each year of our sample, the SFE has a different name. It was known as the Survey of Financial Environment in 2002 and the Survey of Corporate Financial Environment in 2003. The SFE contains the balance sheet information of non-financial and non-agricultural corporations. For each year of the survey, 15,000 firms are randomly chosen from the database of Tokyo Shoko Research (TSR), a private credit research institution. The number of respondents for each year of our sample are 8,466 (2002) and 8,035 (2003).

It is important to note that since only firms that respond to the survey are included in the sample there is the possibility of survival bias. The attrition rate from 2002 to 2003, however, is extremely small, and so we do not believe it to be a serious problem. Further, not all of the surveyed (and responding) firms are SMEs. The legal definition of an SME is a firm that is either no larger than 300 million yen in total capital, or has no more than 300 employees. And actually, in a few industries, including wholesale, retail sales, and services, the thresholds are lower than the general definition. It is generally presumed that large firms, relative to small firms, have better access to credit.¹³ This is problematic as the large firm response to a credit shock can be very different from the SME response. To avoid this problem, we eliminate the large firm observations from the sample. We, therefore, eliminate 653 and 344 observations from the original data set for each year, respectively. From the remaining observations, we are able to construct a balanced panel of 2,198 firms.

We should also emphasize that the SFE also contains a variety of qualitative variables not derived from the balance sheet items. In particular, these variables contain information on the relationship between firms and financial institutions. Responses of the main bank to a firm's loan application, other procurement sources when a firm's loan application is rejected, requests by the main bank to change the conditions of the loan, and the highest short-term interest rate paid over the past year are examples. The survey also includes questions about the terms of trade credit transactions, such as the change in the payment period, and its effect on a firm's procurement activities. Furthermore, the SFE includes several items on procurement demand, including if a firm intends to increase or decrease its loans outstanding for the following year. Unfortunately, not all of the 2,198 firms in the sample respond to all the questions in the survey, which significantly reduces the total number of observations in the estimations in Section V.

B. Defining the Variables of Interest

Before we estimate the determinants of loans and trade credit, we must first define the variables of interest. Our estimation strategy depends critically on the wide range of qualitative information concerning companies' fund procurement. These variables allow us to specify shocks to credit supply, while simultaneously controlling for a companies' demand for funds.

Consistent with earlier studies,¹⁴ we interpret changes in the lending attitude of financial institutions as exogenous shocks to the banking sector. Here we define exogenous shocks as those uncontrolled by small businesses. In other words, we view any adverse change in the lending environment as a negative shock to the supply of loans. How firms alter their use of trade credit in response to these shocks will allow us to determine whether trade credit buffers firms from adverse shocks to the financial sector.

To measure shocks to the demand for trade credit we use two types of variables. First, to represent shocks to the volume of transactions we use changes in sales and the cost of sales. This reflects the fact that the volume of transactions in goods and services is an important determinant of trade credit. Moreover, for small businesses whose products are often purchased by large-sized firms, the amount of transactions is usually exogenously determined. Thus, as real activity falls, the volume of transactions falls, and subsequently trade credit usage falls. Second, we use changes to the payment period of trade credit to represent shocks to the availability and price of trade credit. A slowdown in economic activity or an accumulation of debt in the corporate sector can result in a breakdown in relations between companies, and lead to a demand for earlier settlement, even without a change in the volume of trade. In this case, the payment period of trade credit becomes shorter, putting more pressure on the firm's financing. Again, the terms of payment are usually determined by large-sized firms and not by purchaser small businesses. Through both of these types of "real activity" shocks, we can examine whether loans are able to absorb the effects of shocks to the real side of the economy.

Below is a full listing of our variables.

1. Dependent Variables

The dependent variables are changes in loans and changes in trade payables outstanding. We differentiate between total loans and short-term loans since the maturity of trade payables is well less than a year, and thus, short-term loans are (possibly) a closer substitute for trade payables.

- *loans*: sum of short-term loans, long-term loans, and bills discounted
- *loans (short)*: short-term loans
- *trade payables*: sum of accounts payable and bills payable

2. Explanatory Variables

There are five categories of explanatory variables.

(1) Loans or trade payables

The first category of exogenous variables simply includes the dependent variables. When loans are the dependent variable, trade payables are included as an explanatory variable, and vice versa. Since these two variables are endogenously determined, however, we need to employ instruments.

- *loans*
- *loans (short)*
- *trade payables*

(2) Instruments for the supply of loans (*iv loans*)

The second category includes instruments for the supply of loans. The response of a firm's main bank to a loan application or a request for a change in the terms of lending is mainly initiated by supply-side factors. When a borrower's loan application is rejected, or when a bank requests stricter loan conditions, it is likely that loan growth slows, which adversely affects the firm's financial situation. Under these circumstances, the firm seeks alternative sources of funding, namely trade credit.

- *reject*: main bank's response to a loan application (1 = rejected or approved for a reduced amount, 0 = approved without reduction or solicited for an increase)
- *request1*: request of main bank (1 = no request, 0 = more than one request)
- *request2*: request of main bank (1 = higher interest rate, 0 = no such request)
- *request3*: request of main bank (1 = additional collateral, 0 = no such request)
- *request4*: request of main bank (1 = additional guarantor, 0 = no such request)
- *request5*: request of main bank (1 = early repayment, 0 = no such request)
- *request6*: request of main bank (1 = larger deposit, 0 = no such request)
- *request7*: request of main bank (1 = terminate the loan contract or renew contract for smaller loans, 0 = no such request)

(3) Instruments for the supply of trade credit (*iv trade payables*)

The third category of variables includes three possible instruments for the supply of trade credit. First are the rates of change in sales. Sales are particularly suitable as an instrument for the supply of trade credit to SMEs. Since many SMEs sell their products to their larger counterparts, including their parent firms, they often have little bargaining power. Hence, in these cases SME sales are determined exogenously, and substantially constrain trade payables.

We also consider the change in the length of the payment period (*paymentsite*) as an instrument. If repayment arrives sooner, the firm will need to obtain funds from other sources. We must note, however, that the shorter payment period may possibly be initiated by the borrower, in which case the change in the payment period does not capture an adverse shock to credit conditions. We account for this possibility by including a dummy variable equaling one if the firm recognizes the change in the payment period as deterioration its credit conditions, and zero otherwise.

- *sales*
- *paymentsite*: [Change in payment terms of trade payables (1 = shorter, 0 = unchanged or longer)] * [dummy for deteriorating procurement conditions if the terms of trade payables become shorter (1 = yes, 0 = no)]

(4) Variables for procurement demand (*demand*)

The fourth category of variables includes measures of the demand for funds. The first three variables capture the demand for capital, both fixed and inventory, and labor. The next two variables measure how much of this demand is met by firms' current cash holdings. The final variable is one of the non-balance sheet items from the SFE. The survey actually asks firms if they plan to change the loan amount.

- *employment*: number of employees
- *inventory*: inventory assets
- *investment*: fixed tangible assets
- *cf*: ratio of cash flow (= business profit + depreciation value) to sales
- *cash*: ratio of cash equivalent and securities to total assets
- *loanplan*: intended change in loans outstanding for the next year (1 = decrease, 2 = unchanged, 3 = increase)

(5) Other variables (*others*)

Other control variables are included in category five. These are firm level variables, which control for the creditworthiness of the firm.

- *rate*: highest short-term interest rate for the previous year
- *score*: change in the credit score

Some sample statistics are presented in Table 1.

Table 1
Basic sample statistics

| | Observations | Mean | Standard deviation | Minimum | Maximum |
|----------------|--------------|-----------|--------------------|----------|----------|
| loans | 1954 | -0.049 | 0.371 | -3.844 | 4.734 |
| loans(short) | 1658 | -0.034 | 0.602 | -8.474 | 4.481 |
| trade payables | 2061 | -0.042 | 0.448 | -2.937 | 4.231 |
| reject | 1656 | 0.088 | 0.283 | 0 | 1 |
| request1 | 2198 | 0.553 | 0.497 | 0 | 1 |
| request2 | 2198 | 0.193 | 0.395 | 0 | 1 |
| request3 | 2198 | 0.043 | 0.202 | 0 | 1 |
| request4 | 2198 | 0.011 | 0.106 | 0 | 1 |
| request5 | 2198 | 0.027 | 0.163 | 0 | 1 |
| request6 | 2198 | 0.010 | 0.100 | 0 | 1 |
| request7 | 2198 | 0.008 | 0.090 | 0 | 1 |
| sales | 2198 | -0.034 | 0.181 | -1.607 | 1.407 |
| costsales | 2177 | -0.034 | 0.224 | -3.218 | 2.199 |
| paymentsite | 2198 | 0.043 | 0.202 | 0 | 1 |
| loanplan | 2109 | 1.600 | 0.568 | 1 | 3 |
| employment | 2156 | -1.489 | 64.050 | -2487 | 1245 |
| inventory | 2198 | -9935.953 | 232451.700 | -4886663 | 4472802 |
| investment | 2198 | -9619.178 | 510787.100 | -3565427 | 16300000 |
| cf | 2198 | 0.052 | 0.678 | -8.902 | 30.112 |
| cash | 2198 | 0.188 | 0.146 | 0 | 0.950 |
| rate | 1720 | 2051.893 | 1036.032 | 0 | 9999 |
| score | 2198 | 57.287 | 7.036 | 25 | 84 |

Note: Balance sheet figures are percent changes (log differences). These are the values used in the empirical analysis. Some firms in the sample do not respond to all the survey questions, which reduces the total number of observations for some variables (from a maximum of 2,198).

V. THE RELATIONSHIP BETWEEN TRADE CREDIT AND LOANS

In Section V-A, we calculate some summary statistics to obtain a general idea about the relationship between trade credit and loans. In Section V-B, we are much more precise about the relationship, and estimate the determinants of trade credit and loans using two-stage least squares (2SLS).

A. Summary Statistics

We begin our investigation of the trade credit-lending relationship with some summary statistics. Our interest is in determining the driving forces behind a firm's short-term financing decision, specifically the choice between bank loans and trade credit. To get an idea of how this decision is influenced by changes in the sources of financing we calculate the growth rate¹³ of the financing variables for each instrumental variable defined in Section IV-B. The use of growth rates allows us to observe the evolution in the credit variables for each instrument.

Table 2 displays the growth rates of loans, short-term loans, and trade payables for each loan supply instrument (*reject* and *request1* through *request7*).

Table 2
Trade payables, loans, and the instruments affecting the supply of loans

Panel (a): Loan application response

| | | loans | loans (short) | trade payables |
|--------|----------------------------------|--------|---------------|----------------|
| reject | Reject (or lesser amount) | -7.77% | -10.69% | -10.10% |
| | Approved (or solicited increase) | -2.95% | -0.10% | -6.06% |

Panel (b): Main bank request

| | | loans | loans (short) | trade payables |
|-----------|--|---------|---------------|----------------|
| request 1 | Request made by main bank | -6.02% | -3.09% | -6.72% |
| | No request | -4.45% | -2.16% | -6.55% |
| request 2 | Request higher interest rate | -6.31% | -3.97% | -6.28% |
| | No request | -4.80% | -2.12% | -6.71% |
| request 3 | Request additional collateral | -4.96% | -7.32% | 0.35% |
| | No request | -5.14% | -2.31% | -6.95% |
| request 4 | Request additional guarantor | -7.18% | -7.72% | -3.51% |
| | No request | -5.10% | -2.50% | -6.67% |
| request 5 | Request early repayment | -9.94% | -19.90% | -0.01% |
| | No request | -4.96% | -1.94% | -6.83% |
| request 6 | Request deposit increase | -0.76% | -5.30% | 2.09% |
| | No request | -5.18% | -2.54% | -6.71% |
| request7 | Request contract termination (or lower amount) | -10.78% | -10.33% | 9.68% |
| | No request | -5.07% | -2.49% | -6.76% |

As would be expected, a more stringent lending attitude by financial institutions leads to a reduction in loan growth. For example, firms whose loan applications are either rejected or approved for an amount less than requested have a 7.77% drop in their loan growth, while those whose loan requests are approved experience only a 2.95% drop in their loan growth. These results are reassuring in that our choice of instruments seems to be significantly correlated with loans and short-term loans. In addition, there is no reason to believe that these variables are endogenously determined with trade credit.

Our results for the growth in trade payables, on the other hand, are mixed. Looking at the main bank's response to a loan application, we find that the growth rates of loans and trade payables move in the same direction. This is evidence of a complementary relationship between loans and trade payables. In contrast, for *request4*, *request5*, and *request7* the growth rate of trade payables moves opposite of the growth rate of loans, which supports the view that loans and trade payables are substitutes.

In Table 3, we examine how the growth rates of loans, short-term loans, and trade payables vary with the instruments for the supply of trade payables (*sales*, *paymentsite*). In panel (a) we divide firms into four quartiles depending on the growth of sales. We then examine differences in the growth rates of loans, short-term loans, and trade payables across these four quartiles. In panel (b), we examine how the terms of payment affect the financing choice.

Table 3

Trade payables, loans, and instruments affecting the supply of trade payables

Panel (a): Sales

| | Growth rate quartiles | loans | loans (short) | trade payables |
|-------|--------------------------|--------|---------------|----------------|
| sales | 1 st quartile | -7.32% | 0.47% | -30.63% |
| | 2 nd quartile | -6.29% | -0.87% | -12.56% |
| | 3 rd quartile | -4.09% | -1.93% | -1.34% |
| | 4 th quartile | -3.53% | -1.34% | 5.80% |

Note: Quartiles are ordered from lowest to highest growth rates.

Panel (b): Terms of trade credit

| | | loans | loans (short) | trade payables |
|-------------|----------------------------------|--------|---------------|----------------|
| paymentsite | Reject (or lesser amount) | -3.81% | -0.12% | -13.20% |
| | Approved (or solicited increase) | -5.22% | -2.23% | -6.01% |

Both a reduction in the volume of transactions, as measured by *sales*, and a shorter payment schedule, as measured by *paymentsite*, reduces the growth rate of trade payables, indicating that these variables are valid instruments for shocks to the supply of trade credit. As we observed with loan growth, however, evidence for the substitutability or complementarity between loans and trade credit is mixed. Loans and trade payables positively commove in response to changes in sales or the cost of sales, implying the two are complements. In contrast, when the terms of payment change, loans and trade payables move counter to one another, suggesting (weak) substitutability.

B. Two-stage Least Squares Estimation

In our estimations, we exploit the panel aspect of the data by (log) differencing across 2002 and 2003 and running a cross-sectional regression. This eliminates the effect of any unobserved variable that is constant across time but differs across firms. This is equivalent to including fixed effects in a panel regression. Additionally, differencing removes any unit root that may be present in any of the series.

As we have made clear in previous sections, jointly estimating the determinants of trade credit and loans is complicated by the strong possibility of endogeneity. Although in using summary statistics we are able to employ instrumental variables to deal with this problem, we are still only able to observe the relationship between two variables at a time, and are not able to control for other variables, such as credit risk or changes in the demand for funds. In addition, there is no way to test the statistical significance of the relationship between trade credit and loans. In order to jointly estimate the relationship between trade credit and loans we implement a two-step least squares estimation. Our system includes the growth of trade credit and the growth of loans as dependent variables. We specify our system as follows:

$$\text{loans}_i = \alpha + \beta \cdot \text{trade payables}_i + \gamma \cdot \text{demand}_i + \delta \cdot \text{others}_i + \varepsilon_i \quad (1)$$

$$\text{trade payables}_i = \mu + \theta \cdot \text{loans}_i + \eta \cdot \text{demand}_i + \nu \cdot \text{others}_i + \xi_i \quad (2)$$

In order to estimate equations (1) and (2), we need instruments for trade payables and loans, respectively. We select our instruments from the *iv trade payables* and *iv loans* category of variables defined in Section IV-B. To estimate equation (1) we employ three different sets of instruments: *sales* only, *paymentsite* only, and both *sales* and *paymentsite*.

Similarly, to estimate equation (2) we employ *reject* only, *request* only, and both *reject* and *request*. We have previously argued about the validity of these instruments in Section IV. In Table 4, panels (a) and (b), we present some correlations between the instruments and trade credit and loans, respectively.

Table 4
Instrument correlations

Panel (a): Trade payables

| | sales | paymentsite | trade payables |
|----------------|-----------------------|-----------------------|----------------|
| sales | 1 | | |
| paymentsite | -0.01110 (0.60140) | 1 | |
| trade payables | 0.29550 (0.00000) | -0.03270 (0.13780) | 1 |

Panel (b): Loans

Note: Probability of correlation values being zero is in parenthesis

| | reject | request1 | request2 | request3 | request4 | request5 | request6 | request7 | loans |
|----------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|-------|
| reject | 1 | | | | | | | | |
| request1 | -0.2316 (0.0000) | 1 | | | | | | | |
| request2 | 0.21200 (0.0000) | -0.5304 (0.0000) | 1 | | | | | | |
| request3 | 0.3223 (0.0000) | -0.2350 (0.0000) | 0.2324 (0.0000) | 1 | | | | | |
| request4 | 0.1640 (0.0000) | -0.1192 (0.0000) | 0.0996 (0.0000) | 0.2318 (0.0000) | 1 | | | | |
| request5 | 0.3324 (0.0000) | -0.1806 (0.0000) | 0.2008 (0.0000) | 0.2130 (0.0000) | 0.1927 (0.0000) | 1 | | | |
| request6 | 0.0831 (0.0007) | -0.1118 (0.0000) | 0.0665 (0.0018) | 0.0691 (0.0012) | 0.0754 (0.0004) | 0.1234 (0.0000) | 1 | | |
| request7 | 0.1804 (0.0000) | -0.1010 (0.0000) | 0.0833 (0.0001) | 0.2053 (0.0000) | 0.0379 (0.0760) | 0.2636 (0.0000) | 0.0416 (0.0513) | 1 | |
| loans | -0.0540 (0.0313) | 0.0375 (0.0978) | -0.0204 (0.3684) | -0.0003 (0.9897) | -0.0227 (0.3167) | -0.0131 (0.5621) | -0.0034 (0.8801) | -0.0120 (0.5964) | 1 |

Table 5
Determinants of trade payables and loans

Panel (a): All instruments

| | Trade Payables | | Loans | |
|----------------|---------------------|---------------------|---------------------|---------------------|
| | 2SLS | OLS | 2SLS | OLS |
| loans | 1.030** (0.513) | -0.047 (0.030) | | |
| sales | 0.467*** (0.103) | 0.619*** (0.055) | | |
| paymentsite | -0.117 (0.073) | -0.088 (0.053) | | |
| trade payables | | | 0.204*** (0.077) | -0.020 (0.020) |
| reject | | | -0.053 (0.039) | -0.084** (0.036) |
| request1 | | | 0.020 (0.029) | 0.019 (0.028) |

| | | | | |
|-------------|--|----------------------|----------------------|----------------------|
| request2 | | | -0.002 (0.032) | -0.006 (0.031) |
| request3 | | | 0.035 (0.047) | 0.069 (0.044) |
| request4 | | | 0.002 (0.082) | -0.002 (0.079) |
| request5 | | | -0.039 (0.057) | -0.017 (0.055) |
| request6 | | | 0.054 (0.099) | 0.082 (0.095) |
| request7 | | | -0.069 (0.101) | -0.091 (0.097) |
| loanplan | -0.057 (0.042) | 0.011 (0.020) | 0.062*** (0.017) | 0.064*** (0.016) |
| employment | 0.000 (0.000) | 0.000 (0.000) | 0.000 (0.000) | 0.000 (0.000) |
| inventory | 0.000 (0.000) | 0.000** (0.000) | 0.000** (0.000) | 0.000*** (0.000) |
| investment | 0.000 (0.000) | 0.000 (0.000) | 0.000*** (0.000) | 0.000*** (0.000) |
| cf | -0.259 (0.284) | -0.659*** (0.158) | -0.283* (0.146) | -0.437*** (0.132) |
| cash | 0.039 (0.126) | 0.005 (0.093) | -0.055 (0.081) | -0.064 (0.078) |
| rate | 0.000 (0.000) | 0.000 (0.000) | 0.000 (0.000) | 0.000 (0.000) |
| score | 0.019** (0.010) | 0.004 (0.005) | -0.015*** (0.004) | -0.011*** (0.004) |
| constant | 0.067 (0.075) | -0.032 (0.043) | -0.101** (0.046) | -0.107** (0.044) |
| NOB | 1635 | 1635 | 1635 | 1635 |
| F-statistic | 9.42 | 16.50 | 7.34 | 7.52 |
| Prob > F | 0.000 | 0.000 | 0.000 | 0.000 |
| Instruments | reject request1 request2 request3 request4 request5 request6 request7 | | sales paymentsite | |

Note: Standard errors in parentheses. ***, **, and * indicates significance at the 1%, 5%, and 10% levels (two-sided), respectively.

We find significant correlations between *trade payables* and *sales*, *loans* and *reject*, and *loans* and *request1*. In order to avoid possible endogeneity across instruments, we implement regressions with a limited set of variables. In Table 5, we display the two-stage estimation results for trade payables and loans. In panel (a) we display the results when all available instruments are employed. For comparison, we also include the OLS estimates.

Our main concern is with the sign of the coefficient on *loans*, in the trade payables equation, and the sign of the *trade payables* coefficient in the loans equation. In panel (a) we see that both coefficients are significantly positive in the 2SLS estimation, which contrasts with the negative, but insignificant coefficients in the OLS estimation. An exogenous increase (decrease) in the growth rate of loans results in an increase (decrease) in the growth rate of trade payables. It is also true that an exogenous increase (decrease) in the growth rate of trade payables results in an increase (decrease) in the growth rate of loans. A quantitative comparison of the coefficients indicates that the effect of exogenous loan shocks on trade payables is larger than that of exogenous trade credit shocks on loans. A 1% (exogenous) increase in loan growth increases trade payables growth by 1.03%. In contrast, a 1% exogenous increase in trade payables growth increases loan growth by only 0.20%.

In panel (b), we display the results when we limit the set of instrumental variables.

Table 5
Determinants of trade payables and loans

Panel (b): Robustness

| | Instruments: reject, sales | | Instruments: request, paymentsite | |
|----------------|----------------------------|---------------------|-----------------------------------|---------------------|
| | Trade Payables | Loans | Trade payables | Loans |
| loans | 1.029 (0.703) | | 0.683 (0.526) | |
| sales | 0.469*** (0.123) | | | |
| paymentsite | | | -0.142** (0.062) | |
| trade payables | | 0.224*** (0.078) | | 0.230 (0.349) |
| reject | | -0.060* (0.036) | | |
| request1 | | | | 0.026 (0.028) |
| request2 | | | | -0.021 (0.032) |
| request3 | | | | 0.080 (0.064) |
| request4 | | | | 0.001 (0.085) |
| request5 | | | | -0.020 (0.062) |
| request6 | | | | 0.116 (0.017) |
| request7 | | | | -0.145 (0.116) |
| loanplan | -0.058 (0.052) | 0.062*** (0.017) | -0.045 (0.044) | 0.074*** (0.017) |
| employment | 0.000 (0.000) | 0.000 (0.000) | 0.000 (0.000) | 0.000 (0.000) |

| | | | | |
|-------------|-------------------|----------------------|--|----------------------|
| inventory | 0.000 (0.000) | 0.000** (0.000) | 0.000 (0.000) | 0.000** (0.000) |
| investment | 0.000 (0.000) | 0.000*** (0.000) | 0.000 (0.000) | 0.000*** (0.000) |
| cf | -0.238 (0.338) | -0.262* (0.148) | -0.164 (0.371) | -0.769*** (0.230) |
| cash | 0.050 (0.127) | -0.054 (0.081) | -0.048 (0.106) | -0.005 (0.080) |
| rate | 0.000 (0.000) | 0.000 (0.000) | 0.000 (0.000) | 0.000 (0.000) |
| score | 0.018 (0.012) | -0.015*** (0.004) | 0.021*** (0.007) | -0.006 (0.006) |
| constant | 0.065 (0.087) | -0.085** (0.038) | 0.055 (0.080) | -0.143*** (0.046) |
| NOB | 1635 | 1635 | 1812 | 1812 |
| F-statistic | 10.02 | 12.06 | 3.53 | 5.5 |
| Prob > F | 0.000 | 0.000 | 0.0001 | 0.000 |
| Instruments | reject | sales | request1 request2 request3 request4 request5 request6 request7 | paymentsite |

Note: Standard errors in parentheses. ***, **, and * indicates significance at the 1%, 5%, and 10% levels (two-sided), respectively.

When we employ only *sales* and *reject* as instruments (columns 2 and 3 of panel (b)) we obtain similar results as to what we find in panel (a). Note, however, that the coefficient on *loans* in the trade payables equation is insignificant. When *request* and *paymentsite* (columns 4 and 5 of panel (b)) are the only included instruments we obtain positive, but insignificant results for both loans and trade credit. This is presumably caused by the inefficiency of the instruments.¹⁵ At the very least, however, the loan coefficient (in the trade payables equation) and the trade payables coefficient (in the loans equation) are positive across all three specifications, which is consistent with the idea that Japanese SMEs treat these instruments as complements, rather than substitutes.

Table 6 displays the results when loans are replaced by short-term loans. In contrast to loans and trade payables, short-term loans and trade payables are of similar maturity, and are therefore more likely to be substitutes. However, for almost all combinations of instruments, the estimated coefficients on *loans (short)* and *trade payables* are insignificant. While this clearly differs from Table 5, in that there is no evidence that short-term loans and trade credit are complements, there is also no support for the idea that the two are substitutes. At best, there is no evidence of a relationship between short-term loans and trade payables.

These results reinforce the idea that trade payables and loans are complements. This stands in stark contrast with much of the existing literature, which has emphasized

the substitutability between these two instruments. The majority of these studies have focused on the financing behavior of U.S. firms. While not all of the literature is supportive of the substitutability between trade credit and loans, researchers have generally not argued that they are complements. Studies that have focused on Japan, however, have found some suggestive evidence that trade credit and loans are complements. Our investigation provides much stronger evidence of this fact. We not only find that trade credit and loans positively commove in response to loan shocks, which is what previous studies have found, but also that trade credit and loans positively commove in response to trade credit shocks, which has not been previously documented.

Table 6
Determinants of trade payables and short-term loans

Panel (a): All instruments

| | Trade Payables | | Short-term loans | |
|----------------|---------------------|---------------------|----------------------|----------------------|
| | 2SLS | OLS | 2SLS | OLS |
| loans (short) | 0.158 (0.182) | -0.031 (0.020) | | |
| sales | 0.584*** (0.060) | 0.588*** (0.058) | | |
| paymentsite | -0.102* (0.057) | -0.105* (0.056) | | |
| trade payables | | | -0.002 (0.129) | -0.056 (0.034) |
| reject | | | -0.202*** (0.063) | -0.210*** (0.060) |
| request1 | | | -0.021 (0.049) | -0.020 (0.049) |
| request2 | | | -0.046 (0.052) | -0.046 (0.052) |
| request3 | | | 0.034 (0.076) | 0.043 (0.072) |
| request4 | | | 0.108 (0.130) | 0.104 (0.129) |
| request5 | | | -0.141 (0.092) | -0.136 (0.092) |
| request6 | | | -0.016 (0.159) | -0.008 (0.157) |
| request7 | | | 0.042 (0.158) | 0.035 (0.157) |
| loanplan | -0.017 (0.023) | -0.007 (0.021) | 0.051* (0.028) | 0.050* (0.028) |
| employment | 0.000 (0.000) | 0.000 (0.000) | 0.000 (0.000) | 0.000 (0.000) |
| inventory | 0.000** (0.000) | 0.000*** (0.000) | 0.000*** (0.000) | 0.000*** (0.000) |
| investment | 0.000 (0.000) | 0.000 (0.000) | 0.000* (0.000) | 0.000** (0.000) |

| | | | | |
|-------------|--|----------------------|----------------------|---------------------|
| cf | -0.628*** (0.165) | -0.647*** (0.159) | -0.202 (0.230) | -0.238 (0.214) |
| cash | 0.061 (0.108) | 0.038 (0.102) | -0.196 (0.137) | -0.196 (0.137) |
| rate | 0.000 (0.000) | 0.000 (0.000) | 0.000 (0.000) | 0.000 (0.000) |
| score | 0.005 (0.006) | 0.003 (0.005) | -0.014** (0.007) | -0.013** (0.006) |
| constant | 0.007 (0.048) | -0.005 (0.045) | -0.042 (0.073) | -0.043 (0.073) |
| NOB | 1441 | 1441 | 1441 | 1441 |
| F-statistic | 13.15 | 14.13 | 2.6 | 2.76 |
| Prob > F | 0.000 | 0.000 | 0.0004 | 0.0001 |
| Instruments | reject request1 request2 request3 request4 request5 request6 request7 | | sales paymentsite | |

Panel (b): Robustness

| | Instruments: <i>reject, sales</i> | | Instruments: <i>request, paymentsite</i> | |
|-----------------------|-----------------------------------|----------------------|--|---------------------|
| | Trade Payables | Short-term Loans | Trade payables | Short-term Loans |
| <i>loans (short)</i> | 0.401* (0.232) | | -0.456 (0.321) | |
| <i>sales</i> | 0.581** (0.067) | | | |
| <i>paymentsite</i> | | | -0.141** (0.062) | |
| <i>trade payables</i> | | 0.014 (0.132) | | -0.136 (0.463) |
| <i>reject</i> | | -0.210*** (0.058) | | |
| <i>request1</i> | | | | 0.031 (0.046) |
| <i>request2</i> | | | | -0.010 (0.048) |
| <i>request3</i> | | | | 0.011 (0.097) |
| <i>request4</i> | | | | 0.101 (0.135) |
| <i>request5</i> | | | | -0.167* (0.096) |
| <i>request6</i> | | | | 0.018 (0.168) |
| <i>request7</i> | | | | -0.045 (0.175) |
| <i>loanplan</i> | -0.029 (0.027) | 0.052* (0.027) | -0.023 (0.032) | 0.065** (0.027) |

| | | | | |
|-------------------|-------------------|---------------------|---|----------------------|
| <i>employment</i> | 0.000 (0.000) | 0.000 (0.000) | 0.000 (0.000) | 0.000 (0.000) |
| <i>inventory</i> | 0.000 (0.000) | 0.000*** (0.000) | 0.000*** (0.000) | 0.000** (0.000) |
| <i>investment</i> | 0.000 (0.000) | 0.000** (0.000) | 0.000 (0.000) | 0.000 (0.000) |
| <i>cf</i> | -0.586 (0.185) | -0.185 (0.231) | -0.778*** (0.202) | -0.453*** (0.328) |
| <i>cash</i> | 0.098 (0.121) | -0.189 (0.137) | -0.075 (0.122) | -0.151 (0.130) |
| <i>rate</i> | 0.000 (0.000) | 0.000 (0.000) | 0.000 (0.000) | 0.000 (0.000) |
| <i>score</i> | 0.008 (0.006) | -0.014** (0.007) | 0.010* (0.006) | -0.008 (0.010) |
| <i>constant</i> | 0.020 (0.054) | -0.066 (0.059) | -0.049 (0.058) | -0.111 (0.070) |
| NOB | 1441 | 1635 | 1579 | 1579 |
| F-statistic | 11.51 | 12.06 | 3.77 | 2.06 |
| Prob > F | 0.000 | 0.000 | 0.000 | 0.0081 |
| Instruments | <i>reject</i> | <i>sales</i> | <i>request1</i> <i>request2</i> <i>request3</i> <i>request4</i> <i>request5</i> <i>request6</i> <i>request7</i> | <i>paymentsite</i> |

Note: Standard errors in parentheses. ***, **, and * indicates significance at the 1%, 5%, and 10% levels (two-sided), respectively.

VI. INTERPRETATION OF RESULTS

The fact that loans and trade credit are complements has strong implications for the Japanese economy. If it is true that trade credit and loans positively commove, a shock in one market (the loan market or the trade credit market) is amplified by the other. Thus, small businesses in Japan face strong borrowing constraints. This may have been a cause of the severe credit crunch in Japan in the late 1990s.

The question is, to avoid a similar situation in the future, what measures must be taken? There are two possibilities. The first is to rely on flexible borrowing from financial institutions. Loan terms, including interest rates, and loan amounts are much more flexible than the terms on trade credit, which is mainly determined by commodity transactions. Hence, loans are much more capable of dampening adverse economic shocks than trade credit. Note, however, that an increase in liquidity in financial markets must be met with proper measures to prevent, or lessen, the possibility of moral hazard.

The second possibility is trade credit insurance. Trade credit insurance is offered by private insurance companies, and though the market is still rather small, we have recently seen an increase in the use of insured trade credit. We should expect that as the

market grows, it will serve to alleviate the volatility in the trade credit market. In either case, it is necessary that developments in both the market for loans and the market for trade credit be watched closely in order to assure that the procurement system for SMEs stabilizes, rather than amplifies, the impact of adverse economic shocks.

VII. CONCLUSION

In this paper, we examine the relationship between loans, mainly extended by financial institutions, and trade credit. While previous studies have only investigated how shocks in the financial sector, such as monetary contractions or credit crunches, impact trade credit, we additionally investigate how trade credit shocks affect financial sector lending. Our findings are not consistent with the substitutability between loans and trade payables. In fact, we find that when loan (trade payables) growth significantly decreases, trade payables (loan) growth significantly decreases. Our findings are consistent, however, with a few empirical studies of Japanese firms, particularly Ogawa (2003). He finds that a decrease in loans extended to small businesses is not offset by an increase in trade credit.

It is important to note that our sample covers a period in which the Japanese banking sector was heavily burdened by non-performing loans, which clearly influences our results. Researchers, however, have not reached any consensus as to whether banks extended more loans, or less, in response to the non-performing loans problem. One possible consequence is that banks engaged in forbearance lending in order to avoid the realization of loan losses. Another possibility is that banks were more reluctant to provide additional loans. Hence, even though the situation of the banking sector affects our empirical results, it is unclear, as to which direction the bias would run.

Though the data used for analysis is limited to the early 2000s, the complementary relationship between trade credit and loans may have been characteristic of the Japanese economy for a long period. Uesugi and Yamashiro (2006) document that Japan's general trading companies, which provide a large amount of trade credit to their related small firms, have changed their behavior over time. They show that since the 1980s trading company finance has positively comoved with credit market shocks, rather than accommodating them.

Our results also shed some light on whether financial institutions in Japan lessen the impact of real shocks. The question is one of accommodation (forbearance lending) or withdrawal (credit crunch). We find that real shocks, through trade credit, are not necessarily absorbed by the extension of loans by financial institutions. Because we find that SMEs with similar credit risk have difficulties in obtaining loans when faced with a reduction in trade credit, our results lend more support to credit crunches rather than forbearance lending by banks. SMEs are, in many cases, bank-dependent and limited in their access to other sources of funds, such as corporate bonds, or IPOs. Hence, adverse shocks, be they real or financial, amplify the adverse effect on SME financing.

ENDNOTES

1. Source: Ministry of Finance's *Financial Statements Statistics of Corporations*.

2. The ratio of total loans to assets was 37.1%.
3. This discussion is based on Petersen and Rajan (1997), Schwartz (1974), Ferris (1981), and Ono (2001).
4. This justifies the use of trade credit by financially constrained firms.
5. This benefit enables both creditworthy (unconstrained) *and* (financially) constrained firms to take advantage of trade credit.
6. The payment amount may be discounted for cash settlements compared to handling them as accounts payable. Petersen and Rajan (1997) develop a model based on the presumption that the ratio of purchases on credit will be decided by factors on the supplier's side, since purchasers will always want to buy on credit.
7. In the United States, some trade payables are discounted if they are settled prior to the settlement date. For example, "2/10 net 30" means that there will be a 2% discount if the trade credit is settled within the first 10 days, and if the payment is made later, it is to be made within 30 days. See Ng, Smith, and Smith (1999) for details on the trade credit situation by industry.
8. See Brennan, Maksimovic and Zechner (1988).
9. See Ferris (1981).
10. The survey is jointly conducted by the U.S. Small Business Administration and the Federal Reserve Board every five years
11. This assertion is based on interviews with various *Shosha* and government officials.
12. Practitioners often refer to trade credit as "a shelter for a credit-constrained firm."
13. For instance, the White papers on SMEs, issued by the Small and Medium Enterprise Agency (SMEA) of Japan, constantly refer to the "fact" that SMEs are credit constrained. In the 2002 issue, for example, the SMEA reports that about 20% of small businesses with no more than 20 employees were either declined, or were required to reduce their borrowing requests filed at financial institutions, which is one of many symptoms of financial market frictions. Other practices documented by the SMEA include higher interest payments, additional collateral or personal guarantees, and shorter payment periods.
14. See Ono (2001) and Ogawa (2003).
15. Correlations between *loans* and *request* are between 0.01 and 0.04 in absolute values, which are significantly lower than that between *loans* and *reject*. The correlation between *trade payables* and *paymentsite* is -0.04, while the correlation between *trade payables* and *sales* is 0.27.

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