

Bank Information Monopoly and Trade Credit: Does Only Bank Have Information? - Evidence from Panel Data of Small Businesses in Japan - *

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Abstract

According to previous studies, a bank can set a higher interest rate for small firms by establishing a lending relationship with them since information asymmetry limits competition between banks. In this paper, we examine whether small firms can use trade credit if the bank sets a higher interest rate in order to acquire monopoly rent from borrowers. Using panel data of small firms in Japan, our analysis shows that when the interest rate the bank sets is worsened for the borrower, the ratio of trade payables increases and the bank loses its amount of loans. This result implies that if the bank raises the interest rate, the borrower can use credit from other non-financial firms. Hence, the problem of bank information monopolies is not very serious.

JEL classification : G21; G32; D82

Keywords : Small business; Bank; Trade credit; Lending relationship; Monopoly

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1 Introduction

Due to a problem of information asymmetry between a borrower and its creditor, small firms have had trouble accessing to the capital market. Therefore loans from financial intermediations are important sources of financing for small firms. In recent years, large numbers of empirical studies have focused on the long-term relationship between a borrower and a bank. Previous studies argue that establishing a long-term relationship between the bank and the borrower mitigates the problem of information asymmetry. Petersen and Rajan (1994), for example, find that a closer relationship with the bank increases the credit availability for financing. Berger and Udell (1995) find that borrowers with longer banking relationships are less likely to pledge collateral.

However, previous works also point out that there is a dark side to the lending relationship. Sharpe (1990) and Rajan (1992) show if only one bank has information of the borrower, competition between banks does not work, and therefore the informed bank extracts a rent from the borrower. Borrowers cannot borrow from an uninformed bank because of the problem of information asymmetry, so they face a hold-up problem. Since the informed bank can extract rent, the borrower (particularly, for the good quality firms) is discouraged to invest. To avoid a hold-up problem, the borrower makes relationships with multiple banks (Detragiache , Garella, and Guiso (2000)). When there are two or more informed banks, competition between banks erases the monopoly rent. However, previous studies do not show how the small firm that has a relationship with only one bank mitigates the hold-up problem. This paper focuses on trade credit and tests whether or not the existence of informed non-financial firms mitigates the problem of bank information monopolies.

We examine the following questions: 1) What kind of firms use trade credit more frequently? 2) Can the informed bank set a higher interest rate to extract rent from a firm? Can the borrower extend trade credit from other non-financial firms when the bank sets a higher interest rate? Using large panel data of small firms in Japan, our analysis shows the following results. First, we

find that a firm that possesses less collateral assets uses a larger amount of trade credit. Banks do not offer credit to firms that do not possess real estate because they cannot liquidate easily other assets excluding real estate if firms default. On the other hand, suppliers can liquidate current assets at low cost because they have a network to sell these assets (Frank and Maksimovic (1998)). Second, when the interest rate the bank sets is worsened for the borrower, the ratio of trade payables increases. This result does not change if we use the ratio of notes payable as the dependent variable and regress by 2SLS with fixed effects to mitigate the problems of unobserved errors and simultaneity. These results do not support the story of information monopolies. If the informed bank raises the interest rate to extract a rent, the borrower can use trade credit since there are many non-financial firms that have information about its creditworthiness and offer trade credit. Even if a firm has a relationship with only one bank, it is not correct that the hold-up problem must be serious.

These results indicate that trade credit is one of important financial sources for small businesses. In recent years, large numbers of empirical studies have investigated the function of trade credit (For example, Petersen and Rajan (1997), McMillan and Woodruff (1999), Ng, Smith, and Smith (1999) , Fisman and Love (2003)). An explosion of papers argues that borrowers use more trade credit when credit from banks is unavailable because of the problem of information asymmetry. This paper has a close relation to previous works that investigated a function of trade credit.

We use Credit Risk Database (CRD) which is large panel data of small businesses. The dataset contains a firm's balance sheet (B/S) data and profit & loss (P/L) data from 1997 to 2001. The number of samples is over 70,000 firms. The National Survey of Small Business Finance (NSSBF) which is one of datasets for small businesses in the US contains a large number of variables, but it is not panel data. The determinant of trade payables is not so simple and many factors affect the amount of trade credit. We cannot obtain all variables that affect the determinant of trade payables (for example, the characteristics of the firm's owner, the firm's management policy, the characteristics of the supplier's owner and so on). By using panel data,

we can mitigate unobserved errors and the endogeneity problem.

This paper is organized as follows. In Section 2, we review the theoretical and empirical literature on long-term relationships with banks and trade credit. In Section 3, we discuss when the problem of cost of relationship is serious, and then we present the hypothesis. We describe our dataset in Section 4 and we discuss empirical results in Section 5. Section 6 concludes the paper.

2 Previous Works

2.1 Benefit or Cost? - Debate on the Lending Relationship

Many previous studies have investigated the effect of the long-term relationship between a bank and small firms. Using the National Survey of Small Business Finance (NSSBF) in the US, Petersen and Rajan (1994) show that small firms that have been with their banks for a long time have a greater access to bank loans. Similarly, Berger and Udell (1995) show that borrowers with longer banking relationships pay a lower interest rate and are less likely to pledge collateral. According to these results, Petersen and Rajan (1994) and Berger and Udell (1995) extract conclusions that the lending relationships with banks are valuable for the borrowers to mitigate the problems of adverse selection and moral hazard¹.

On the other hand, some previous studies show the existence of a problem of information monopolies that is pointed out by Sharpe (1990) and Rajan (1992). In their two period models, a bank that makes a loan to a borrower in period 1 acquires more accurate information about characteristics of the borrower. Since banks that do not make a loan to the borrower in period 1 cannot mitigate the problem of asymmetric information in period 2, the informed bank acquires an information monopoly over the borrower. Therefore, the informed bank can set a higher interest rate over the competitive level to extract monopoly rent. The borrower has less incentive to borrow from the informed bank since the informed bank sets a high interest rate in period 2.

Using small business data, Angelini, Di Salvo, and Ferri (1998) and Degryse and Van Cay-

¹See also Boot (2000) and Gorton and Winton (2002) for useful surveys of relationship lending.

seele (2000) show that borrowers with longer banking relationships pay a higher interest rate. Similarly, in D'Auria, Foglia, and Reedtz (1999), a borrower with higher dependence on bank loans pays a higher interest rate. In addition to these studies, Houston and James (1996) and Weinstein and Yafeh (1998) point out the existence of information monopolies and the cost of lending relationships using the sample of stock listed firms². These studies conclude that the problem of information monopolies is serious for borrowers.

However, some recent studies find that the borrower has relationships with multiple banks to avoid extraction of the rent from the banks. Therefore, the problem of an information monopoly might not be serious. For example, Detragiache , Garella, and Guiso (2000)³ show that the borrower establishes multiple relationships with banks to reduce the likelihood of early liquidation⁴.

2.2 Empirical Studies on Trade Credit

Trade credit is one of the sources of external finance for small firms. Many previous studies, for example Schwartz (1974) , Ferris (1981) , Biais and Gollier (1997), and Frank and Maksimovic (1998), analyze theoretically the function of trade credit. According to their analyses, suppliers of trade credit have some advantages over the traditional lender. Petersen and Rajan (1997) point out that they have three advantages over banks; 1) Advantage in information acquisition, 2) Advantage in controlling the buyer, and 3) Advantage in salvaging value from existing assets.

In recent years, a large number of empirical studies has investigated the function of trade credit. Using the NSSBF, Petersen and Rajan (1997) argue that when credit from banks is unavailable, borrowers use more trade credit, and firms that can easily access to a bond market offer trade credit to small firms. McMillan and Woodruff (1999) investigate the case of Vietnam. They provide the evidence that a longer duration of trading relationships is associated with larger

²The story of Japanese main banks is not one of examples for relationship banking. See Miwa and Ramseyer (2003).

³See also Ongena and Smith (2000) and Farinha and Santos (2002) for empirical studies about multiple banking relationships.

⁴Rajan (1992) argues that if there are multiple informed banks, the Bertrand competition with informed banks occurs and extracting the rent is impossible.

credit. Using the aggregate data of the *Quarterly Report on Financial Statements of Incorporated Business* and *Short-Term Economic Survey of Enterprises* in Japan, Ono (2001) finds that when the lending attitude of banks is strict, the ratio of trade payables to trade receivables increases. Fisman and Love (2003) show that industries with higher dependence on trade credit exhibit a higher rate of growth in countries with weaker financial institutions.

3 When is the problem of information monopolies serious?

3.1 What kind of information does a bank acquire ?

In previous papers, a bank that has a long-term relationship with its borrower acquires the information of the borrower's characteristics. What kind of information does the bank acquire over time? Is it difficult to acquire the information of the borrower's characteristics for non-informed banks? Berger and Udell (2002) and Berger, et al. (2002) argue that the informed bank acquires the soft information of borrowers⁵. Soft information is defined as information that is difficult to quantify and verify (for example, the information of character and reliability of the firm's owner). Thus, banks can acquire soft information of borrowers over time, which can not be transferred from or to other firms. For small business lending, soft information is important to identify the quality of borrowers (Berger and Udell (2002)).

It is difficult for *de novo* banks to acquire soft information, as they cannot lend to new customers because of the problem of information asymmetry. Thus, as Sharpe (1990) and Rajan (1992) argue, if the borrower has a relationship with only one bank, the informed bank acquires an information monopoly over the borrower⁶. However, the number of firms that have a relationship with only one bank is not high. Table 1 shows that the ratio of firms that have a relationship with only one bank is less than 20%. According to Table 1, smaller firms might face the problem of information monopolies more frequently.

⁵Berger and Udell (2002) and Berger, et al. (2002) describe that agency problems between a loan officer and a bank must be solved for small business lending. This paper does not discuss agency problems.

⁶However, if informed banks form a cartel, they can extract rent from the borrower.

3.2 Can only banks offer credit?

Sharpe (1990) and Rajan (1992) assume implicitly that only banks offer credit for borrowers. However, non-financial firms, such as suppliers, also can offer credit. Therefore, even if the borrower has a relationship with only one bank, the problem of information monopolies may not be serious. As Smith (1987) and Petersen and Rajan (1997) have stated, suppliers of trade credit can acquire the information of characteristics of buyers because suppliers also has a long-term relationship with the buyers⁷. If buyers default, suppliers lose their sales and must revise their business strategy, so suppliers have incentive to acquire the information of buyers' creditworthiness.

3.3 Trade credit in Japan

In Japan, it is common that suppliers offer trade credit for buyers. Typically, buyers stretch their cash payment to next month (for example, the end of month). In the day of payoff, the buyers can pay by notes, so buyers can stretch their payment by more than one month if suppliers accept. According to Smith (1987) and Ng, Smith, and Smith (1999), the price of trade credit is higher than the loan rate from banks in the US, since suppliers offer the "2-10 net 30" contract⁸. In Japan, credit terms of trade credit are not obvious. However, it is not common that the price of trade credit is higher than the loan rate from banks.

Figure 1 shows the amount of trade credit and bank loans for small business. Before the Bubble Economy, the ratio of trade payables was larger than the ratio of bank loans. In the 90's, the ratio of trade payables was still not low, about 15%⁹. According to this figure, many suppliers of goods might offer trade credit. Thus, the provision of credit between firms might mitigate the problem of information monopolies.

⁷Biais and Gollier (1997) and Wilner (2000) also analyse a theoretical relationship between the long-term relationship and the price of trade credit.

⁸"2-10" means that if buyers pay within ten days, suppliers make a 2% discount on buyers' payment. "net 30" means "full payment is due 30 days after the invoice date; after that date, the buyer is in default" (Ng, Smith, and Smith (1999), p.1110)

⁹It is a puzzle that the amount of trade credit has decreased dramatically since 1980.

3.4 Hypothesis

In this paper, we investigate the following questions.

- What types of firms use trade credit more frequently?
- Can a borrower extend trade credit from other firms when the bank sets a higher interest rate?

What types of firms use trade credit more frequently?

A large number of papers argues that suppliers of trade credit have an advantage in salvaging value from existing asset (Schwartz (1974), Emery (1984) , Petersen and Rajan (1997)). If the borrower defaults, suppliers of trade credit can seize the goods that are supplied, so they can offer credit to firms that do not possess enough tangible assets (Frank and Maksimovic (1998)). Moreover, larger firms use more trade credit to save the cost of paying bills.

Bank information monopoly and trade credit

The informed bank acquires an information monopoly over the borrower, if the borrower cannot use trade credit from non-financial firms even when the interest rate the bank sets is worsened for the borrower. We test whether the borrower can extend trade credit or not if the interest rate the bank sets is worsened, using the sample of small firms that might have a relationship with only one or few banks.

4 Dataset

4.1 Credit Risk Database (CRD)

The data in this study are obtained from the Credit Risk Information Database for Small and Medium Enterprises (CRD). This database was established by Credit Guarantee Corporations and some financial institutions under the guidance of the Small Medium Enterprise Agency (SMEA) in Japan. This database is managed by the CRD Management Council¹⁰. It targets

¹⁰See <http://www.crd.ne.jp/> (in Japanese) for more information about the CRD .

firms defined as the “Small and Medium Enterprises” under the Small and Medium Enterprise Basic Law in Japan¹¹. The dataset in this study includes only corporations that existed from 1997 to 2001 in CRD. Since we omitted financial and agricultural small businesses, the data collected from Credit Guarantee Corporations, and firms whose capital stock is over 3,000 million yen, we use 76,102 firms in this study.

The dataset includes information of a firm’s balance sheet and profit & loss statement, but it does not contain information about length of or numbers of relationships with banks, which is present in the NSSBF conducted by the Board of Governor of the Federal Reserve System and the U.S. Small Business Administration (SBA). This dataset is reliable since it is collected by financial institutions, not by question sheets.

In Table 2, we compare some variables in our dataset with *Financial Statements Statistics of Corporations* by the Ministry of Finance, which is one of the reliable databases of firms in Japan. The average of sales and assets in our dataset is larger than that in the above, and leverage and the interest rate are not different between each datasets. This table implies that our dataset is not biased.

4.2 The ratio of trade credit and total loans

Table 3 shows the ratio of trade payables and total loans to firm’s total debts. In each panel, we compare the ratio of trade payables and total loans by scale, firm age, and industries. Panel A shows the average ratio when firms are grouped by sales. In this panel, the ratio of trade payables in the smallest group of firms is the lowest in the sample. According to Ferris (1981), one purpose of using trade credit is reducing the transaction cost of paying bills. Thus, larger

¹¹According to *White Paper on Small and Medium Enterprises* in Japan, “Under the Small and Medium Enterprise Basic Law, the term “small and medium enterprises”(SMEs) refers in general to enterprises with capital stock not in excess of 300 million yen or 300 or fewer regular employees, and sole proprietorships with 300 or fewer employees. However, SMEs in the wholesaling industry are defined as enterprises with capital stock not in excess of 100 million yen or 100 or fewer employees, SMEs in the retailing industry are defined as enterprises with capital stock not in excess of 50 million yen or a workforce of 50 or fewer, and SMEs in the service industry are defined as enterprises with capital stock not in excess of 50 million yen or a workforce of 100 or fewer. Small enterprises are defined as enterprises with 20 or fewer employees. In the commercial and service industries, however, they are defined as enterprises with five employees or fewer.”

firms use more trade credit.

However, the determinants of trade payables are not only due to saving the cost of cash payment. If firms offer credit to save the cost of cash payment, the distribution of the ratio of trade payables must be constant for same type of firms. In Figure 2, we show the distribution of the trade payables ratio for wholesales trade firms whose sales are less than 100 million yen. According to Figure 2, the distribution of the ratio has a wide range¹². Therefore, the purpose of using trade credit is not only a measure to save the cost of paying bills, but also a financial motive.

The youngest firms rely less heavily on trade credit (Table 3, Panel B). However, the youngest firms are generally small, so that they do have less incentive to save transaction cost of paying cash and use trade credit¹³. Table 3, Panel C compares each ratio by type of industries. The ratios of trade payables in Real estate and Restaurant are lower than in other industries. Panel C shows that the ratio of trade payables is different due to the characteristics of industries.

Table 4 shows the number of firms divided into the annual change in trade payables ratio. According to Table 4, the number of firms that increased trade payables by more than 5% is 2,524 in 2000-2001. On the other hand, the number of firms that decreased trade payables ratio by more than 5% is 2,514 in 2000-2001. This table implies that the amount of trade payables is not fixed over time.

¹²This result does not depend on the sample selection. We can observe the result if the sample is divided by each industries and scales.

¹³As McMillan and Woodruff (1999) have stated, a longer duration of trading relationship is associated with larger trade credit. Table 3, Panel B is consistent with McMillan and Woodruff (1999)'s results.

5 Empirical Analysis

5.1 The Determinant of Trade Credit

5.1.1 Estimation

In this section, we estimate what types of firms use trade credit more frequently. To investigate this question, we estimate the following regression:

$$\begin{aligned} \text{The determinants of trade payables ratio} \\ = f(\text{Firm characteristics, Firm performance,} \\ \text{Credit terms with banks, Individual fixed dummies}) + \epsilon_i \end{aligned}$$

We include three proxies of the Firm's characteristics: Scale, Firm age, and Demand for short term credit. As we argued, one purpose of using trade credit is reducing the transaction cost of paying bills. In general, larger firms purchase more goods than smaller firms. Since large firms have incentive to reduce the transaction cost of paying bills, they may use more trade credit. Firm age is the proxy of the length of relationship with their suppliers. Longer relationships with their suppliers mitigate information asymmetry between firms and their suppliers, so older firms may use more trade credit. Generally speaking, firms finance short term funds with trade credit. Thus, firms that demands short terms credit may use more trade credit.

Proxies of Firm performances are ROA and Sales growth¹⁴. Firms that are growing more quickly have more business opportunities, so they need a lot of funds and use more trade credit. Firms that make more profit use less trade credit since they have more internal cash.

Proxies of Credit terms with banks are the tangible asset ratio and the interest rate. As discussed in a previous section, suppliers have an advantage in salvaging value from existing assets. Therefore, suppliers offer credit to firms that have less collateral assets. We also predict that firms with a higher interest rate use more trade credit.

¹⁴Previous papers (for example, Smith (1987), Petersen and Rajan (1997)) argue that suppliers have an information advantage over banks, and therefore suppliers can offer credit to riskier firms.

5.1.2 Variables

Dependent Variable

Trade payables-debt ratio The ratio of a firm's trade payables (which is defined as accounts payable plus notes payable) to total debts.

Trade payables-asset ratio The ratio of a firm's trade payables to total assets.

Firm Characteristics Variables

Scale $\text{Log}(1+\text{sales})^{15}$.

Firm age $\text{Log}(1+\text{firm age})$.

Demand for short term credit The ratio of current assets excluding cash to total assets.

Performance

ROA The ratio of the sum of a firm's operating income, interest receivables, and dividend to total asset for each year.

Sales growth The annual growth rate of a firm's sales ($\Delta\text{sales}/\text{total assets}$).

Credit Terms with Banks

Tangible asset ratio The ratio of a firm's tangible asset (which is the sum of book value of buildings and land) to total debts.

Interest rate The ratio of a firm's interest expenses to the sum of its short-term debt, long-term debt, and discounted notes receivable, minus the prime rate¹⁶ (in percentages).

¹⁵We add one because our dataset includes firms whose sales or firm age are zero.

¹⁶We do not have the data on the prime rate in each bank. Hence, we obtained the short-term prime rate at the end of March from *Financial and Economics Statistics Monthly* issued by the Bank of Japan.

5.1.3 Results

In Table 6, we use the ratio of a firm's trade payables to its total assets (in columns (1)-(3)) and the ratio of a firm's trade payables to its total debts (in columns (4)-(6)) as dependent variables. In columns (1) and (4), the full sample is included and in columns (2) and (5), only small firms (whose sales are less than 100 million yen in 1997) are included¹⁷. In columns (3) and (6), we limit the sample to only manufacturers. We estimate fixed effects models to deal with the problem of unobserved errors. A summary of the data is reported in Table 5.

Firm Characteristics

The coefficient of scale is positive and statistically significant at 1% level. Firm age does not have a positive effect for the ratio of trade credit as we expected. The reason is that firm age is also a proxy of length of relationships with banks. Many previous studies show that having a longer relationship with banks increases the provision of bank loans. Therefore, the sign of firm age is negative. The coefficient of demand for short-term credit is positive and statistically significant at 1% level, as we expected. These results do not change if the sample is limited to small firms and manufacturers (in columns (2)-(3)) or if the dependent variables are changed to the ratio of trade payables to total debts (in column (4)-(6)).

Firm Performance

The coefficients of sales growth are positive and statistically significant as we predicted. If the sample is limited to small firms or manufacturers, the signs of coefficients are still positive (in columns (2) and (3)), which is consistent with what we argued. ROA has a negative effect and is statistically significant as we expected.

Credit Terms with Banks

¹⁷The median number of workers for small firms whose sales are less than 100 million yen in 1997 is 4 workers in this data set.

In order to investigate the effect of collateral assets, we regress the ratio of a firm's tangible assets to total assets. The coefficient of the tangible asset ratio is negative and statistically significant. The results do not change if we change the dependent variable to the ratio of trade payables to total debts (in columns (4)-(6)). Thus, these results show that firms that possess less collateral assets use more trade credit than those with more collateral assets. Our finding is consistent with the results of previous papers (for example, Cunat (2002)). However, many small firms pledge their owner's real estates as a collateral. Because of lack of data, we cannot investigate the effect of owner's assets. The coefficient of the interest rate is positive and statistically significant. This result shows that the higher the interest rate is, the higher the ratio of trade payables is.

5.2 Testing for information monopolies

As we discussed in an earlier section, Sharpe (1990) and Rajan (1992) argue that an informed bank can set a higher interest rate for borrowers since uninformed banks cannot offer loans because of a lack of information. In this subsection, we focus on the informed non-financial firm, such as borrower's suppliers, and investigate whether the problem of information monopolies is serious for small firms.

5.2.1 Sample

Rajan (1992) and Detragiache, Garella, and Guiso (2000) have claimed that the problem of an information monopoly is serious when a borrower has a long-term relationship with only one bank. In our dataset, the number of relationships with banks is not included. However, SMEA (2002) shows that smaller firms have a less number of relationships with banks (Table 1). In this estimation, the sample is limited to small firms whose sales are less than 100 million yen in 1997¹⁸.

¹⁸Results do not change if we do not limit the sample to small firms whose sales are less than 100 million yen.

5.2.2 Estimation

To investigate whether the problem of information monopolies is serious, we estimate the following regression:

$$\begin{aligned} \text{The annual change in trade payables ratio} \\ = f(\text{Firm characteristics, Firm performance,} \\ \text{Credit terms with the bank, Individual fixed dummies}) + \epsilon_i \end{aligned}$$

In this regression, we focus on variables of credit terms with banks that include an increase in the interest rate. If only one bank has information of the borrower's creditworthiness, it can set a higher interest rate. Even if the interest rate is high, a borrower cannot be financed from non-financial firms when the problem of information monopolies occurs. Therefore, coefficients of the increase in the interest rate must be significantly close to zero if the problem of information monopolies occurs.

Other variables are control variables. Suppliers do not offer trade credit for firms that likely will go into default. Thus, the lower a firm's performance is, the lower the annual change in trade credit is. As we argued, the amount of collateral assets that a firm possesses affects the amount of trade credit. We use the annual change in a firm's tangible asset ratio as a proxy of a firm's collateral assets.

5.2.3 Variables

Dependent variables

Trade payables-asset ratio difference The ratio of a firm's trade payables to total assets in year t+1, less that ratio in year t.

Trade payables-debt ratio difference The ratio of a firm's trade payables to total debt in year t+1, less that ratio in year t.

Firm characteristics variables

Scale $\text{Log}(1+\text{sales})$.

Short-term credit demand difference A firm's demand for short term credit (the ratio of current assets excluding cash to total assets) in year $t+1$, less that ratio in year t .

Performance

ROA difference A firm's ROA in year $t+1$, less that ratio in year t .

Sales growth The annual growth rate of a firm's sales ($\Delta\text{sales}/\text{total assets}$).

Credit Terms with the Bank

Tangible asset ratio difference A firm's tangible asset ratio in year $t+1$, less that ratio in year t .

Interest rate difference A firm's interest rate in year $t+1$, less that in year t .

5.2.4 Results

Table 8 presents the estimates of regressions. In columns (3)-(4) and columns (7)-(8), the sample is limited to manufacturers. Table 7 reports the summary statistics of variables.

To investigate whether the interest rate affects the ratio of trade payables, we regress the annual change in the ratio of trade payables to assets (in columns (1)-(4)) or total debts (in columns (5)-(8)). We regress OLS models and fixed effects models to deal with unobserved effects. The coefficients of the interest rate difference are positive and statistically significant at 1% level (in columns (1)-(2)). These results do not change if the sample is limited (columns (3)-(4)) or if we use the Trade payables-debt ratio difference as the dependent variable (columns (5)-(8)). According to these results, if an informed bank sets a higher interest rate, a borrower will increase trade credit, which is another method of finance. Hence, even if only one bank has

information of creditworthiness of a borrower, the informed bank cannot extract full information rents.

The sign of other variables are consistent with what we argued. Suppliers offer more trade credit for less risky firms. Firms with a decreasing ratio of tangible assets to total debts use more trade credit.

The level of coefficients

The above interpretation, however, can be considered weak since the coefficients of the interest rate difference are tiny. In column (1) of Table 8, the coefficient of the interest rate difference is 0.0029. The problem of tiny coefficients is largely due to the endogeneity problem. In the case that suppliers can increase the amount of trade payables, banks have incentive to set a lower interest rate to keep their amount of loans. Thus, the trade payables difference might influence the level of interest rate difference. To mitigate this problem, we estimate using 2SLS regressions.

In Table 9, we present the estimates of 2SLS regression. We use the quick assets ratio difference¹⁹ and the square of the quick asset ratio difference as instrument variables due to the following reason. A lower quick assets ratio implies that borrowers might have less assets for immediate repayment of their loans. Generally, banks can offer a high interest rate easily if a firm's quick asset ratio is low because other non-informed banks cannot make a loan to the borrower. On the other hand, the borrower whose quick asset ratio is low does not have incentive to switch to trade credit from bank loans.

The coefficients of the interest rate difference increase to 0.1702 and are still statistically significant at 1% level (in column (1)). However, J statistics are significant at 5% level, so the estimation in column (1) does not satisfy the orthogonal condition. To satisfy the orthogonal condition, we regress fixed effects models in column (2). We obtain the result that the coefficients of the interest rate difference is large and still statistically significant at 1% level. These results

¹⁹The quick asset ratio difference is defined as the ratio of current asset minus inventories to current liability in year $t+1$ less that ratio in year t .

are similar if we limit the sample (in columns (3)-(4)) or change the dependent variable to the trade payables-debts ratio difference (columns (5)-(8)). According to these results, the coefficient of the interest rate is not too small.

The price of trade credit

As we mentioned in a previous section, credit terms of trade credit are not obvious in Japan. However, an implicit interest rate of paying by notes might not be higher. One reason is that suppliers can liquidate notes at banks. If default risk of the buyer is low, the cost of receiving notes for the supplier is not high since they can easily liquidate notes at banks. Another reason is that the information about unpaid notes is made public by clearinghouse if buyers default on notes payable. Since all banks stop the transaction with firms that defaults notes payable, this punishment of default is the equivalent of business failure (Matsumura and Ryser (1995)). Buyers have more incentive to pay off their notes because of the punishment system, so the risk of receiving notes is not so high for suppliers. In columns (1) and (2) of Table 10, we use the ratio of notes payable to total assets as the dependent variable. The coefficients of the interest rate difference are still positive and statistically significant at 1% level and the level of coefficients is not so tiny if we regress by 2SLS. These results support the hypothesis that trade credit from suppliers mitigate the problem of information monopolies.

6 Conclusion

In this paper, we investigate the function of trade credit for small firms. We show whether or not the problem of information monopolies is serious for small firms. By using panel data of small businesses in Japan, we find the following results. First, we find that firms that have less collateral assets have higher trade payables. This result does not change if we limit the sample to manufacturers. In general, small firms that have less collateral assets cannot easily borrow from banks and they face the problem of credit rationing. Since suppliers can easily liquidate the borrower's current assets if borrowers default (for example, the borrower's inventories), small

firms that have less collateral assets can use trade credit from suppliers.

Second we find that if the bank sets a higher interest rate, the firm increases the trade payables, which is another method of financing. Previous papers argue that the problem of information monopolies is serious for the small firm that has relationship with only one bank. Our result implies that trade credit mitigates the problem of information monopolies. Since suppliers have information about firm's creditworthiness, small firms can use trade credit even when bank loans are not available. Thus, it is hard for banks to acquire an information monopoly and full monopoly rent.

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Table 1: Number of Banks used by Enterprises in Japan, by Number of Employees (%)

No. of employees	1	2	3	4~5	6~10	11~
~ 20	18.6	27.8	23.9	20.2	8.1	1.3
21 ~ 100	10.6	17.7	20.5	29.6	17.8	3.8
101 ~ 300	5.7	8.2	10.4	30.7	35.8	9.1
301 ~	3.6	4.3	4.5	19.0	34.1	34.6

Source: SMEA (2002) *White Paper on Small and Medium Enterprises in Japan*

Figure 1: The ratio of trade payables and bank loans to total assets, by time series data (For firms whose capital stock is over 10 million yen and less than 100 million yen)



Source: MOF *Quarterly Report on Financial Statements of Incorporated Business*

Table 2: Comparison with *Financial Statements Statistics of Corporations*

(Million yen)	FSSC	CRD
Total Sales	72.958	174.196
Total Assets	48.625	150.738
Leverage	0.920	0.928
Trade Payables/Total Assets	0.101	0.077
Interest Rate	0.021	0.023

Note : The sample is limited for firms whose capital stock is less than 10 million yen. Interest Rate is defined as the ratio of a firm's interest expenses to the sum of its short-term debt, long-term debt, and discounted notes receivable.

Figure 2: The ratio of trade payables to assets, by each percentile
(For firms whose sales are less than 100 million yen and belongs to Wholesales trade)

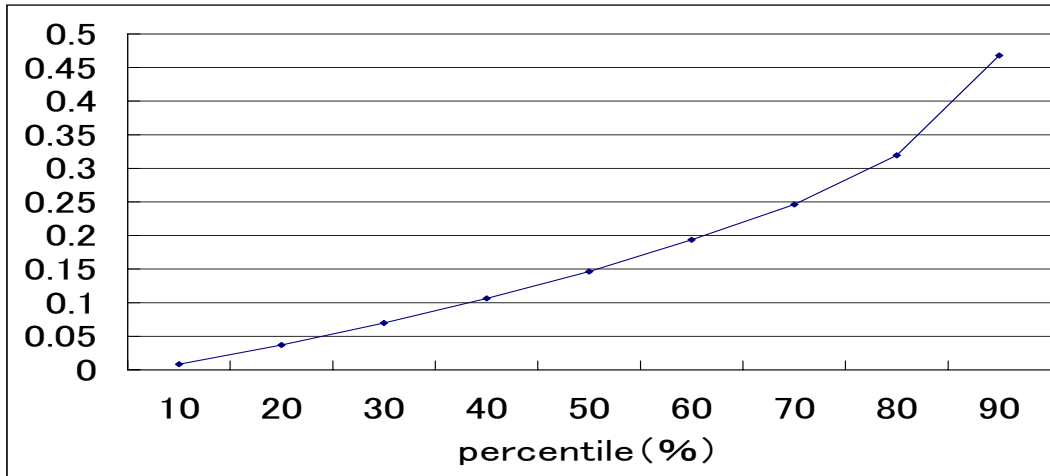


Table 3: The ratio of total loans and trade payables to total debts

Panel A: Compared by Scale			
Level of total sales (1 million yen)	Trade payables	Loan	Numbers of firms
less than 1,000	0.0785	0.7540	23,393
1,000-3,000	0.1476	0.7019	19,157
3,000-10,000	0.1978	0.6600	16,772
Over 10,000	0.2629	0.6027	16,780
total	0.1629	0.6868	76,102

Panel B: Compared by Firm Age			
Year of establishment	Trade payables	Loan	Numbers of firms
1991-	0.1404	0.6830	10,938
1981-1990	0.1407	0.6977	19,837
1971-1980	0.1636	0.6873	17,149
1951-1970	0.1815	0.6847	22,426
-1950	0.2071	0.6632	5,752
total	0.1629	0.6868	76,102

Panel C: Compared by Industry			
Name of Industries	Trade payables	Loan	Numbers of firms
Mining	0.1663	0.6702	106
Construction	0.1610	0.6572	15,160
Manufacturing	0.1747	0.6917	20,048
Electricity and Gas	0.1633	0.6453	354
Transportation and Communication	0.1054	0.6901	4,092
Wholesales trade	0.3058	0.6077	10,852
Retail trade	0.1823	0.6998	8,808
Restaurant	0.0529	0.7832	1,696
Real estate	0.0182	0.7875	4,516
Service	0.0809	0.7325	10,470
total	0.1629	0.6868	76,102

Note : “Trade payables” is defined as the ratio of accounts payable plus notes payable to total debts. “Loans” is defined as the ratio of long-term loans plus short-term loans to debts.

Table 4: The annual change in trade payables ratio
(for firms whose sales are less than 100 million yen)

year	ntp	less than -0.1	-0.1/-0.05	-0.05/-0.01	-0.01/0	0/0.01	0.01/0.05	0.05/0.1	over 0.1	Total
97-98	obs	1,565	1,601	3,549	2,409	7,833	2,357	958	890	21,162
	%	7.40	7.57	16.77	11.38	37.01	11.14	4.53	4.21	100.00
98-99	obs	1,626	1,736	3,785	2,578	8,380	2,625	984	876	22,590
	%	7.20	7.68	16.76	11.41	37.10	11.62	4.36	3.88	100.00
99-00	obs	1,034	1,267	3,333	2,690	8,788	3,294	1,335	1,176	22,917
	%	4.51	5.53	14.54	11.74	38.35	14.37	5.83	5.13	100.00
00-01	obs	1,155	1,369	3,491	2,852	8,907	3,105	1,331	1,183	23,393
	%	4.94	5.85	14.92	12.19	38.08	13.27	5.69	5.06	100.00
Total	obs	5,380	5,973	14,158	10,529	33,908	11,381	4,608	4,125	90,062
	%	5.97	6.63	15.72	11.69	37.65	12.64	5.12	4.58	100.00

Note : $ntp = (\text{trade payables}/\text{total assets})_{t+1} - (\text{trade payables}/\text{total assets})_t$. x/y means that over x and less than y .

Table 5: Summary Statistics

A . All Sample								
	Obs	Mean	Std.Dev.	Min	1%	50%	99%	Max
<u>Dependent Variable</u>								
Trade payables-asset ratio	304,678	0.146	0.173	0.000	0.000	0.094	0.694	15.970
Trade payables-debt ratio	304,672	0.167	0.181	0.000	0.000	0.109	0.754	1.000
<u>Firm Characteristics Variables</u>								
Log(1+sales)	304,678	12.502	1.681	0.000	9.076	12.372	16.360	19.466
Log(1+age)	299,685	2.931	0.783	0.000	0.693	3.091	4.190	4.868
Current asset ratio	304,678	0.379	0.226	-1.347	0.002	0.364	0.903	2.276
<u>Performance</u>								
ROA	304,678	0.786	265.246	-250.519	-1.683	-0.030	1.804	130,901.000
Sales growth	304,678	-0.006	0.485	-220.753	-0.520	0.015	0.253	22.895
<u>Credit Terms with Banks</u>								
Interest rate	302,501	1.641	78.175	-1.625	-1.375	1.143	7.599	41,510.500
Tangible asset-debt ratio	302,549	0.326	1.317	-6.682	0.000	0.225	1.427	644.252
Default	304,678	0.043	0.202	0.000	0.000	0.000	1.000	1.000
B . Sales <100 Million Yen								
	Obs	Mean	Std.Dev.	Min	1%	50%	99%	Max
<u>Dependent Variable</u>								
Trade payables-asset ratio	81,741	0.087	0.171	0.000	0.000	0.027	0.648	15.970
Trade payables-debt ratio	81,735	0.082	0.128	0.000	0.000	0.027	0.598	1.000
<u>Firm Characteristics Variables</u>								
Log(1+sales)	81,741	10.639	0.958	0.000	8.215	10.758	12.415	17.869
Log(1+age)	80,126	2.550	0.836	0.000	0.693	2.565	4.159	4.868
Current asset ratio	81,741	0.351	0.255	-0.220	0.000	0.321	0.927	2.276
<u>Performance</u>								
ROA	81,741	2.974	511.684	-15.681	-2.026	-0.020	2.889	130,901.000
Sales growth	81,741	-0.038	0.470	-82.500	-0.868	0.007	0.391	22.895
<u>Credit Terms with Banks</u>								
Interest rate	81,040	1.472	27.949	-1.625	-1.466	1.030	9.372	7,609.151
Tangible asset-debt ratio	81,372	0.291	2.433	-6.682	0.000	0.077	1.550	644.252
Default	81,741	0.037	0.189	0.000	0.000	0.000	1.000	1.000

Table 6: Determinants of Trade Credit

dependent variable	Trade payables-asset ratio			Trade payables-debt ratio		
	(1)	(2)	(3)	(4)	(5)	(6)
Sample	All	Small	Manuf	All	Small	Manuf
Models	Fixed effects	Fixed effects	Fixed effects	Fixed effects	Fixed effects	Fixed effects
Scale	0.0160*** (0.0004)	0.0076*** (0.0005)	0.0238*** (0.0007)	0.0243*** (0.0003)	0.0116*** (0.0004)	0.0417*** (0.0007)
Firm age	0.0025 (0.0031)	-0.0027 (0.0055)	0.0066 (0.0048)	0.0007 (0.0028)	0.0008 (0.0045)	-0.0009 (0.0049)
Demand for short term credit	0.1153*** (0.0016)	0.0891*** (0.0025)	0.1439*** (0.0031)	0.1432*** (0.0015)	0.1034*** (0.0023)	0.1967*** (0.0031)
Sales growth	0.0187*** (0.0003)	0.0144*** (0.0004)	0.0295*** (0.0006)			
ROA	-0.0342*** (0.0014)	-0.0241*** (0.0017)	-0.0509*** (0.0026)			
Interest rate	0.0058*** (0.0001)	0.0037*** (0.0002)	0.0047*** (0.0003)	0.0081*** (0.0001)	0.0051*** (0.0002)	0.0069*** (0.0003)
Tangible asset-debt ratio	-0.0443*** (0.0014)	-0.0228*** (0.0027)	-0.0450*** (0.0024)	-0.0270*** (0.0014)	-0.0082*** (0.0024)	-0.0215*** (0.0025)
Year dummies	yes	yes	yes	yes	yes	yes
Number of observations	277,477	69,462	69,462	290,049	77,607	77,756
R^2	0.0986	0.0638	0.1594	0.0898	0.0729	0.1694

Note: Standard errors are in parentheses. We use the panel data from 1998 to 2001 in columns (1)-(3) and the panel data from 1997 to 2001 in columns (4)-(6). When variables include outliers, they are truncated at their 0.5th percentiles or 99.5th percentiles of the sample. This result does not change if we truncate at their 1st percentiles or 99th percentiles of the sample.

***Significant at 1% level.

**Significant at 5% level.

*Significant at 10% level.

Table 7: Summary Statistics

	Obs	Mean	Std.Dev.	Min	1%	50%	99%	Max
<u>Dependent Variable</u>								
Trade payables-asset ratio difference	81,770	-0.002	0.142	-17.453	-0.259	0.000	0.260	13.274
Trade payables-debt ratio difference	81,749	-0.006	0.080	-1.000	-0.281	0.000	0.238	0.991
<u>Firm Characteristics Variables</u>								
Log(1+sales)	81,770	10.648	0.964	0.000	8.151	10.797	12.168	17.869
Short-term credit demand difference	81,770	-0.002	0.120	-1.043	-0.379	0.000	0.359	1.189
<u>Performance</u>								
Sales growth	81,770	2.975	511.593	-15.681	-2.025	-0.019	2.903	130,901.000
ROA difference	81,770	-0.010	2.080	-576.356	-0.764	-0.002	0.809	25.763
<u>Credit Terms with Banks</u>								
Interest rate difference	80,462	-0.128	37.068	-7,604.75	-6.033	-0.022	4.880	6,693.868
Tangible asset-debt ratio	81,385	-0.003	2.238	-614.221	-0.299	0.000	0.475	47.411

Table 8: Trade credit and the Interest Rate

Dependent variable	Trade payables-asset ratio difference			
	(1)	(2)	(3)	(4)
Sample	Small	Small	Manuf	Manuf
Models	OLS	Fixed effects	OLS	Fixed effects
Interest rate difference	0.0029*** (0.0002)	0.0030*** (0.0002)	0.0024*** (0.0004)	0.0024*** (0.0004)
Scale	-0.0023*** (0.0002)	-0.0042*** (0.0006)	-0.0032*** (0.0006)	-0.0106*** (0.0016)
Short-term credit demand difference	0.0849*** (0.0030)	0.0842*** (0.0023)	0.0997*** (0.0063)	0.0970 (0.0050)
Sales growth	0.0155*** (0.0007)	0.0174*** (0.0006)	0.0209*** (0.0018)	0.0228*** (0.0013)
ROA difference	-0.0221*** (0.0017)	-0.0253*** (0.0014)	-0.0278*** (0.0033)	-0.0348*** (0.0028)
Tangible asset ratio difference	-0.0286*** (0.0025)	-0.0317*** (0.0035)	-0.0395*** (0.0061)	-0.0438*** (0.0078)
Industrial dummies	yes	-	no	-
Year dummies	yes	yes	yes	yes
Number of observations	76,779	76,779	17,814	17,814
R^2	0.0545	0.0577	0.0734	0.0826

Dependent variable	Trade payables-debt ratio difference			
	(5)	(6)	(7)	(8)
Sample	Small	Small	Manuf	Manuf
Models	OLS	Fixed effects	OLS	Fixed effects
Interest rate difference	0.0048*** (0.0003)	0.0051*** (0.0002)	0.0040*** (0.0006)	0.0041*** (0.0004)
Scale	-0.0024*** (0.0003)	-0.0026*** (0.0007)	-0.0035*** (0.0006)	-0.0070*** (0.0018)
Short-term credit demand difference	0.1085*** (0.0039)	0.1104*** (0.0027)	0.1143*** (0.0080)	0.1128 (0.0057)
Sales growth	0.0219*** (0.0009)	0.0246*** (0.0006)	0.0285*** (0.0021)	0.0313*** (0.0014)
ROA difference	0.0007 (0.0018)	-0.0026 (0.0017)	-0.0083** (0.0035)	-0.0130*** (0.0032)
Tangible asset ratio difference	-0.0161*** (0.0039)	-0.0211*** (0.0041)	-0.0246*** (0.0090)	-0.0322*** (0.0089)
Industrial dummies	yes	-	no	-
Year dummies	yes	yes	yes	yes
Number of observations	77,368	77,368	17,901	17,901
R^2	0.0783	0.0805	0.0978	0.1043

Note: Robust standard errors are in parentheses. Each regression includes 10 industrial dummies that are recorded in CRD dataset. When variables include outliers, they are truncated at their 0.5th percentiles or 99.5th percentiles of the sample. This result does not change if we truncate at their 1st percentiles or 99th percentiles of the sample. We use the difference of quick asset ratio and the square of the difference of quick asset ratio as instrument variables of Interest rate difference.

*** Significant at 1% level.

** Significant at 5% level.

* Significant at 10% level.

Table 9: Trade credit and the Interest Rate (2SLS regression)

Dependent variable	Trade payables-asset ratio difference			
	(1)	(2)	(3)	(4)
Sample	Small	Small	Manuf	Manuf
Models	2SLS	2SLS with FE	2SLS	2SLS with FE
Interest rate difference	0.1434*** (0.0230)	0.1454*** (0.0483)	0.1321*** (0.0272)	0.1376*** (0.0399)
Scale	-0.0012 (0.0008)	-0.0056** (0.0023)	-0.0057*** (0.0017)	-0.0105** (0.0053)
Short-term credit demand difference	0.0879*** (0.0086)	0.0822*** (0.0202)	0.0734*** (0.0159)	0.0803*** (0.0169)
Sales growth	-0.0139*** (0.0052)	-0.0138 (0.0126)	-0.0068 (0.0069)	-0.0079 (0.0101)
ROA difference	-0.0710*** (0.0092)	-0.0841*** (0.0214)	-0.0846*** (0.0147)	-0.0853*** (0.0171)
Tangible asset ratio difference	-0.1515*** (0.0230)	-0.1897*** (0.0599)	-0.2141*** (0.0429)	-0.2017*** (0.0527)
Industrial dummies	yes	-	no	-
Year dummies	yes	yes	yes	yes
F-test for 1st stage	93.88***	123.4***	48.73***	35.56***
J statistics	4.691**	2.061	0.005	0.009
Number of observations	75,810	75,810	17,666	17,666

Dependent variable	Trade payables-debt ratio difference			
	(5)	(6)	(7)	(8)
Sample	Small	Small	Manuf	Manuf
Models	2SLS	2SLS with FE	2SLS	2SLS with FE
Interest rate difference	0.1702*** (0.0269)	0.1593*** (0.0230)	0.1540*** (0.0509)	0.1567*** (0.0449)
Scale	-0.0010 (0.0009)	0.0066*** (0.0025)	-0.0058** (0.0024)	-0.0053 (0.0060)
Short-term credit demand difference	0.1141*** (0.0102)	0.1196*** (0.0080)	0.0983*** (0.0212)	0.0933*** (0.0188)
Sales growth	-0.0121** (0.0060)	-0.0020 (0.0044)	-0.0055 (0.0127)	0.0004 (0.0105)
ROA difference	-0.0565*** (0.0108)	-0.0559*** (0.0093)	-0.0683*** (0.0233)	-0.0715*** (0.0199)
Tangible asset ratio difference	-0.1566*** (0.0266)	-0.1662*** (0.0248)	-0.1791*** (0.0623)	-0.2066*** (0.0585)
Industrial dummies	yes	-	no	-
Year dummies	yes	yes	yes	yes
F-test for 1st stage	92.65***	122.59***	46.52***	33.95***
J statistics	3.044*	2.137	0.005	0.050
Number of observations	76,395	76,395	17,752	17,752

Note: Robust standard errors are in parentheses. Each regression includes 10 industrial dummies that are recorded in CRD dataset. When variables include outliers, they are truncated at their 0.5th percentiles or 99.5th percentiles of the sample. This result does not change if we truncate at their 1st percentiles or 99th percentiles of the sample. We use the difference of quick asset ratio, the square of the difference of quick asset ratio as instrument variables of Interest rate difference.

***Significant at 1% level.

**Significant at 5% level.

*Significant at 10% level.

Table 10: Interest rate and Trade Credit
(Using the notes payable ratio difference as the dependent variable.)

Dependent variable	Notes payable-asset ratio difference			
	(1)	(2)	(3)	(4)
Sample	Small	Small	Small	Small
Models	OLS	2SLS	Fixed effects	2SLS with FE
Interest rate difference	0.0010*** (0.0001)	0.0282*** (0.0047)	0.0009*** (0.0001)	0.0240*** (0.0045)
Scale	-0.0004*** (0.0001)	-0.0002 (0.0002)	-0.0011*** (0.0002)	0.0002 (0.0005)
Short-term credit demand difference	0.0037*** (0.0010)	0.0046 (0.0019)	0.0030*** (0.0010)	0.0045*** (0.0016)
Sales growth	0.0029*** (0.0002)	-0.0027*** (0.0010)	0.0031*** (0.0002)	-0.0008 (0.0009)
ROA difference	-0.0026*** (0.0006)	-0.0122*** (0.0020)	-0.0034*** (0.0006)	-0.0115*** (0.0018)
Tangible asset ratio difference	-0.0085*** (0.0010)	-0.0322*** (0.0047)	-0.0091*** (0.0015)	-0.0316*** (0.0049)
Industrial dummies	yes	-	yes	-
Year dummies	yes	yes	yes	yes
F-test for 1st stage	-	93.28***	-	123.3***
J statistics	-	1.074	-	0.061
Number of observations	76,679	75,707	76,679	75,707
R^2	0.0097	-	0.0099	-

Note: Robust standard errors are in parentheses. Each regression includes 10 industrial dummies that are recorded in CRD dataset. When variables include outliers, they are truncated at their 0.5th percentiles or 99.5th percentiles of the sample. This result does not change if we truncate at their 1st percentiles or 99th percentiles of the sample. We use the difference of quick asset ratio and the square of the difference of quick asset ratio, and cash asset ratio difference as instrument variables of Interest rate difference.

***Significant at 1% level.

**Significant at 5% level.

*Significant at 10% level.