RIETI Discussion Paper Series 07-E-043

Credit Contagion and Trade Credit Supply: Evidence from Small Business Data in Japan

TSURUTA Daisuke
National Graduate Institute for Policy Studies and CRD Association

RIETI
Research Institute of Economy, Trade & Industry, IAA

The Research Institute of Economy, Trade and Industry
http://www.rieti.go.jp/en/

RIETI Discussion Paper Series 07-E-043

Credit Contagion and Trade Credit Supply: Evidence from Small Business Data in Japan*

Daisuke Tsuruta+

National Graduate Institute for Policy Studies
and
CRD Association

May 2007

Abstract

In this paper, using microdata in Japan, we investigate whether credit contagion decreases trade credit supply for small businesses. In 1997-98 the Japanese economy experienced a large recession, and the number of dishonored bills and the number of bankruptcy filings caused by the domino effect increased. During a period of credit contagion, if firms possess higher financial claims than other firms, the possibility of default becomes higher. Therefore, if the problem of credit contagion is serious during such a period, suppliers withdraw trade credit from customers with higher trade receivables. They might also withdraw more trade credit from customers even though the credit risk of the customers is low. We find that during a recession, suppliers reduce trade credit more for small businesses with higher trade receivables. Additionally, in the manufacturing trade, credit is reduced for both risky and non-risky small firms. This effect in other industries, however, is weak.

---

* The author is a researcher at the CRD Association (CRD: Credit Risk Database). CRD data was used with permission from the CRD Association. The views expressed in this paper do not necessarily reflect those of the CRD Association. I would like to thank the seminar participants at the Industrial and Financial Structure Workshop at RIETI, the 2006 JEA Annual Meeting at Osaka City University, and the policy modeling workshop at GRIPS for many helpful comments. All remaining errors are mine.

+ Address.: 7-22-1 Roppongi, Minato-ku, Tokyo, 106-8677, Japan.; Tel.: +81-3-6439-6187.;
Fax: +81-3-6439-6187.; E-mail address: tsuruta@grips.ac.jp

1 Introduction

Using microdata, we investigate whether credit contagion decreases trade credit supply for small businesses. Many papers focus on the effects of financial contagion on economic activity. According to Kaufman (1994), contagion is "the spillover of effects of shocks from one or more firms to others" (p. 123) and the problem of contagion is likely to occur in banking industries. For example, Calomiris and Mason (1997) analyze whether solvent banks failed during the Chicago bank panic in 1932 as the result of confusion about a bank's credit risk by depositors. Allen and Gale (2000) theoretically analyze liquidity shocks and financial contagion to banks. However, both banks and non-financial firms act as intermediaries in the provision of credit. As Kiyotaki and Moore (1997a) and Kiyotaki and Moore (2002) argue, non-financial firms form links by giving trade credit to one another. Non-financial firms are also "financial institutions" because they take credit from suppliers and offer credit to their customers. If a firm suffers from an unanticipated liquidity shock and defaults, the effect of the shock spreads to the firms that have financial claims on the defaulting firm. Additionally, the effects of the unanticipated liquidity shock spread to many other firms by a similar process.

Despite many papers examining the effects of bank runs, there are few papers that focus on the relationship between financial contagion and trade credit linkages.[1] Empirical studies about trade credit contagion do not focus adequately on this relationship. As stated by Chen (2004) and Miwa and Ramseyer (2005), trade creditors are unsecured creditors, which are different from secured bank lenders. Therefore, if the unanticipated liquidity shock spreads to many firms and they default because of financial contagion, trade creditors suffer large losses. According to Kiyotaki and Moore (1997a), the possibility of default is higher during a period of credit contagion if firms possess higher financial claims against other firms. Suppliers can observe which customers possess higher trade receivables, so suppliers withdraw trade credit from these

[1] See Petersen and Rajan (1997), Fisman and Love (2003), and Burkart et al. (2005) for detailed discussions about trade credit. See also Ono (2001), Uesugi and Yamashiro (2006), and Tsuruta (2006) for detailed discussion about trade credit in Japan.

customers if the problem of credit contagion becomes serious. In addition, if trade creditors have difficulty anticipating which firms will default because of contagion, they withdraw credit from their customers even though firm-specific risk is low.

In this paper, using microdata during the Japanese recession of 1997–98, we investigate whether credit contagion decreases trade credit supply for small businesses. In this period, the growth rate of the GDP in Japan dropped to around -1.8% (in 1998) and the Japanese economy experienced a large recession. Moreover, the number of bills not honored and bankruptcy filings caused by the domino effect rose during the recession. Therefore, the problem of credit contagion was considered to be serious during this period. If many firms are worried about trade credit linkages among firms and the default of customers because of credit contagion, suppliers will withdraw trade credit from customers with higher trade receivables in order to avoid large losses. In addition, suppliers refuse to offer trade credit to customers even though the credit risk of the customers is low.

We use the Credit Risk Database (CRD), which is a large panel database of small businesses in Japan. The dataset contains the balance sheet data and profit and loss data of 100,691 small businesses during the 1997–98 recession, so this database is suitable for our analysis. Using the CRD, our analysis shows the following results. First, trade payables decreased during the recession of 1997–98, especially for manufacturers and wholesalers. Second, the decline in trade payables was higher if trade debtors had many financial claims from their customers during the recession. This result strongly supports the possibility that credit contagion reduces trade credit supply. Third, trade credit supply was reduced for both risky and non-risky small manufacturing firms whereas these effects were weak for other industries.

This paper is organized as follows. In Section 2, we review the theoretical and empirical literature on credit contagion. In Section 3, we show what happened during 1997–98 using macrodata and small business data. We describe our dataset and discuss the empirical results in Section 4. Section 5 concludes the paper.

2 Previous Papers

2.1 Theoretical and Empirical Analysis of Credit Runs

There are many theoretical and empirical studies about bank runs. Diamond and Dybig (1983) and Chen (1999) develop theoretical models of depositors and examine how the problem of bank runs occurs. Many empirical papers, for example, Calomiris and Mason (1997), Schumacher (2000), Peria et al. (2001), and Calomiris and Mason (2003), test the theory of bank runs. Calomiris and Mason (1997) use data from the Chicago bank panic of June 1932. They compare the *ex ante* characteristics of panic failures and panic survivors and show that the panic did not produce significant social costs in terms of failures among solvent banks. Schumacher (2000) examines the case of Argentina during the 1994–95 "Tequila Crisis." He shows that the weak banks were most likely to lose deposits and fail during the crisis, despite Argentina having no deposit insurance system. Using a unique dataset from India, Iyer and Peydro-Alcalde (2006) investigate whether a bank's position in the interbank market affects its level of depositor runs. They show that the level of exposure to the failed bank is an important determinant of depositor runs. On the other hand, Kiyotaki and Moore (1997a) and Kiyotaki and Moore (2002) focus on trade credit. Their models show that in the case of liquidity shocks, trade credit relationships between firms may promote credit contagion and many firms fail to default because of the spread of the contagion. Also, Franks and Sussman (2005) and Tsuruta and Xu (2007) investigate credit runs using a sample of bankrupt firms.

2.2 Financial Shocks and Trade Credit

Although many previous studies investigate the effects of macrofinancial shocks, they focus on the relationship between financial shocks and the supply of bank credit.[2] For example, Hahm and Mishkin (2000) research the Korean case. They find that during financial crises, banks reduce their loans not only for risky firms, but also for safe firms. According to Motonishi and Yoshikawa (1999), a credit crunch occurred in the Japanese economy after 1997 and Japanese banks reduced the credit supply to small businesses. However, as Welch (1997) shows, banks in general are secured lenders, so

[2] See Mishkin (1997) for more detailed discussion.

they have less incentive to monitor the credit risk of their borrowers. Secured creditors make fewer losses if the borrowers default, so banks do not recall a large number of loans if an unanticipated macrofinancial shock affects their borrowers.[3]

Some studies investigate the relationship between bank credit and the behavior of trade creditors during financial shocks. Burkart and Ellingsen (2004) insist that trends in trade credit are countercyclical and that suppliers offer more trade credit during recessions. Nilsen (2002) finds that small firms increase their reliance on trade credit during monetary contractions. On the other hand, Marotta (1997) finds, using Italian data, that there is no evidence that suppliers offer credit for small firms to mitigate a monetary squeeze. Love et al. (2007) investigate the effect of financial crises on trade credit in emerging economies. They find that bank credit is redistributed from financially stronger firms to weaker firms by using trade credit. Fukuda et al. (2006) focus on the role of trade credit in Japan during banking crises, and the substitution hypothesis between bank credit and trade credit is not supported in this period.

Some papers investigate intra- or interindustrial contagion using event study methods. For example, Lang and Stulz (1992) investigate the effects of bankruptcy announcements on the equity value of the bankrupt firm's competitors. Similarly, Brewer III and Jackson III (2002) study the negative effects on the stock returns of life insurance companies of interindustrial contagion caused by financial distress announcements by commercial banks. However, they do not focus on the relationships between trade credit chains and contagion.

3 Economic Shock during 1997–98

3.1 The Increase in Dishonored Bills and The Decline of Trade Payables

During 1997–98 in Japan, GDP growth became negative and the Japanese economy experienced a large and serious recession. Yamaichi Shouken, which was one of the large securities trading firms in Japan, and the Hokkaido-Takushoku bank, which was one of Japan's largest banks, went bankrupt. Also, many non-financial firms struggled

[3] If the value of collateral assets deteriorates, banks reduce their credit supply to small businesses. See Kiyotaki and

with the economic downturn and the number of firms that declared bankruptcy increased. In this period, the main cause of bankruptcy changed. According to Figure 1, the numbers of "Side Effect of Bankruptcy of Another Company" and "Diffculty Recovering Accounts Receivable, Cumulative Loss" both increased, despite the fact that the number of "Slumping Sales" decreased. This implies that the default of firms might have induced many suppliers to fall into default. The number of dishonored bills also increased. Table 1 shows the growth rate of dishonored bills. According to this figure, the sum of dishonored bills increased by 27% and the number of dishonored bills increased by 28% for two years from 1996.

The amount of trade payables decreased during the recession. The data in Panel A of Table 2 shows the trend of trade payables from 1996 to 2000 using the CRD. According to this table, the average growth rate in trade payables was -0.59% in 1996, but fell to -6.91% in 1997 and -10.01% in 1998. The magnitude of the decline of trade payables in 1997 and 1998 shown in this table was likely to have had large impacts on small businesses. We also use a second method of calculating the trade payables growth rate because firms that do not use trade credit are excluded if we use the trade payables growth rate defined in Panel A. In Panel B of Table 2, the trade payables growth rate is defined as (a firm's trade payables in t+1 minus trade payables in t)/total assets in t. Even if we change the definition of the growth rate, the average growth rate of trade payables was also negative during 1997 and 1998.

These impacts differ because of firm size and industry. Table 2 also shows the average and median trade payables growth rate for larger, medium, and smaller firms. In Panel A, the impact on small firms is larger. However, if we change the definition of the growth rate, the decline of trade payables is higher for large firms. In Table 3, we present the average trade payables growth rate for firms in each industry group. This table shows that in 1997 and 1998 the decline of trade payables for manufacturing firms and wholesalers was higher than for other firms.

Moore (1997b)

3.2 Hypothesis

In this paper, we test whether credit contagion during the recession in Japan decreased trade credit supply. In general, suppliers offer trade credit for customers, and these customers offer trade credit for their customers. Firms construct a huge financial network by offering and taking trade credit. Therefore, if some firms are adversely affected by liquidity shocks and unable to repay their trade debt, the suppliers that offer trade credit for default firms also might be unable to repay their trade debt. According to Kaufman (1994), contagion is the spillover of the effects of shocks from one or more firms to other firms. If credit contagion is serious, the firms with higher trade receivables are likely to default because of credit contagion. Therefore, suppliers reduce trade credit more for customers with higher trade receivables when credit contagion is serious.

As we described, trade creditors are unsecured lenders, so they suffer large losses when customers do not repay trade credit. Accordingly, they have an incentive to monitor the credit risk of their customers and to cut back on their credit supply to risky firms. During the recession, the performance of many customers deteriorated sharply, and therefore, suppliers might have reduced the credit supply to many distressed firms. For this reason, the decline of trade payables might not be caused by credit contagion, but rather by suppliers reducing their credit to risky firms. On the other hand, if the effects of credit contagion are serious, the possibility of default for both high-risk and low-risk groups of small firms becomes higher because of credit contagion, and suppliers might reduce trade credit for all firms. That is, if credit contagion decreases trade credit supply, suppliers reduce trade credit for all firms even though the idiosyncratic risk of customers is low. If credit contagion is not an issue for suppliers, they reduce trade credit for only risky firms, which is usual practice.

4 Econometric Analysis

4.1 Data

The CRD is one of the larger databases concerning small businesses in Japan. This database was established by a number of financial institutions and credit guarantee

corporations under the guidance of the Small and Medium Enterprise Agency in Japan.[4] The CRD targets firms defined as Small and Medium Enterprises under the Small and Medium Enterprise Basic Law in Japan.[5] The dataset in this study includes only corporations that existed for more than two consecutive years in the CRD. We omitted financial and small farm businesses and the data collected from credit guarantee corporations. Also, we limited firms in the sample to those that settle in January, February, or March. As a result, the number of firms in this study is 100,691. The CRD includes 91 variables from the firm's balance sheets and profit and loss statements. It also contains the year of establishment, industry classification, and the geographic location of each firm.

4.2 Estimation

We estimate the following equation using the CRD data.

$$Trade\ Payables\ Growth_{ijt} = \alpha_1 + \alpha_2\ Trade\ Receivables_{ijt} + \alpha_3\ Credit\ Risk_{ijt} + \sum \alpha_4^T\ Year\ Dummy_t + X_{ijt}\alpha_5 + \in_{ijt} \quad (1)$$

X = (Firm scale, Sales growth, ROA, Collateral assets, Interest rate, Cash holding, Regional dummies, Industrial dummies)

T=1997, 1998, 1999, 2000

X_{ijt} is a matrix of control variables and $_{ijt}$ is the error term of firm i at prefecture j in year t. The firms that possess more trade receivables of other firms might have many non-performing credits. In addition, trade debtors with higher trade receivables are more

[4] See http://www.crd.ne.jp/ (in Japanese) for more information about the CRD.

[5] According 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) generally refers to enterprises with capital stock under 300 million yen and/or 300 or less regular employees, and sole proprietorships with 300 or less employees. However, SMEs in the wholesaling industry are defined as enterprises with capital stock under 100 million yen and/or 100 or fewer employees, SMEs in the retailing industry are defined as enterprises with capital stock under 50 million yen and/or a workforce of 50 or less, while SMEs in the service industry are defined as enterprises with capital stock under 50 million yen and/or a workforce of 100 or less. 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 less."

likely to suffer from credit contagion. The credit risk of those firms is higher during the recession period of 1997–98. Therefore, the suppliers reduce trade credit more for customers with higher trade receivables. We expect that the negative effects of *Trade Receivables*$_{ijt}$ on trade payables growth are larger during economic shock periods. The prediction is that $\alpha_2^{shockperiods} < 0$ *and* $\alpha_2^{\ shock\ periods} < \alpha_2^{\ non\text{-}shock\ \ periods}$ if the problem of credit contagion reduces the supply of trade credit for firms with higher trade receivables. We check this hypothesis by including the products of trade receivables and the year dummies for 1997 and 1998 in Equation (1).

The unanticipated macro-shock during 1997–98 might induce trade credit runs and decrease the supply of trade credit, even if the default risk of trade debtors is low. In non-economic shock periods, suppliers withdraw their trade credit from only risky firms. Thus, we predict that the coefficient of *Credit Risk*$_{ijt}$ is negative. On the other hand, suppliers might withdraw their trade credit from all firms when the problem of credit contagion is serious. If the suppliers withdraw their trade credit from all small firms, the impacts of *Credit Risk*$_{ijt}$ are small during the economic shock periods of 1997 and 1998 and the effects of *Year Dummy*$_{1997}$ and *Year Dummy*$_{1998}$ are likely to be negative. Thus, we predict that $\alpha_3^{shockperiods} > \alpha_3^{non\text{-}shockperiods}$, and $\alpha_4^{1997} < 0$, and $\alpha_4^{1998} < 0$ if the problem of credit contagion reduces the supply of trade credit for non-risky firms. We check this hypothesis by including the products of credit risk and the year dummies for 1997 and 1998 in Equation (1).

We also specify several control variables: firm scale, sales growth, ROA, collateral assets, interest rates, cash–short-term loan ratio, industry dummies, and regional dummies. Generally, the larger firms use more trade credit, so firms that are growing more quickly increase their trade payables. Firms that make more profit use less trade credit because they have more internal cash, so we predict that ROA has a negative effect for trade payables growth. As Tsuruta (2006) argues, suppliers have an advantage in salvaging value from existing assets. Thus, firms that possess fewer collateral assets use more trade credit because they cannot borrow enough from banks. Also, we predict that firms with a higher interest rate use more trade credit. Firms with lower

cash–short-term loan ratio cannot repay debts if they have large losses. Therefore, suppliers do not offer trade credit to such firms and the coefficients of the cash–short-term loan ratio are likely to be negative.

We do not have all the information that affects the determinants of trade payables growth. For example, we do not have data about the length of the relationships between suppliers and customers. Previous studies, such as Uchida et al. (2006), claim that the length of relationships affects the supply of trade credit, so the problem of unobserved effects may be serious. Because we employ panel data, we can estimate using the fixed effects model to eliminate time-invariant unobserved effects. However, the F test for individual effects is not statistically significant. Hence, we estimate Equation (1) using OLS. The definition of each variable is shown in the Appendix.

4.3 Results

4.3.1 The effects of trade receivables and credit risk

We show summary statistics in Table 4 and the estimation results in Tables 5-19. Table 5 is the model without the product variables. According to this table, the coefficient of credit risk is negative and statistically significant (Column (1)). This result is not changed if we use capital deficiency$_2$, leverage, and total loans–sales ratio as proxies of credit risk (Columns (2)–(4)). These results suggest that suppliers lower trade credit for risky firms. The effects of the trade receivables turnaround period, which is a proxy for the amount of financial claims from customers, are negative and statistically significant at the 1% level. This result implies that suppliers reduce their trade credit for customers with higher trade receivables. The effects of the year dummies also suggest that the economic shock decreases trade payables. As stated in the previous section, the large recession became serious in 1997–98. The coefficients of the year dummies for 1997 and 1998 are negative and statistically significant at the 1% level.

The effects of the other control variables are consistent with what we predicted in the previous subsection except for interest rates. Sales growth and the cash–short-term loan ratio have positive effects, and ROA and the tangible asset ratio have negative effects on the amount of trade payables. These coefficients are statistically significant at the 1%

and 5% level.

4.3.2 The effects of trade receivables during the economic shock

In Table 6, we show the results of the products of trade receivables and the year dummies for 1997 and 1998. We use two proxies for trade receivables: turnaround period[6] and the ratio of trade receivables to assets. In columns (1) and (2) of Table 6, we estimate the OLS model. The coefficients of the proxies of trade receivables are negative and statistically significant at the 1% level if we use the trade receivables turnaround period as a proxy for trade receivables (column (1)). However, the coefficients of trade receivables become positive if we change the proxy (column (2)). The effects of trade receivables for trade payables growth are ambiguous. The coefficients of products of trade receivables and the year dummies for 1997 and 1998 are negative and statistically significant at the 1% level. This result does not depend on the types of proxy of trade receivables, so these results are robust. While the coefficient of the trade receivables–assets ratio is 0.00584, the coefficient of the trade receivables–assets ratio * year dummy for 1997 is -0.4803 and for 1998 is -0.04367 (column (2)). Thus, the effect of the trade receivables–assets ratio turns out to be negative in 1997 and 1998. From these results, we can see that suppliers reduce trade credit more for customers with higher trade receivables during the recession, which is consistent with our hypothesis. In columns (1) and (2) of Table 6, we do not know whether trade payables decreased or not because we used the trade payables growth rate as the dependent variable. To overcome this problem, we used the probability of an increase in trade payables as the independent variable. Columns (3) and (4) of Table 6 are the results of the logit estimation. The results in columns (3) and (4) are similar to the results of the OLS estimation in columns (1) and (2), except for the coefficient of the trade receivable–sales ratio in column (4). The results of the logit estimation imply that suppliers are likely to reduce trade credit to firms with higher trade receivables, as was especially the case during the 1997–98 recession.

[6] The trade receivables turnaround period is defined as Trade Receivables/Sales

4.3.3 The effects of credit risk during the economic shock

To compare the effects of credit risk in shock and non-shock periods, we add the products of credit risk and the year dummies for 1997 and 1998. As we argued, if the unanticipated macro-shock decreases the supply of trade credit for risky and non-risky firms, the impact of credit risk is smaller in the shock periods than in the non-shock periods. Therefore, we predict that the year dummies for 1997 and 1998 are negative and the product of credit risk and the year dummies for 1997 and 1998 is positive. We use several proxies of a firm's credit risk: two types of capital deficiency dummy, leverage, and total debts–sales ratio. The definition of each variable is shown in the appendix.

We show the results using all samples in Table 7. The coefficients of credit risk are negative and statistically significant at the 1% level. These results imply that suppliers decreased trade payables more for risky firms in the non-shock periods. The coefficients of the year dummies for 1997 and 1998 are negative and statistically significant at the 1% level. On the other hand, the coefficients of credit risk * year dummies for 1997 are positive and statistically significant at the 10% level if the proxies of credit risk are the two types of capital deficiency (columns (1) and (2)). Moreover, the coefficients of the total debts–sales ratio * year dummies for 1997 and 1998 are both positive and statistically significant at the 1% level (column (4)). According to these results, suppliers significantly reduced trade credit for not only risky firms, but also non-risky firms in 1997 and 1998. If we use leverage for the proxy of credit risk, the coefficients of credit risk * year dummies for 1997 are not statistically significant (column (3)) and the coefficient for 1998 turns out to be negative and statistically significant at the 1% level.

As we mentioned, we cannot know whether trade payables decrease or not when the independent variable is the trade payables growth rate. Thus, we also use the probability of an increase in trade payables as an independent variable. Table 8 presents the results of logit estimation. The coefficients of the year dummies for 1997 and 1998 are negative and statistically significant at the 1% level. Additionally, the coefficients of credit risk * year dummy for 1997 are positive and statistically significant at the 1%

level. The coefficients of credit risk * year dummy for 1998 are also positive and statistically significant at the 1% level. According to the results of Table 7 and Table 8, suppliers might have significantly reduced trade credit for risky and non-risky firms in 1997 and/or 1998.

4.3.4 Comparison by industry sector

The strength of trade credit linkages differs by industry. Table 9 shows the average and median day payables outstanding (DPO)[7] for each industry. The levels of average DPO for the wholesale trade and for manufacturing are higher than the ratio for other industries. The average DPO for the wholesale trade is 61.08 and the ratio for manufacturing is 47.68. Also, the levels of average DPO for construction and retail trade are both over 30. Because of this table, firms in the other industries (that is, transportation and communications, restaurants, and real estate) do not use trade credit frequently. We predict that the effects of credit contagion are serious for firms that depend on trade credit because of industry characteristics.

To check this hypothesis, we estimate Equation (1) for each type of industry. The results of trade receivables for each industry are presented in Tables 10–14. The coefficients of the products of trade receivables and the year dummies for 1997 and 1998 are negative and statistically significant at the 1% level for all industries. These results suggest that suppliers reduce trade credit more for customers with higher trade receivables, which was not dependent on industry characteristics in 1997 and 1998.

According to Tables 15–19, the results of credit risk are different between each industry. The results of the year dummies are similar to Table 7 if we limit the samples for each industry[8], which implies that the trade payables growth rate was low in all industries in 1997 and 1998. In Table 15, we limit the samples to manufacturers. The coefficients of credit risk * year dummy for 1997 are positive and statistically significant if we use the capital deficiency$_1$ and total loans–sales ratio as proxies of credit risk. In addition, the coefficients of credit risk * year dummy for 1998 are positive and statistically

[7] "Day payables outstanding" is defined as (a firm's trade payables/ total sales)* 365.

significant except for column (3). Although the products of the leverage and the year dummies for 1997 and 1998 are not statistically significant, we can interpret this result as suggesting that credit contagion in 1997 and 1998 significantly reduced credit supply for risky and non-risky firms in manufacturing.

The effects of credit contagion for trade credit supply are weak in other industries. In Table 16, we limit samples to wholesalers. The effects of the total debts–sales ratio * year dummies for 1997 and 1998 are positive and significant (column (4)), but the results in columns (1)–(3) do not support the hypothesis. The results for construction and retail trade (Tables 17 and 18) are similar. The coefficients of the products of the total loans–sales ratio and the year dummy for 1997 are statistically positive (column (4)), but the other proxies of credit risk have larger negative effects in 1998 (columns (1)–(3)). Moreover, when we use samples for transportation and communications, restaurants, real estate and services (Table 19), the coefficients of the total loans–sales ratio become higher in 1997 and 1998, but the negative effects of the other proxies of credit risk are larger in 1998. This result implies that suppliers reduced trade credit more for risky customers in 1998.[9]

5 Conclusion

We have investigated the effects of the credit chain and the increase in dishonored bills for trade credit supply using small business data in Japan. Our results are summarized as follows: 1) suppliers reduce trade credit more for customers with higher trade receivables because they avoid default because of credit contagion; 2) in the non-recession periods, suppliers reduce trade credit for risky firms, but they reduce trade credit more for both risky and non-risky firms in manufacturing during the recession periods; 3) the effects of credit risk are weak in other industries, even if the trade credit link is close. Our results imply that credit contagion in recession periods reduces trade credit more for manufacturers.

---

[8] The results are not shown in Tables 15–19.

[9] In Table 5, the coefficients of the proxies of credit risk become statistically significant if we exclude the cross

A Definition of Variables

Dependent variables

Trade payables growth rate The annual growth rate of a firm's trade payables (Δtrade payables/total assets).

Trade receivables

Trade receivable turnaround period Trade receivables/sales.

Trade receivables - assets ratio turnaround period Trade receivables/assets.

Credit risk

Capital deficiency$_1$ = 1 if a firm's capital is negative in year t-1, t or t+1.

Capital deficiency$_2$ = 1 if a firm satisfies at least one of the following conditions: 1) a firm's capital is negative in year t-1, t or t+1; 2) a firm's profit is negative from t-1 to t+1 (profit is negative for three consecutive years).

Leverage = Total debts/assets

Total debts to sales ratio = Total debts/sales

Firm characteristics variables

Scale Log(1+sales).

Cash–short-term debts ratio Cash/short-term debts.

Performance

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

Sales growth The annual growth rate of a firm's sales (Δsales/total assets).

Credit terms with the bank

terms in Tables 16–19.

Tangible asset ratio The ratio of a firm's tangible assets (which is the sum of the 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 rate (in percentages). We do not have 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.

References

Allen, Franklin and Douglas Gale, "Financial Contagion," *Journal of Political Economy*, 2000, *108*, 1–33.

Brewer, Elijah III and William E. Jackson III, "Inter-industry Contagion and the Competitive Effects of Financial Distress Announcements: Evidence from Commercial Banks and Life Insurance Companies," 2002. Federal Reserve Bank of Chicago Working Paper Series, WP 2002-23.

Burkart, Mike C. and Tore Ellingsen, "In-Kind Finance: A Theory of Trade Credit," *American Economic Review*, 2004, *94(3)*, 569–590.

Burkart, Mike C., Tore Ellingsen, **and Mariassunta Giannetti,** "What You Sell is What You Lend? Explaining Trade Credit Contracts," November 2005. European Corporate Governance Institute, Finance Research Paper Series.

Calomiris, Charles W. and Joseph R. Mason, "Contagion and Bank Failures During the Great Depression," *American Economic Review*, 1997, *87*, 863–883.

Calomiris, Charles W. and Joseph R. Mason, "Fundamentals, Panics, and Bank Distress During the Depression," *American Economic Review*, 2003, *93*, 1614–1647.

Chen, Yeh-Ning, "Banking Panics: The Role of the First-Come, First-Served Rule and Information Externalities," *Journal of Political Economy*, 1999, *107*, 946–968.

Chen, Yeh-Ning, "Debt Seniority and the Lenders' Incentive to Monitor: Why Isn't Trade Credit Senior?," 2004. EFA 2004 Maastricht Meetings Paper, No. 2244.

Diamond, Douglas W. and Phillip H. Dybig, "Bank Runs, Deposit Insurance, and. Liquidity," *Journal of Political Economy*, 1983, *91*, 401–419.

Fisman, Raymond and Inessa Love, "Trade Credit, Financial Intermediary Development, and Industry Growth," *The Journal of Finance*, 2003, *58(1)*, 353–374.

Franks, Julian R. and Oren Sussman, "Financial Distress and Bank Restructuring of Small to Medium Size UK Companies," *Review of Finance*, 2005, *9*, 65–96.

Fukuda, Shinichi, Munehisa Kasuya, and Kentaro Akashi, "TheRoleof Trade Credit for Small Firms: An Implication from Japan's Banking Crisis," October 2006. CIRJE Discussion Paper Series, The University of Tokyo.

Hahm, Joon-Ho and Frederic S. Mishkin, "Causes of the Korean Financial Crisis: Lessons for Policy," Jan 2000. NBER Working Paper No. 7483.

Iyer, Rajkamal and Jose Luis Peydro-Alcalde, "Interbank Contagion: Evidence from Real Transactions," 2006. mimeo.

Kaufman, George G., "Bank Contagion: A Review of the Theory and Evidence," *Journal of Financial Services Research*, 1994, *8(2)*, 123–150.

Kiyotaki, Nobuhiro and John H. Moore, "Credit Chains," 1997. mimeo

Kiyotaki, Nobuhiro and John H. Moore, "Credit Cycles," *Journal of Political Economy*, 1997, *105(2)*, 211–248.

Kiyotaki, Nobuhiro and John H. Moore, "Balance-Sheet Contagion," *American Economic Review, Papers and Proceedings*, 2002, *92(2)*, 46–50.

Lang, Larry H.P. and René M. Stulz, "Contagion and Competitive Intra-industry

Effects of Bankruptcy Announcements: An Empirical Analysis," *Journal of Financial Economics*, 1992, *32*, 45–60.

Love, Inessa, Lorenzo A. Preve, and Virginia Sarria-Allende, "Trade Credit and Bank Credit: Evidence From Recent Financial Crises," *Journal of Financial Economics*, 2007, *83*, 453–469.

Marotta, Giuseppe, "Does Trade Credit Redistribution Thwart Monetary Policy? Evidence from Italy," *Applied Economics*, 1997, *29(12)*, 1619–1629.

Mishkin, Federic S., "The Causes and Propagation of Financial Instability: Lessons for Policymakers," in Hakkio, C. ed., "Maintaining Financial Stability in a Global Economy," Federal Reserve Bank of Kansas City,, 1997.

Miwa, Yoshiro and J. Mark Ramseyer, "Trade Credit, Bank Loans, and Monitoring: Evidence from Japan," November 2005. CIRJE Discussion Paper Series, The University of Tokyo.

Motonishi, Taizo and Hiroshi Yoshikawa, "Causes of the Long Stagnation of Japan during the 1990s: Financial or Real?," *Journal of the Japanese and International Economies*, 1999, *13(3)*, 181–200.

Nilsen, Jeffrey H., "Trade Credit and the Bank Lending Channel," *Journal of Money Credit and Banking*, 2002, *34(1)*, 226–253.

Ono, Masanori, "Determinants of Trade Credit in the Japanese Manufacturing Sector," *Journal of the Japanese and International Economies*, 2001, *15(2)*, 160–177.

Peria, Martinez, Maria Soledad, and Sergio L. Schmukler, "Do Depositors Punish Banks for Bad Behavior? Market Discipline, Deposit Insurance, and Banking Crises," *The Journal of Finance*, 2001, *56(3)*, 1029–1051.

Petersen, Mitchell and Raghuram G. Rajan, "Trade Credit: Theories and Evidence," *The Review of Financial Studies*, 1997, *10*, 661–691.

Schumacher, Liliana, "Bank Runs and Currency Run in a System Without a Safety Net: Argentina and the 'Tequila' Shock," *Journal of Monetary Economics*, 2000, *46(1)*, 257–277.

Tsuruta, Daisuke, "Bank Information Monopoly and Trade Credit: Do Only Banks Have Information about Small Businesses?," *Applied Economics*, 2006, *Forthcoming*

.

Tsuruta, Daisuke and Peng Xu, "Debt Structure and Bankruptcies of Financially Distressed Small Businesses," April 2007. RIETI Discussion Paper Series.

Uchida, Hirofumi, Gregory F. Udell, and Wako Watanabe, "Are Trade Creditors Relationship Lenders?," April 2006. RIETI Discussion Paper Series.

Uesugi, Iichiro and Guy M. Yamashiro, "Trading Company Finance and the Relationship between Trade Credit and Loans," September 2006. RIETI Discussion Paper Series.

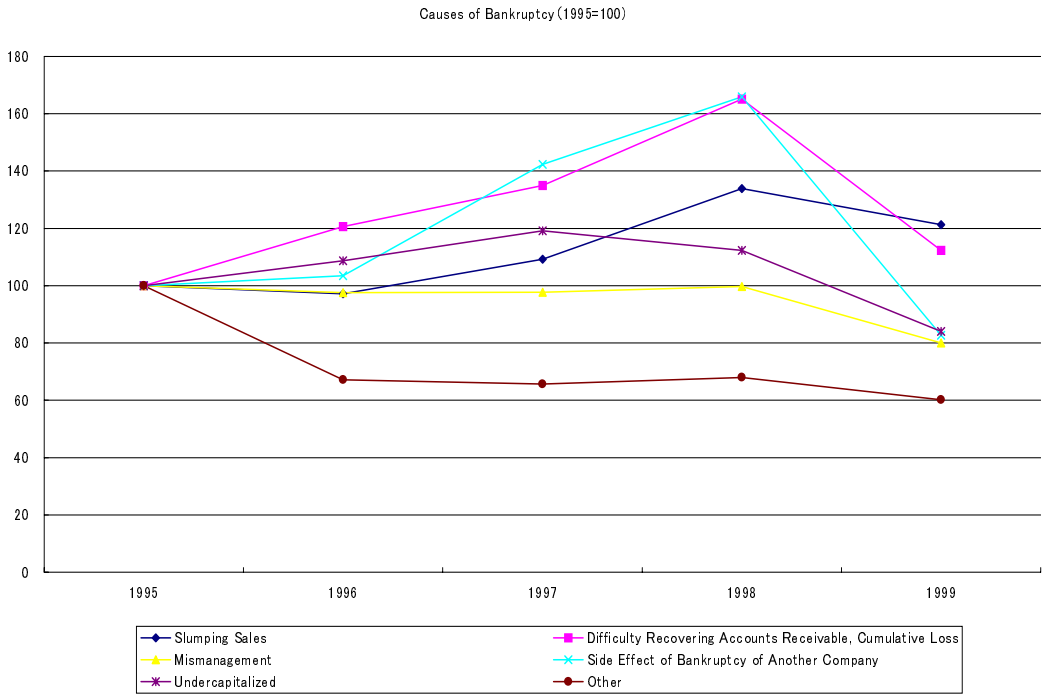
Welch, Ivo, "Why Is Bank Debt Senior? A Theory of Asymmetry and Claim Priority Based on Influence Costs," *The Review of Financial Studies*, 1997, *10*, 1203–1236.

Table 1: The Number and Sum of Dishonored Bills, 1995–1999

Year	Number (thousand sheet)	Sum (million yen)	Annual Change		Dishonored Bills/Total Bills	
			Number(%)	Sum(%)	Number(%)	Sum(%)
1995	532	1,127,207	8.2	-0.3	0.17	0.06
1996	506	972,616	-4.9	-13.7	0.17	0.06
1997	571	1,142,239	12.9	17.4	0.20	0.07
1998	648	1,235,348	13.4	8.2	0.25	0.10
1999	477	961,970	-26.4	-22.1	0.20	0.08

Source: The Japanese Bankers Association, *Kessan Tokei Nenpo*

Figure 1: The Numbers of Causes of Bankruptcy (1995=100)



Source: Tokyo Shoko Research, Ltd., *Bankruptcy White Paper.*

Table 2: The Growth Rate of Trade Payables

Panel A: Defined as (Trade Payables$_{t+1}$-Trade Payables$_t$)/Trade Payables$_t$*100

	Firm Scale			
Year	Smaller	Middle	Larger	Total
1995	-2.53%	1.32%	5.18%	2.71%
1996	-4.32%	0.00%	1.98%	0.59%
1997	-12.89%	-8.27%	-5.24%	-6.91%
1998	-13.31%	-11.49%	-8.52%	-10.01%
1999	-5.61%	-2.84%	-0.58%	-1.95%
2000	-3.51%	-1.11%	1.43%	0.00%

Note: We show only the median of the trade payable growth rate because the distribution is skewed. We define small-sized firms as those whose average sales were less than 100 million yen, and middle-sized firms as those whose average sales were less than 300 million yen and more than 100 million yen. Larger-sized firms are firms whose average sales were more than 300 million yen.

Panel B: Defined as (Trade Payables$_{t+1}$-Trade Payables$_t$)/Total Assets$_t$*100

	Firm Scale			
Year	Smaller	Middle	Larger	Total
1996	0.40%	1.02%	0.90%	0.83%
	(0.00%)	(0.00%)	(0.12%)	(0.00%)
1997	-0.63%	-0.68%	-0.85%	-0.74%
	(0.00%)	(-0.16%)	(-0.52%)	(-0.15%)
1998	-0.69%	-1.06%	-1.25%	-1.05%
	(0.00%)	(-0.27%)	(-0.75%)	(-0.25%)
1999	0.14%	0.35%	0.38%	0.31%
	(0.00%)	(0.00%)	(0.00%)	(0.00%)
2000	0.42%	0.94%	1.19%	0.89%
	(0.00%)	(0.00%)	(0.12%)	(0.00%)

Note: We show the average and the median of each ratio in parentheses. We calculate the average for each group without firms whose trade payables growth rate belongs to the lower 0.5% percentile or the upper 99.5% percentile. We define small-sized firms as those whose average sales were less than 100 million yen, and middle-sized firms as those whose average sales were less than 300 million yen and more than 100 million yen. Larger-sized firms are firms whose average sales were more than 300 million yen.

Table 3: The Growth Rate of Trade Payables, Compared by Industry

	Industry								
Year	Construction	Manufacturing	Transportation and Communications	Wholesales trade	Retail trade	Restaurants	Real estate	Services	Total
1996	1.86%	0.75%	0.14%	1.23%	0.55%	0.12%	0.09%	0.48%	0.83%
	(0.00%)	(0.09%)	(0.00%)	(0.16%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)
1997	-0.99%	-0.45%	-0.38%	-1.83%	-1.09%	0.27%	-0.13%	-0.15%	-0.74%
	(-0.51%)	(-0.41%)	(0.00%)	(-1.56%)	(-0.72%)	(0.00%)	(0.00%)	(0.00%)	(-0.15%)
1998	-0.57%	-1.73%	-1.00%	-1.98%	-0.52%	0.16%	0.07%	-0.23%	-1.05%
	(-0.23%)	(-1.01%)	(-0.15%)	(-1.43%)	(-0.41%)	(-0.03%)	(0.00%)	(0.00%)	(-0.25%)
1999	0.84%	0.32%	0.01%	0.01%	0.19%	0.11%	0.16%	0.33%	0.31%
	(0.00%)	(0.00%)	(0.00%)	(-0.30%)	(-0.05%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)
2000	1.39%	0.99%	1.21%	1.02%	0.45%	0.34%	0.16%	0.49%	0.89%
	(0.00%)	(0.02%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)

Note: The growth rate of trade payables is defined as (Trade Payables$_{t+1}$-Trade Payables$_t$)/Total Assets$_t$*100. We show the average and the median of each ratio in parentheses. We calculate the average for each group without firms whose trade payables growth rate belongs to the lower 0.5% percentile or the upper 99.5% percentile.

Table 4: Summary Statistics

	Obs	Mean	Std. Dev.	Min	1%	50%	99%	Max
Trade Payables Growth	326,411	0.0370	5.8330	-485.6031	-0.2708	0.0000	0.4005	2,719.00
Prob (Payables Growth ≥ 0)	326,411	0.5343	0.4988	0.0000	0.0000	1.0000	1.0000	1.00
Trade Receivables Turnaround Period	325,932	0.1587	1.2740	0.0000	0.0000	0.1255	0.6126	495.00
Trade Receivables-Asset Ratio	326,380	0.2114	0.1781	0.0000	0.0000	0.1808	0.7338	495.00
Capital Deficiency Dummy	237,729	0.3418	0.4743	0.0000	0.0000	0.0000	1.0000	1.00
Capital Deficiency Dummy	237,729	0.2705	0.4442	0.0000	0.0000	0.0000	1.0000	1.00
Leverage	326,411	0.9815	8.2971	0.0000	0.2188	0.8838	2.8262	2,498.49
Total Loans-Sales Ratio	325,963	1.8428	77.1299	0.0000	0.0848	0.6166	11.6936	35,399.82
Probability of Default	326,411	0.0180	0.0306	0.0000	0.0006	0.0083	0.1495	0.78
Scale	326,411	12.6692	1.7083	0.0000	9.0367	12.6295	16.3969	19.41
Sales Growth	325,963	1.9519	684.8150	-1.0000	-0.5841	-0.0157	1.4864	383,276.00
ROA	326,411	-0.0007	0.2799	-63.8878	-0.5217	0.0174	0.2646	94.00
Tangible Asset Ratio	307,708	1.9769	150.0404	0.0000	0.0192	0.5949	8.9464	52,317.83
Interest Rate	321,650	3.9884	360.4934	0.0000	0.0000	2.7618	10.3640	199,790.00
Cash–Short-term Loan Ratio	324,652	1.2391	53.4226	0.0000	0.0051	0.3107	7.4486	18,610.67
Dishonored Bill Ratio	237,672	0.0565	0.5332	-0.8546	-0.7097	-0.0168	2.2009	3.80

Table 5: The Growth Rate of Trade Payables and Credit Risk

Dependent Variable	Trade Payables Growth Rate			
	(1)	(2)	(3)	(4)
Models	OLS	OLS	OLS	OLS
Proxy of Credit Risk	Capital Deficiency$_1$	Capital Deficiency$_2$	Leverage	Total Loans -Sales Ratio
Credit Risk	-0.00179***	-0.00165***	-0.00433***	-0.00165***
	(0.00040)	(0.00043)	(0.00057)	(0.00008)
Trade Receivable Turnaround Period	-0.04712***	-0.04707***	-0.04934***	-0.04832***
	(0.00161)	(0.00161)	(0.00144)	(0.00144)
Scale	0.00056***	0.00058***	0.00082***	0.00071***
	(0.00011)	(0.00011)	(0.00009)	(0.00010)
Sales Growth	0.09046***	0.09057***	0.08640***	0.08859***
	(0.00119)	(0.00119)	(0.00100)	(0.00101)
ROA	-0.00514**	-0.00416*	-0.00645***	-0.00237
	(0.00240)	(0.00232)	(0.00205)	(0.00199)
Tangible Asset Ratio	-0.00183***	-0.00186***	-0.00211***	-0.00191***
	(0.00016)	(0.00016)	(0.00015)	(0.00014)
Interest Rate	-0.00010	-0.00009	0.00021	0.00013
	(0.00015)	(0.00015)	(0.00013)	(0.00013)
Cash–Short-term Loan Ratio	0.00204***	0.00204***	0.00176***	0.00195***
	(0.00010)	(0.00010)	(0.00009)	(0.00009)
Year=1997	-0.01056***	-0.01055***	-0.01114***	-0.01114***
	(0.00092)	(0.00092)	(0.00052)	(0.00052)
Year=1998	-0.00994***	-0.00991***	-0.01040***	-0.01025***
	(0.00091)	(0.00091)	(0.00052)	(0.00052)
Year=1999	-0.00134	-0.00133	-0.00155***	-0.00151***
	(0.00090)	(0.00090)	(0.00050)	(0.00050)
Year=2000	0.00221**	0.00223**	0.00196***	0.00188***
	(0.00091)	(0.00091)	(0.00050)	(0.00050)
Observations	220,350	220,350	293,331	292,942
R-squared	0.09	0.09	0.09	0.09

Note: Robust standard errors are in parentheses. Each regression includes industrial dummies that are recorded in the CRD dataset. Regional dummies are also added except for column (3). 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.

Table 6: The Growth Rate of Trade Payables and Trade Receivables

Dependent Variable	Trade Payables Growth Rate		Prob (Payables Growth ≥ 0)	
	(1)	(2)	(3)	(4)
Models	OLS	OLS	Logit	Logit
Proxy of Trade Receivables	Trade Receivables Turnaround Period	Trade Receivables -Assets Ratio	Trade Receivables Turnaround Period	Trade Receivables -Assets Ratio
Trade Receivables	-0.04706***	0.00584***	-0.04934***	-0.30983***
	(0.00161)	(0.00177)	(0.00144)	(0.03632)
Proxy of Trade Receivables * Year Dummy				
Year=1997	-0.03894***	-0.04803***	-0.98937***	-0.56332***
	(0.00363)	(0.00318)	(0.10747)	(0.06953)
Year=1998	-0.04547***	-0.04367***	-1.32474***	-0.41974***
	(0.00351)	(0.00305)	(0.10536)	(0.06579)
Control Variables				
Credit Risk	-0.00181***	-0.00114***	-0.07374***	-0.05107***
(Capital Deficiency$_1$)	(0.00040)	(0.00040)	(0.01085)	(0.01077)
Scale	0.00059***	0.00033***	-0.08421***	-0.09227***
	(0.00011)	(0.00011)	(0.00325)	(0.00322)
Sales Growth	0.09006***	0.08838***	2.44153***	2.39549***
	(0.00119)	(0.00118)	(0.03166)	(0.03157)
ROA	-0.00499**	-0.00557**	0.04939	0.01981
	(0.00240)	(0.00240)	(0.05227)	(0.05237)
Tangible Asset Ratio	-0.00183***	-0.00161***	-0.03155***	-0.02481***
	(0.00016)	(0.00016)	(0.00402)	(0.00399)
Interest Rate	-0.00013	-0.00002	-0.02019***	-0.01645***
	(0.00015)	(0.00015)	(0.00335)	(0.00334)
Cash–Short-term Loan Ratio	0.00205***	0.00218***	0.11371***	0.11538***
	(0.00010)	(0.00010)	(0.00563)	(0.00566)
Year Dummies				
Year=1997	-0.00490***	-0.00016	-0.10954***	-0.13081***
	(0.00103)	(0.00101)	(0.02762)	(0.02742)
Year=1998	-0.00355***	-0.00064	-0.06300**	-0.15420***
	(0.00100)	(0.00099)	(0.02678)	(0.02650)
Year=1999	-0.00144	-0.00126	0.04486**	0.04182*
	(0.00090)	(0.00090)	(0.02232)	(0.02228)
Year=2000	0.00214**	0.00232**	0.12013***	0.11746***
	(0.00091)	(0.00091)	(0.02220)	(0.02215)
Observations	220,350	221,347	221,808	222,815
R-squared	0.09	0.09		
Pseudo R-squared			0.08	0.08
Log Likelihood			-140982.87	-142245.02

Note: Robust standard errors are in parentheses. Each regression includes regional and industrial dummies that are recorded in the 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.

Table 7: The Growth Rate of Trade Payables and Credit Risk

Dependent variable	Trade Payables Growth Rate			
	(1)	(2)	(3)	(4)
Models	OLS	OLS	OLS	OLS
Proxy of Credit Risk	Capital Deficiency$_1$	Capital Deficiency$_2$	Leverage	Total Loans -Sales Ratio
Credit Risk	-0.00213***	-0.00167***	-0.00349***	-0.00243***
	(0.00050)	(0.00055)	(0.00068)	(0.00009)
Proxy of Credit Risk * Year Dummy				
Year=1997	0.00165*	0.00191*	0.00019	0.00208***
	(0.00096)	(0.00108)	(0.00143)	(0.00016)
Year=1998	0.00013	-0.00148	-0.00474***	0.00218***
	(0.00086)	(0.00096)	(0.00126)	(0.00016)
Control Variables				
Trade Receivables Turnaround Period	-0.04710***	-0.04706***	-0.04936***	-0.04834***
	(0.00161)	(0.00161)	(0.00144)	(0.00144)
Scale	0.00056***	0.00058***	0.00083***	0.00070***
	(0.00011)	(0.00011)	(0.00009)	(0.00010)
Sales Growth	0.09045***	0.09056***	0.08641***	0.08849***
	(0.00119)	(0.00119)	(0.00100)	(0.00101)
ROA	-0.00523**	-0.00420*	-0.00634***	-0.00231
	(0.00240)	(0.00233)	(0.00205)	(0.00199)
Tangible Asset Ratio	-0.00184***	-0.00186***	-0.00212***	-0.00190***
	(0.00016)	(0.00016)	(0.00015)	(0.00014)
Interest Rate	-0.00010	-0.00009	0.00021	0.00013
	(0.00015)	(0.00015)	(0.00013)	(0.00013)
Cash–Short-term Loan Ratio	0.00204***	0.00204***	0.00176***	0.00194***
	(0.00010)	(0.00010)	(0.00009)	(0.00009)
Year Dummies				
Year=1997	-0.01109***	-0.01102***	-0.01131***	-0.01322***
	(0.00095)	(0.00094)	(0.00132)	(0.00058)
Year=1998	-0.01000***	-0.00954***	-0.00614***	-0.01245***
	(0.00095)	(0.00094)	(0.00119)	(0.00058)
Year=1999	-0.00136	-0.00133	-0.00155***	-0.00147***
	(0.00090)	(0.00090)	(0.00050)	(0.00050)
Year=2000	0.00220**	0.00222**	0.00194***	0.00193***
	(0.00091)	(0.00091)	(0.00050)	(0.00050)
Observations	220,350	220,350	293,331	292,942
R-squared	0.09	0.09	0.09	0.09

Note: Robust standard errors are in parentheses. Each regression includes regional and industrial dummies that are recorded in the 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.

Table 8: The Growth Rate of Trade Payables and Credit Risk – Logit Estimation

Dependent Variable	Prob (Payables Growth ≥ 0)			
	(1)	(2)	(3)	(4)
Models	Logit	Logit	Logit	Logit
Proxy of a Firm's Risk	Capital Deficiency$_1$	Capital Deficiency$_2$	Leverage	Total Loans -Sales Ratio
Credit Risk	-0.11570***	-0.09403***	-0.14410***	0.01722***
	(0.01359)	(0.01443)	(0.01517)	(0.00407)
Proxy of Credit Risk * Year Dummy				
Year=1997	0.10696***	0.14878***	0.14705***	0.03064***
	(0.02542)	(0.02743)	(0.03182)	(0.00822)
Year=1998	0.10021***	0.08250***	0.08922***	0.02418***
	(0.02363)	(0.02548)	(0.02963)	(0.00763)
Control Variables				
Scale	-1.51692***	-1.50849***	-1.52549***	-1.50331***
	(0.04430)	(0.04429)	(0.03838)	(0.03820)
Sales Growth	-0.08508***	-0.08289***	-0.07609***	-0.06823***
	(0.00325)	(0.00325)	(0.00274)	(0.00275)
ROA	2.45252***	2.46096***	2.29831***	2.30583***
	(0.03167)	(0.03164)	(0.02713)	(0.02714)
Tangible Asset Ratio	0.03577	0.09048*	0.07195	0.16031***
	(0.05233)	(0.05120)	(0.04441)	(0.04256)
Interest Rate	-0.03161***	-0.03143***	-0.03982***	-0.02874***
	(0.00402)	(0.00406)	(0.00364)	(0.00344)
Cash–Short-term Loan Ratio	-0.01963***	-0.01936***	-0.01688***	-0.01491***
	(0.00335)	(0.00335)	(0.00281)	(0.00281)
Trade Receivables Turnaround Period	0.11378***	0.11441***	0.11308***	0.12128***
	(0.00563)	(0.00566)	(0.00495)	(0.00501)
Year=1997	-0.28930***	-0.29175***	-0.48378***	-0.37784***
	(0.02414)	(0.02378)	(0.03152)	(0.01550)
Year=1998	-0.28220***	-0.26946***	-0.42750***	-0.36552***
	(0.02393)	(0.02356)	(0.02981)	(0.01532)
Year=1999	0.04517**	0.04584**	-0.05251***	-0.04973***
	(0.02242)	(0.02241)	(0.01338)	(0.01337)
Year=2000	0.12079***	0.12099***	0.01672	0.01909
	(0.02229)	(0.02228)	(0.01310)	(0.01309)
Observations	221,808	221,808	295,462	295,108
Pseudo R-squared	0.08	0.08	0.08	0.08
Log Likelihood	-141077.66	-141089.13	-188662.46	-188604.71

Note: Robust standard errors are in parentheses. Each regression includes regional and industrial dummies that are recorded in the 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.

Table 9: The Level of Day Payables Outstanding, Compared by Industry

	Industry								
Year	Construction	Manufacturing	Transportation and Communication	Wholesales trade	Retail trade	Restaurants	Real estate	Services	Total
1996	43.878	52.257	28.606	66.822	39.358	14.174	11.803	20.235	43.356
	(34.739)	(47.787)	(20.712)	(61.594)	(30.526)	(9.140)	(0.000)	(8.265)	(33.528)
1997	42.061	50.263	26.830	64.872	38.851	13.586	10.975	19.540	41.364
	(33.498)	(45.498)	(19.081)	(59.130)	(30.278)	(9.656)	(0.000)	(7.890)	(31.391)
1998	39.002	47.681	25.848	61.077	37.309	12.042	8.986	18.145	38.588
	(29.864)	(42.444)	(16.952)	(53.998)	(28.300)	(9.039)	(0.000)	(6.989)	(28.036)
1999	37.857	44.949	23.456	59.291	36.707	12.611	8.134	17.070	36.564
	(28.300)	(38.566)	(14.319)	(51.638)	(27.724)	(8.966)	(0.000)	(6.219)	(25.685)
2000	37.125	45.146	22.007	57.717	35.460	12.502	7.168	16.671	35.703
	(27.582)	(38.403)	(12.728)	(49.591)	(26.728)	(8.940)	(0.000)	(5.829)	(24.741)

Note: We show the average and the median of each ratio in parentheses. We calculate the average for each group without firms whose DPO belongs to the upper 99.5% percentile.

Table 10: The Growth Rate of Trade Payables and Trade Receivables, Compared by Industry
(The coefficients of control variables are not reported)

Dependent Variable	Trade Payables Growth Rate		Prob (Payables Growth $\geq$ 0)	
	(1)	(2)	(3)	(4)
Models	OLS	OLS	Logit	Logit
Industry	Manufacture			
Proxy of Trade Receivables	Trade Receivables Turnaround Period	Trade Receivables -Assets Ratio	Trade Receivables Turnaround Period	Trade Receivables -Assets Ratio
Trade Receivables	-0.02171***	0.00671*	-0.87279***	-0.38309***
	(0.00340)	(0.00362)	(0.10759)	(0.08353)
Proxy of Trade Receivables * Year Dummy				
Year=1997	-0.02528***	-0.03721***	-0.55328***	-0.34667**
	(0.00668)	(0.00693)	(0.21167)	(0.15865)
Year=1998	-0.04145***	-0.05418***	-1.61062***	-0.43276***
	(0.00610)	(0.00623)	(0.22387)	(0.16000)
Observations	65,481	65,664	65,752	65,936
R-squared	0.16	0.16		
Pseudo R-squared			0.09	0.09
Log Likelihood			-41183.96	-41417.05

Table 11: The Growth Rate of Trade Payables and Trade Receivables, Compared by Industry
(The coefficients of control variables are not reported)

Dependent Variable	Trade Payables Growth Rate		Prob (Payables Growth $\geq$ 0)	
	(1)	(2)	(3)	(4)
Models	OLS	OLS	Logit	Logit
Industry	Wholesales trade			
Proxy of Trade Receivables	Trade Receivables Turnaround Period	Trade Receivables -Assets Ratio	Trade Receivables Turnaround Period	Trade Receivables -Assets Ratio
Trade Receivables	-0.03507***	0.01270***	-0.82470***	0.04864
	(0.00547)	(0.00469)	(0.13958)	(0.09347)
Proxy of Trade Receivables * Year Dummy				
Year=1997	-0.05249***	-0.06144***	-1.62957***	-0.66778***
	(0.01072)	(0.00832)	(0.30179)	(0.18126)
Year=1998	-0.05159***	-0.05754***	-1.34624***	-0.67907***
	(0.01043)	(0.00821)	(0.29446)	(0.17499)
Observations	32,491	32,681	32,775	32,965
R-squared	0.15	0.14		
Pseudo R-squared			0.09	0.08
Log Likelihood			-20472.72	-20706.72

Note: Robust standard errors are in parentheses. Each regression includes regional dummies. 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.

Table 12: The Growth Rate of Trade Payables and Trade Receivables, Compared by Industry
(The coefficients of control variables are not reported)

Dependent variable	Trade Payables Growth Rate		Prob (Payables Growth ≥ 0)	
	(1)	(2)	(3)	(4)
Models	OLS	OLS	Logit	Logit
Industry	Construction			
Proxy of Trade Receivables	Trade Receivables Turnaround Period	Trade Receivables -Assets Ratio	Trade Receivables Turnaround Period	Trade Receivables -Assets Ratio
Trade Receivables	-0.08786***	-0.01276***	-1.89473***	-0.73743***
	(0.00612)	(0.00463)	(0.12165)	(0.07903)
Proxy of Trade Receivables * Year Dummy				
Year=1997	-0.02473**	-0.04710***	-0.49018*	-0.39024**
	(0.01211)	(0.00940)	(0.26909)	(0.16857)
Year=1998	-0.00847	-0.02065**	-0.11555	-0.09461
	(0.01170)	(0.00882)	(0.23837)	(0.15194)
Observations	34052	34169	34538	34658
R-squared	0.10	0.09		
Pseudo R-squared			0.06	0.05
Log Likelihood			-22480.21	-22694.64

Table 13: The Growth Rate of Trade Payables and Trade Receivables, Compared by Industry
(The coefficients of control variables are not reported)

Dependent Variable	Trade Payables Growth Rate		Prob (Payables Growth ≥ 0)	
	(1)	(2)	(3)	(4)
Models	OLS	OLS	Logit	Logit
Industry	Retail trade			
Proxy of Trade Receivables	Trade Receivables Turnaround Period	Trade Receivables -Assets Ratio	Trade Receivables Turnaround Period	Trade Receivables -Assets Ratio
Trade Receivables	-0.01566***	0.01073**	0.18298	0.30329***
	(0.00555)	(0.00537)	(0.15779)	(0.10723)
Proxy of Trade Receivables * Year Dummy				
Year=1997	-0.06130***	-0.07009***	-2.79629***	-1.78546***
	(0.01127)	(0.00981)	(0.39259)	(0.23234)
Year=1998	-0.01697*	-0.02619***	-1.32647***	-0.52363***
	(0.01014)	(0.00956)	(0.31903)	(0.20325)
Observations	25,330	25,417	25,470	25,557
R-squared	0.09	0.09		
Pseudo R-squared			0.06	0.05
Log Likelihood			-16590.03	-16665.59

Note: Robust standard errors are in parentheses. Each regression includes regional dummies. 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.

Table 14: The Growth Rate of Trade Payables and Trade Receivables, Compared by Industry
(The coefficients of control variables are not reported)

Dependent variable	Trade Payables Growth Rate		Prob (Payables Growth ≥ 0)	
	(1)	(2)	(3)	(4)
Models	OLS	OLS	Logit	Logit
Industry	Transportation and Communications, Restaurants, Real Estate, Services			
Proxy of Trade Receivables	Trade Receivables Turnaround Period	Trade Receivables -Assets Ratio	Trade Receivables Turnaround Period	Trade Receivables -Assets Ratio
Trade Receivables	-0.01284***	0.00676**	-1.55448***	-0.64929***
	(0.00339)	(0.00300)	(0.11090)	(0.06988)
Proxy of Trade Receivables * Year Dummy				
Year=1997	-0.01958***	-0.02323***	-0.74770***	-0.29870**
	(0.00648)	(0.00572)	(0.23168)	(0.13731)
Year=1998	-0.02877***	-0.02941***	-1.03399***	-0.32632**
	(0.00657)	(0.00537)	(0.21570)	(0.12713)
Observations	62,996	63,416	63,273	63,699
R-squared	0.03	0.03		
Pseudo R-squared			0.08	0.07
Log Likelihood			-38661.86	-39118.41

Note: Robust standard errors are in parentheses. Each regression includes regional dummies. 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.

Table 15: The Growth Rate of Trade Payables and Credit Risk, Compared by Industry
(The coefficients of control variables are not reported)

Dependent Variable	Trade Payables Growth Rate			
	(1)	(2)	(3)	(4)
Models	OLS	OLS	OLS	OLS
Industry	Manufacturing			
Proxy of a Firm's Risk	Capital Deficiency$_1$	Capital Deficiency$_2$	Leverage	Total Loans -Sales Ratio
A Firm's Risk	-0.00209**	-0.00264***	-0.00597***	-0.00384***
	(0.00087)	(0.00096)	(0.00125)	(0.00032)
Proxy of a Firm's Risk * Year Dummy				
Year=1997	0.00201	0.00304*	0.00086	0.00269***
	(0.00166)	(0.00183)	(0.00247)	(0.00072)
Year=1998	0.00464***	0.00427**	-0.00011	0.00490***
	(0.00149)	(0.00166)	(0.00233)	(0.00068)
Observations	65,481	65,481	86,138	86,214
R-squared	0.16	0.16	0.15	0.15

Table 16: The Growth Rate of Trade Payables and Credit Risk, Compared by Industry
(The coefficients of control variables are not reported)

Dependent variable	Trade Payables Growth Rate			
	(1)	(2)	(3)	(4)
Models	OLS	OLS	OLS	OLS
Industry	Wholesales trade			
Proxy of a Firm's Risk	Capital Deficiency$_1$	Capital Deficiency$_2$	Leverage	Total Loans -Sales Ratio
A Firm's Risk	-0.00213	-0.00049	-0.00334	-0.00449***
	(0.00162)	(0.00191)	(0.00274)	(0.00058)
Proxy of a Firm's Risk * Year Dummy				
Year=1997	0.00159	-0.00103	-0.00692	0.00306***
	(0.00314)	(0.00389)	(0.00543)	(0.00114)
Year=1998	0.00009	-0.00214	-0.00712	0.00370***
	(0.00276)	(0.00341)	(0.00526)	(0.00117)
Observations	32,491	32,491	43,048	43,071
R-squared	0.15	0.15	0.15	0.15

Note: Robust standard errors are in parentheses. Each regression includes regional dummies. 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.

Table 17: The Growth Rate of Trade Payables and Credit Risk, Compared by Industry
(The coefficients of control variables are not reported)

Dependent Variable	Trade Payables Growth Rate			
	(1)	(2)	(3)	(4)
Models	OLS	OLS	OLS	OLS
Industry	Construction			
Proxy of a Firm's Risk	Capital Deficiency$_1$	Capital Deficiency$_2$	Leverage	Total Loans -Sales Ratio
A Firm's Risk	-0.00110	-0.00033	-0.00560***	-0.01084***
	(0.00173)	(0.00185)	(0.00210)	(0.00080)
Proxy of a Firm's Risk * Year Dummy				
Year=1997	-0.00321	-0.00107	-0.00426	0.00705***
	(0.00353)	(0.00384)	(0.00481)	(0.00185)
Year=1998	-0.00790**	-0.01130***	-0.01041**	0.00326
	(0.00308)	(0.00332)	(0.00407)	(0.00276)
Observations	34,052	34,052	45,759	45,831
R-squared	0.10	0.10	0.10	0.10

Table 18: The Growth Rate of Trade Payables and Credit Risk, Compared by Industry
(The coefficients of control variables are not reported)

Dependent Variable	Trade Payables Growth Rate			
	(1)	(2)	(3)	(4)
Models	OLS	OLS	OLS	OLS
Industry	Retail trade			
Proxy of a Firm's Risk	Capital Deficiency$_1$	Capital Deficiency$_2$	Leverage	Total Loans -Sales Ratio
A Firm's Risk	0.00091	0.00024	-0.00300*	-0.00256***
	(0.00133)	(0.00143)	(0.00158)	(0.00039)
Proxy of a Firm's Risk * Year Dummy				
Year=1997	-0.00076	-0.00122	0.00380	0.00329***
	(0.00249)	(0.00281)	(0.00391)	(0.00079)
Year=1998	-0.00584***	-0.00552**	-0.00606**	0.00006
	(0.00220)	(0.00247)	(0.00286)	(0.00093)
Observations	25,330	25,330	34,208	34,303
R-squared	0.09	0.09	0.08	0.08

Note: Robust standard errors are in parentheses. Each regression includes regional dummies. 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.

Table 19: The Growth Rate of Trade Payables and Credit Risk, Compared by Industry
(The coefficients of control variables are not reported)

Dependent variable	Trade Payables Growth Rate			
	(1)	(2)	(3)	(4)
Models	OLS	OLS	OLS	OLS
Industry	Transportation and Communications, Restaurants, Real estate, Services			
Proxy of a Firm's Risk	Capital Deficiency$_1$	Capital Deficiency$_2$	Leverage	Total Loans -Sales Ratio
A Firm's Risk	-0.00070	0.00005	0.00107	-0.00103***
	(0.00069)	(0.00075)	(0.00098)	(0.00007)
Proxy of a Firm's Risk * Year Dummy				
Year=1997	0.00121	0.00123	0.00005	0.00077***
	(0.00134)	(0.00149)	(0.00195)	(0.00012)
Year=1998	-0.00267**	-0.00418***	-0.00843***	0.00113***
	(0.00121)	(0.00132)	(0.00180)	(0.00012)
Observations	62,996	62,996	84,178	83,523
R-squared	0.03	0.03	0.03	0.03

Note: Robust standard errors are in parentheses. Each regression includes regional dummies. 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.