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Debt Structure and Bankruptcy of Financially Distressed Small Businesses*

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Abstract

Using a large sample of financially distressed small firms in Japan, we find that a distressed firm goes bankrupt faster if it uses proportionately more trade credits. Financially distressed firms experiencing a sharp decrease in trade payables are also more likely to go bankrupt. This suggests that coordination failure among a large number of dispersed trade creditors contributes to the bankruptcy of financially distressed firms. This finding supports the hypothesis that suppliers have an incentive to acquire credit information on distressed firms, and are able to do so more quickly than banks. Accordingly, they withdraw credits more quickly because trade credits, unlike bank loans, are unsecured.

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1. Introduction

This study investigates the relationship between debt structure and the choice of legal bankruptcy for financially distressed small businesses. Usually, financially distressed firms do not immediately go bankrupt, only a small number of them subsequently go bankrupt, and the remaining distressed firms survive. Many studies investigate the types of firms going bankrupt using data for listed large firms (for example, Franks and Torous (1994), Gilson et al. (1990)). However, most bankrupt firms are small firms, so empirical studies using financially distressed large businesses are not suitable for examining the relationship between debt structure and the choice of bankruptcy.

Since the problem of information gap between creditors and small firms is serious, many previous studies have argued that banks have an advantage in monitoring the creditworthiness of small firms. Therefore, they emphasize that banks play an important role in debt restructuring choices. For example, using a sample of small businesses, Helwege and Packer (2003) find that *keiretsu* banks neither prop up distressed firms that should fail, nor send distressed firms that should be rescued to bankruptcy. Similarly, Kang and Stultz (2000) find that the poor performance of firms affiliated with main banks is due to the poor health of the banks themselves. On the other hand, Franks and Sussman (2005) support the lazy bank hypothesis using data on financially distressed small businesses in the United Kingdom.

However, creditors of small businesses consist of not only banks, but also trade creditors. We focus on the differences between bank debt and trade credits, as well as the differences between bank debt and public debt. First, trade credits are unsecured and bank loans are secured. Hence, trade creditors make large losses if distressed firms go bankrupt. To avoid large losses, trade creditors then have a strong incentive to acquire credit information on the distressed firms (Fama (1990), Miwa and Ramseyer (2005)). Second, trade creditors have an information advantage over banks since trade creditors have networks for information

collection (Petersen and Rajan (1997)). Third, the number of trade creditors is large, so coordination among trade creditors in private debt restructurings is difficult (von Thaddén et al. (2003)). Therefore, trade creditors immediately refuse to extend credit to financially distressed firms.

For the above reasons, we expect that financially distressed firms that proportionately use more trade credit are more likely to choose bankruptcy than workouts. It also takes less time for them to go bankrupt because trade creditors have a strong incentive to withdraw unsecured credits from financially distressed firms as quickly as possible. Many studies on insolvency resolutions focus on the roles of banks.[1] In this paper, we explicitly investigate the effect of the fraction of trade credit on the bankruptcy of financially distressed firms.

We use the Credit Risk Database (CRD), a large panel of data on small businesses in Japan. The dataset provides the financial statements of small firms along with the date when a firm goes bankrupt, as well as other firm characteristics. Moreover, the CRD contains small business data after the late 1990s. Bankruptcy in Japan means that "either there was a court-approved filing for one of Japan's formal bankruptcy procedures, accompanied by a stay on debt payment and collection, or there was a public notice of 'suspension of bank transactions,' triggered by default on a promissory note." (Helwege and Packer (2003), p99).[2] The number of bankruptcy filings has been increasing in Japan since the late 1990s (Xu (2004b)), so this database contains a large amount of data on bankrupt firms.[3]

Using a sample of 176,104 corporations that suffered debt in excess of assets or ordinary losses for more than two consecutive years during the period 1996 to 2002, we find the following results. First, financially distressed firms are more

1 For example, Hoshi et al. (1990) show that Japanese main banks rescued some listed firms because they held credit information on them.
2 See also Xu (2004a) and Xu (2004b) for more detailed explanations of Japanese bankruptcy procedures.
3 Recently, Xu (2004a) and Xu (2004b) compared bankruptcy resolution under Corporate Reorganization and Civil Rehabilitation using a sample of bankrupt firms publicly traded before bankruptcy. Moreover, Xu (2005) analyzes the choices between workout and bankruptcy for large firms.

likely to go bankrupt quickly if they use proportionately more trade credits. Second, there is a sharp decrease in trade payables after financial distress and before bankruptcy. Third, financially distressed firms with a sharp decrease in trade payables are likely to go bankrupt. This suggests that coordination failure among a large number of dispersed trade creditors contributes to the bankruptcy of financially distressed firms. These findings support the hypothesis that suppliers have an incentive to acquire credit information on distressed firms and are able to do so more quickly than banks. Trade creditors also withdraw credits more quickly because trade credits, unlike bank loans, are unsecured. On the other hand, the trend in bank credit has no effect on the timing of bankruptcy. This finding is also consistent with our basic hypothesis.

This paper is organized as follows. In Section 2, we review the theoretical and empirical literature. We describe our dataset in Section 3 and explain the hypothesis and present the empirical results in Section 4. Section 5 provides some final remarks.

2. Bank Debt vs. Trade Credit

To the best of the authors' knowledge, there are few studies concerning bankruptcy in financially distressed small firms. Using data on small- to medium-sized UK companies, Franks and Sussman (2005) finds that banks rely heavily on the value of their collateral in timing the bankruptcy decision. Also, no evidence is found of credit runs. Using samples of large firms, a number of studies find that capital structure affects the debt restructuring process of distressed firms. For example, Franks and Torous (1994), Gilson et al. (1990), James (1995), and James (1996) find that distressed firms are more likely to restructure their debt privately if they owe more debt to banks and have fewer debt contracts. Recently, Xu (2005) found that firms are more likely to restructure troubled debt through court-led reorganization than workouts if the proportion of bonds in total debt is high. The above findings are consistent with the coordination failure hypothesis

for debt restructuring among a large number of dispersed small creditors, as analyzed in von Thaddén et al. (2003). Unfortunately, post-workout firms remain highly leveraged, with more than 30% of firms subsequently experiencing financial distress or bankruptcy (Gilson (1997)). This suggests that financially distressed firms that employ proportionately more bank debt tend to survive longer than their peers with a relatively high proportion of trade credit.

Bondholders are typical dispersed small creditors for large firms. When it comes to small and midsized firms, trade creditors are usually dispersed. Table 2 and Table 1 show the numbers of suppliers and banks for small businesses in Japan. Table 2 illustrates that most small firms have relationships with less than six banks. On the other hand, most small firms purchase from ten suppliers or more, and more than half of all small firms purchase from more than thirty suppliers (Table 1). These figures imply that trade creditors are dispersed creditors and banks are concentrated creditors. Therefore, coordination failure and holdout problems arise in the debt restructuring of distressed small and midsized firms that use proportionately more trade credit. Consequentially, firms tend to choose bankruptcy instead of workouts and go bankrupt faster.

Many studies, for instance, Diamond (1993), Diamond and Rajan (2000), and Diamond and Rajan (2001) assume that financial intermediation produces information about the creditworthiness of borrowers. However, as Welch (1997) and Miwa and Ramseyer (2005) state, bank loans are usually secured while trade credits are unsecured. In addition, Weiss (1990) and Xu (2004a) find that secured creditors make fewer losses, even if the borrowers go bankrupt. Therefore, secured creditors do not have a strong incentive to acquire credit information. In contrast, suppliers have large networks and thus are more able to collect credit information. As a consequence, trade creditors have a cost advantage over banks in monitoring (Petersen and Rajan (1997)). Because of a superior monitoring ability, suppliers can extend credit to small businesses that do not have enough assets to serve as collateral (Tsuruta (2007)). On the other hand, once a firm

becomes financially distressed, trade creditors withdraw credits as soon as they acquire credit information about the distressed firm. Because of cost advantages in information acquisition over banks, dispersed trade creditors are then able to cut back on trade credit to the distressed firms quicker than bank lenders. In sum, a financially distressed firm that proportionately uses more trade credit is more likely to go bankrupt in a shorter time.

3. Sample Selection

The data in this study are obtained from the Credit Risk Database for Small and Medium Enterprises in Japan (CRD). Financial institutions and Credit Guarantee Corporations established this database under the guidance of the Small Medium Enterprise Agency (SMEA) in Japan. Currently, it is managed by the CRD Association.[4] In Japan, Small and Medium Enterprises are defined by the Small and Medium Enterprise Basic Law.[5] The dataset provides financial statements and other firm characteristics. However, unlike the National Survey of Small Business Finances (NSSBF) conducted by the Board of Governors of the Federal Reserve System and the U.S. Small Business Administration (SBA), it does not contain information about the length or numbers of relationships with banks.

In this study, we define a financially distressed firm as a firm that suffered debt in excess of assets and ordinary losses for more than two consecutive years during the period 1996 to 2002. The sample consists of non-financial and non-agricultural corporations. As shown in Table 1, of 176,104 financially distressed firms, 2,782 firms subsequently went bankrupt and 66,538 firms dropped out of the database. In particular, more than half of the firms that suffered financial distress before 1999 are censored. The post-distress performance of the distressed firms is shown in Table 4. After financial distress, the median return on assets

4 See http://www.crd.ne.jp/ (in Japanese) for more information about the CRD.
5 See White Paper on Small and Medium Enterprises in Japan for a definition of Small and Medium Enterprises under the Small and Medium Enterprise Basic Law.

(ROA) of the surviving and noncensored firms improves. Most likely this is because financially distressed firms with poor performance afterwards are more likely to drop from the CRD. On the other hand, the ratio of total assets to total sales, a proxy for firm efficiency, worsens after firms suffer financial distress.

Table 5 shows the median growth rate of trade payables for firms suffering financial distress. Trade payables drop by more than 5% every year. Regardless of the improvement in ROA, median trade payable growth tends to decrease. On the other hand, the decline in the rate of bank loans after financial distress is small (Table 6). Similarly, looking at the median trade payable growth rates and total loans growth rates before bankruptcy in Table 7 and Table 8, we find that the amount of trade payable is more likely to decrease before bankruptcy. These results suggest that suppliers are more likely to cut back on trade credit to distressed firms. It is also consistent with the regression results used to estimate the hazard function for distressed firms in the next section.

4. Empirical Analysis

4.1 Econometric Specification

To investigate the effects of debt structure on the choice of bankruptcy failing, we employ duration analysis. Much of the recent literature on banking relationships has applied this method (for example, Ongena and Smith (2001)). Duration analysis focuses on the length of time until going bankrupt. We define T as the duration of the time spent in bankruptcy. The survival function is $S(t)= P\ (T \geq t)$, which is the probability of survival in time t. The survival function is also one minus the cumulative distribution function of T. The hazard function expresses the probability that firms choose bankruptcy filing. It is defined by:

$$\lambda(t) = lim_{t\to 0}\frac{P(t \leq T + \Delta t | T \geq t)}{\Delta t} = \frac{f(t)}{S(t)} . \qquad (1)$$

$f(t)$ is the density function of the distribution of t. $\lambda(t)$ is hazard rate at time t; that is, length of months after financial distress. To estimate hazard functions, we assume a proportional hazard specification, such that:

$$\lambda[t, \mathbf{X}(t), \beta] = lim_{t \to 0} \frac{P(t \leq T + \Delta t | T \geq t, \mathbf{X}(t), \beta)}{\Delta t} \quad (2)$$

$$= \lambda_0(t) \exp(\mathbf{X}(t)\beta) \text{ for all } t \geq 0, \lambda > 0. \quad (3)$$

$\mathbf{X}(t)$ is the set of time-varying explanatory variables at time t, including debt structure, firm size, note payables, collateral assets, performance, interest rates, and credit guarantee dummies. β is a vector of unknown parameters for the explanatory variables. $\lambda 0(t)$ is the baseline hazard that changes with respect to time t. We assume the baseline hazard function to be the Weibull hazard function, which is:

$$\lambda 0(t) = \lambda p(\lambda t)^{p-1}. \quad (4)$$

Equation (3) can also be estimated without specifying a functional form for the baseline hazard by using the Cox proportional hazards model. [6]

6 See Lancaster (1990) for detailed information about the Cox proportional hazards model.

4.2 Variables

We use the trade payables to total liability ratio as a proxy of debt structure. As mentioned earlier, trade creditors have a strong incentive to acquire information on the firms in distress. They also have a cost advantage in acquiring information. To avoid losses in bankruptcy, suppliers refuse to extend credit to distressed small firms before banks do so. We expect that firms with a higher trade credit ratio are more likely to go bankrupt than to restructure debt privately. Consequentially, these firms go bankrupt faster. We also expect that the trade credit growth rate has a negative effect on the hazard rate.

We now turn to the other explanatory variables to be included in Equation (3). First, studies on the life duration of new firms find that small firms are less likely to last (Caves (1998), Mata and Portugal (1994), and Audretsch and Mahmood (1995)). This is because managers of small firms are less talented and less experienced. The size of the firm signals the prior success and reputations of entrepreneurs. Smaller firms also have a higher proportion of variable costs and thus it is easier for them to exit. When it comes to financially distressed firms, however, a high proportion of trade credits may force larger firms to go bankrupt faster than smaller firms. The holdout problem among dispersed small creditors in private debt restructuring is more likely to occur when larger firms become financially distressed. In sum, and somewhat differently from the survival of new firms, the expected effect of firm size on the survival of financially distressed firms is ambiguous. We use the log of assets as a proxy for firm size.

The information about unpaid notes is made public by the clearinghouse if buyers default on notes payable. Since all banks halt their current account and lending transactions for two years with firms whose bills or checks have been dishonored twice during a six-month period, this default punishment is equivalent to business failure (Matsumura and Ryser (1995)). For these reasons, distressed firms that have more notes payables are more likely to go bankrupt, so we add the ratio of notes payable to trade

payables[7] as an explanatory variable. We expect that the notes payable–trade payables ratio has a positive effect on the hazard rate.

In general, banks are able to offer additional credit for firms with more collateral assets, even if the firm is distressed. In addition, if a firm has more cash, it can easily pay off its liabilities immediately to avoid bankruptcy. The cash to total liability ratio also serves as a proxy for liquidity. In short, if a distressed firm possesses more collateral assets or cash, it is able to raise additional outside funds, or to pay off its debt when due, and thus is more likely to last longer after financial distress. We measure collateral assets by the ratio of the sum of land and buildings to total liabilities and the ratio of cash to total liabilities.

To capture the extent of financial distress, we also include the asset turnover ratio (sales/assets) and the ratio of ordinary income to assets. A firm deep in financial distress is more likely to go bankrupt faster. In Japan, however, ordinary income on the financial statements of smaller firms may be underestimated relative to actual ordinary profits to secure corporate tax savings. For this reason, we include the product of firm size and the ratio of ordinary income to assets as explanatory variables. We predict that the effect of firm performance on the hazard rate is stronger for larger firms than smaller firms.

Some small and middle-sized firms borrow money from owner entrepreneurs. In general, entrepreneurs are less likely to withdraw credit and send firms bankrupt. The reason is that entrepreneurs not only lose their wealth and reputation, but also have to file for personal bankruptcy after the firms go bankrupt. However, data on the amount of loans from entrepreneurs are not available. As a proxy for loans from entrepreneurs, we use the ratio of interest expense to the sum of short-term debt, long-term debt, and discounted notes receivable. Generally, firms borrow money from the owner at lower interest rates. Therefore, the more a firm borrows from entrepreneurs, the lower the interest rate. An alternative is that lenders charge lower interest rates to viable distressed firms. In any case, a distressed

7 If a firm's trade payables are zero, we replace this ratio with zero.

firm charged a lower interest rate is more likely to avoid bankruptcy.

In Japan, the publicly-supported credit guarantee program provides important support for SME financing. Additionally, the Special Guarantee Program for the Financial Stabilization of SMEs was introduced from October 1999 to March 2001. Consequently, financially distressed SMEs with the support of credit guarantees are more likely to avoid bankruptcy. The credit guarantee dummy is equal to 1 if a SME's data are provided by a credit guarantee corporation, and 0 otherwise. The special credit guarantee dummy is equal to 1 if a SME's data were provided by a credit guarantee corporation in 1999 or 2000, and 0 otherwise.

4.3 Results

In Table 9, we summarize the expected signs of the explanatory variables. Industry dummy variables, regional dummy variables, and year dummy variables are also included in the estimation. Table 10 provides summary statistics of the variables. We use the sample of firms that have suffered debt excess and ordinary losses for more than two consecutive years in Tables 11-14.[8]

4.3.1 The Effects of Debt Structure

Table 11 details the results of the logit model and Table 12 the results of the Weibull hazard model. The results without the effect of credit guarantees are similar. The coefficients of the trade payables–total liability ratio are positive and statistically significant. These results imply that the probability of bankruptcy for trade credit dependent firms is higher than for bank dependent firms. We also estimate the coefficients of the trade payables–total liability ratio for the year when the firm became financially distressed (column (2)). The results suggest that the trade payables–total liability ratio has a positive effect on the choice of bankruptcy.

8 For robustness, we estimate using a sample of firms that suffered debt excess and ordinary losses for three consecutive years. The results using these firms are similar with the results in Tables 11-14.

To investigate whether credit run affects the incidence of bankruptcy, we add the rate of growth in trade credit to the explanatory variables. The coefficient of trade credit growth rate is not statistically significant (results not shown). However, if we divide the trade credit growth rate into two, one with a positive sign and the other with a negative sign, the coefficient with the negative trade credit growth is negative and statistically significant at the 1% level (column (3) of Table 12). This suggests that distressed firms are more likely to go bankrupt faster when suppliers cut trade credit to distressed firms. However, the coefficients with the positive trade credit growth are positive and statistically significant at the 1% level, which appears inconsistent with our hypothesis. If trade credits for a distressed firm are increasing, this may suggest that accommodation bills are drawn by other distressed firms. Clearly, more evidence is needed to interpret this puzzle.

On the other hand, the coefficients for the total loan–total liability ratio, which serves as a proxy for the bank loan ratio, is statistically negative at the 1% level (column (4) of Table 12). In addition, the coefficients of total loan growth are not statistically different from zero (column (5)). As discussed earlier, banks, in general, are secured lenders, so they can liquidate collateral assets if distressed firms become insolvent. They then have little incentive to cut back with credit for financially distressed firms since they do not make large losses. In addition, they can restructure debt through workouts more easily since the number of creditors is small. Consequently, firms with higher bank loan ratios do not choose bankruptcy filings. The results in columns (4) and (5) are consistent with this view.

4.3.2 The Effects of Other Explanatory Variables

Interestingly, larger distressed firms are less likely to last. The coefficients for log(assets) are positive and statistically significant at the 1% level. In contrast, Caves (1998), Mata and Portugal (1994), and Audretsch and Mahmood (1995) show larger new firms are more likely to last than smaller firms. These results are due to the following reasons. First, the number of trade creditors is higher for larger firms than smaller firms. If larger firms

experience financial distress, it is difficult for them to coordinate with trade creditors. Second, smaller firms are more likely to construct financial statements with ordinary losses and excess debt to save on corporate and personal tax payments, even if they are earning money. For some smaller firms, suffering debt in excess of assets and ordinary losses might then not actually be financial distress. This explanation is supported by the results in column (5) of Table 12.

The effects of the ordinary income–assets ratio are negative. Looking at the results in column (6) of Table 12, we find that the ordinary income–assets ratio*log(assets) has a significant effect on distressed firms' survival at the 1% level, while the coefficient on the ordinary income–assets ratio is insignificant. This means that the effect of profitability on survival depends on the size of the firm. The larger a firm is, the more correctly ordinary income equals actual profitability. In other words, smaller firms tend to report lower ordinary income and this deviates from actual profitability. If the product of the ordinary income–assets ratio and log(assets) is excluded from the explanatory variables, less profitable firms are less likely to last.

The coefficients for interest rate are positive and statistically significant at the 1% level. This can be interpreted as meaning that a distressed firm is more likely to last if it is able to borrow at lower interest rates. In general, interest rates tend to be lower if the entrepreneur lends more to the firm. In such cases, the entrepreneur has no incentive to withdraw credits and to send his/her own corporation bankrupt. As a consequence, a distressed firm is more likely to survive longer if it borrows more from its owner at lower interest rates. Even if a firm is suffering distress, it is able to borrow secured loans from banks if it is rich in collateral assets. As shown in Table 12, the coefficients of the proxies for collateral assets are negative and statistically significant in all specifications.

The credit guarantee dummy and the special guarantee dummy both have negative effects on the hazard rate if we estimate using the logit model (column (7) of Table 11). This supports the viewpoint that distressed SMEs with the support of public credit

guarantees are more likely to last longer. Moreover, the Special Guarantee System for the Financial Stabilization of Small Businesses strengthens this effect. These results also imply that the availability of public credit may distort the optimal timing of bankruptcy filings for small businesses. These results are not robust. If we estimate the Weibull survival model, the coefficients for credit guarantees are not statistically significant (column (6) and (7) of Table 12).

4.3.3 The Results of Other Models

For robustness, we estimate the Cox proportional hazards model in Table 13. The results for the trade payables and total loans are similar. We also estimate Equation (3) using the split-population hazard model. As shown in Table 3, many distressed firms are censored and do not choose bankruptcy filing. The duration analysis assumes that the event (bankruptcy) occurs for all firms if duration time (t) is sufficiently large. However, not all distressed firms become bankrupt, because some firms restructure their debt through workouts, or merge with more creditworthy firms. The split-population hazard model estimates the hazard rate without such specific assumptions.[9] Nonetheless, the results using the split-population hazard model are similar to the results of the Weibull survival model and the Cox proportional hazard model. These results imply that the trade payables–total liability ratio has a positive effect, and the total loan ratio–total liability ratio has a negative effect on hazard rates. In addition, if trade creditors cut back their credit, distressed firms are likely to choose bankruptcy filing.

9 See Schmidt and Witte (1989) for a more detailed discussion of the split-population hazard model.

5. Conclusion and Remarks

In this paper, we analyze the influence of debt structure on the bankruptcy of financially distressed small firms in Japan. Distressed small firms using more trade credits are less likely to last. There is also a sharp decrease in trade payables before a distressed firm goes bankrupt. This suggests that coordination failure among the large number of dispersed trade creditors contributes to bankruptcy in distressed firms. In addition, this finding supports the hypothesis that suppliers are eager and able to acquire credit information on distressed firms faster than banks and thus withdraw credit quickly because trade credits, unlike bank loans, are usually unsecured.

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Table 1: Number of Suppliers used by Small Firms in Japan

(%)

	1-10	11-30	31-50	51-100	101-200	201-
All Firms	12.60	21.50	21.20	21.50	14.00	9.20
Manufacturers	12.90	22.60	23.60	22.00	13.30	5.50
Nonmanufacturers	12.40	20.50	19.10	21.00	14.50	12.40

Source: Shoko Chukin Bank (2004), "*Chusho kigyou no keiei jittai tou nikansuru chousa*" (a research paper about management strategy in SMEs).

Table 2: 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*

Table 3: The Number of Bankrupt Firms and Surviving Firms

	the year when firms suffer financially distress							
	1996	1997	1998	1999	2000	2001	2002	T
Bankrupt Firms	357	363	351	506	458	500	247	2
go bankrupt in less than 1 year	30	24	21	77	135	263	247	
go bankrupt in 1–2 years	41	36	58	148	193	237		
go bankrupt in 2–3 years	62	63	92	155	130			
go bankrupt in 3–4 years	47	92	103	126				
go bankrupt in 4–5 years	58	76	77					
go bankrupt in 5–6 years	73	72						
go bankrupt in over 6 years	46							
Surviving firms	11,134	16,185	19,663	26,719	31,640	36,150	31,831	173
Not-censored samples	4,047	6,394	7,223	12,465	18,699	26,125	31,831	106
Censored samples	7,087	9,791	12,440	14,254	12,941	10,025		66
Total	11,491	16,548	20,014	27,225	32,098	36,650	32,078	176

Table 4: Performance After Financial Distress

Year after Distressed	Number of samples	ROA	Total Sales /Total Assets
0	176,104	-0.088	1.703
1	107,759	-0.020	1.680
2	70,369	-0.005	1.625
3	44,852	0.000	1.571
4	26,598	0.005	1.519
5	15,235	0.007	1.427
6	5,456	0.006	1.327
Total	446,373	-0.040	1.647

Note: We show the median number of each variable, except for the sample number.

Table 5: Growth Rate of Trade Payables After Financial Distress

Year after	The Amount of Liability			
Distressed	-100M	100M–500M	500M-	Total
1	-6.66%	-4.55%	-5.15%	-5.75%
2	-9.00%	-6.89%	-7.75%	-8.07%
3	-8.40%	-6.32%	-4.95%	-7.03%
4	-8.90%	-5.00%	-2.45%	-6.37%
5	-9.45%	-7.01%	-5.72%	-7.91%
6	-11.29%	-7.29%	-6.40%	-8.69%
Total	-8.04%	-5.75%	-5.52%	-6.81%

Note: We define the growth rate as $(xt-xt-1)/xt-1$. We show only the median number of growth rates since the distribution is skewed. The "-100M" group includes firms whose liabilities were less than 100 million yen, the "100M–500M" group includes firms whose liabilities were less than 500 million yen and more than 100 million yen, and the "500M-" group includes firms whose liabilities were more than 500 million yen.

Table 6: Growth Rate of Total Loans After Financial Distress

Year after	The Amount of Liability			
Distressed	-100M	100M–500M	500M-	Total
1	-0.50%	-1.20%	-1.76%	-0.98%
2	-1.45%	-1.38%	-1.71%	-1.48%
3	-2.01%	-1.77%	-2.06%	-1.93%
4	-2.57%	-2.24%	-2.36%	-2.41%
5	-3.22%	-2.65%	-2.48%	-2.80%
6	-3.52%	-3.15%	-2.27%	-3.05%
Total	-1.40%	-1.64%	-1.97%	-1.60%

Note: We define the growth rate as $(xt-xt-1)/xt-1$. We show only the median number of growth rates since the distribution is skewed. The "-100M" group includes firms whose liabilities were less than 100 million yen, the "100M–500M" group includes firms whose liabilities were less than 500 million yen and more than 100 million yen, and the "500M-" group includes firms whose liabilities were more than 500 million yen.

Table 7: Growth Rate of Trade Payables Before the Bankruptcy

Year before	The Amount of Liability			
Bankruptcy	-100M	100M–500M	500M-	Total
0	-4.21%	-3.00%	-8.61%	-4.52%
1	-5.11%	-6.89%	-8.41%	-6.81%
2	1.55%	-5.51%	-4.37%	-3.65%
3	-7.37%	-6.36%	-7.26%	-7.14%
4	-16.91%	-6.58%	-2.28%	-6.53%
Total	-4.21%	-4.61%	-7.25%	-5.40%

Note: We define the growth rate as $(xt-xt-1)/xt-1$. We show only the median number of growth rates since the distribution is skewed. The "-100M" group includes firms whose liabilities were less than 100 million yen, the "100M–500M" group includes firms whose liabilities were less than 500 million yen and more than 100 million yen, and the "500M-" group includes firms whose liabilities were more than 500 million yen.

Table 8: Growth Rate of Total Loans Before Bankruptcy

Year before	The Amount of Liability			
Bankruptcy	-100M	100M–500M	500M-	Total
0	-2.37%	-2.18%	-1.80%	-2.10%
1	-0.34%	-1.81%	-0.71%	-1.07%
2	1.38%	-0.57%	-1.38%	-0.81%
3	6.06%	0.02%	-0.34%	0.75%
4	2.83%	2.45%	-0.73%	1.26%
Total	0.05%	-1.25%	-1.06%	-1.02%

Note: We define the growth rate as $(xt-xt-1)/xt-1$. We show only the median number of growth rates since the distribution is skewed. The "-100M" group includes firms whose liabilities were less than 100 million yen, the "100M–500M" group includes firms whose liabilities were less than 500 million yen and more than 100 million yen, and the "500M-" group includes firms whose liabilities were more than 500 million yen.

Table 9: Expected Signs

Explanatory Variables	Expected Signs
Log(Assets)	+ or -
Log(1+Age)	+ or -
Interest Rate	+
Trade Payables/Total Liability	+
Trade Payables Growth	-
Total Loans/Total Liability	-
Notes Payable/Trade Payables	+
(Land Buildings)/Total liability	-
Cash/Total liability	-
Ordinary Income/Assets	-
Sales/Assets	-
Credit Guarantee	-
Special Credit Guarantee	-

Table 10: Summary Statistics Legal Bankruptcy

Variable	Obs	Mean	Std. Dev.	Min	25%	50%	75%	Max
Legal Bankruptcy	270,269	0.007	0.085	0.000	0.000	0.000	0.000	1.000
Log(Assets)	270,269	10.895	1.460	0.000	9.908	10.761	11.728	20.602
Log(1+Firm Age)	249,900	3.028	0.661	0.000	2.565	3.091	3.555	7.602
Interest Rate	229,958	2.735	34.983	0.000	1.539	2.436	3.230	15828.950
Trade Payables–Total Liability ratio	250,085	0.112	0.141	0.000	0.010	0.060	0.161	1.000
Trade Payables Growth	234,122	0.013	2.155	-13.274	-0.031	0.000	0.014	863.509
Total Loans–Total Liability ratio	250,085	0.754	0.204	0.000	0.649	0.810	0.912	1.000
Total Loan Growth	234,122	0.154	30.917	-126.695	-0.096	-0.017	0.078	14261.590
Notes Payable/Trade Payables	250,089	0.243	0.349	0.000	0.000	0.000	0.547	1.000
(Land+Buildings)/Total Liability	249,614	0.319	8.726	0.000	0.074	0.196	0.400	4259.500
Cash/Total Liability	266,260	0.085	0.148	0.000	0.018	0.050	0.114	42.387
Ordinary Income/Assets	250,083	-0.077	6.920	-3403.500	-0.104	-0.007	0.043	22.895
Sales/Assets	270,269	2.163	11.146	0.000	0.891	1.611	2.681	4792.718
Credit Guarantee	270,269	0.490	0.500	0.000	0.000	0.000	1.000	1.000
Special Credit Guarantee	270,269	0.143	0.350	0.000	0.000	0.000	0.000	1.000

Table 11: Logit Model

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Logit Model						
	Sample: Excess of debts and ordinary losses for more than two consecutive terms						
Trade Payables–Total Liability ratio	1.523***		1.328***			1.510***	1.583***
	(0.183)		(0.203)			(0.184)	(0.188)
Trade Payables–Total Liability ratio		0.894***					
(at the year of becoming distressed)		(0.183)					
Trade Payables Growth			0.752***				
if Growth Rate is Positive			(0.215)				
Trade Payables Growth			-1.472***				
if Growth Rate is Negative			(0.350)				
Total Loans–Total Liability ratio				-0.671***	-0.684***		
				(0.152)	(0.155)		
Total Loan Growth					-0.073		
if Growth Rate is Positive					(0.152)		
Total Loan Growth					-0.232		
if Growth Rate is Negative					(0.186)		
Log(Assets)	0.373***	0.388***	0.382***	0.395***	0.401***	0.365***	0.376***
	(0.021)	(0.020)	(0.021)	(0.020)	(0.021)	(0.021)	(0.021)
Log(1+Firm Age)	0.051	0.031	0.062	0.027	0.021	0.049	0.047
	(0.046)	(0.046)	(0.047)	(0.046)	(0.047)	(0.046)	(0.047)
Interest Rate	0.123***	0.134***	0.122***	0.128***	0.126***	0.123***	0.124***
	(0.009)	(0.009)	(0.010)	(0.009)	(0.010)	(0.009)	(0.010)
Notes Payable/Trade Payables	0.661***	0.713***	0.620***	0.757***	0.741***	0.665***	0.638***
	(0.077)	(0.077)	(0.079)	(0.075)	(0.077)	(0.077)	(0.079)
(Land+Buildings)/Total Liability	-1.046***	-1.043***	-1.009***	-1.149***	-1.143***	-1.015***	-1.036***
	(0.118)	(0.119)	(0.118)	(0.119)	(0.121)	(0.117)	(0.119)
Cash/Total Liability	-8.089***	-7.804***	-7.972***	-7.810***	-7.757***	-8.097***	-8.063***
	(0.533)	(0.526)	(0.545)	(0.525)	(0.538)	(0.532)	(0.546)
Ordinary Income/Assets	-0.731***	-0.682***	-0.737***	-0.667***	-0.713***	1.767***	-0.768***
	(0.107)	(0.107)	(0.109)	(0.107)	(0.111)	(0.728)	(0.108)
Ordinary Income/Assets*Log(Assets)						-0.251***	
						(0.069)	
Sales/Assets	-0.131***	-0.101***	-0.153***	-0.103***	-0.113***	-0.123***	-0.141***
	(0.026)	(0.025)	(0.027)	(0.025)	(0.026)	(0.026)	(0.027)
Credit Guarantee	-0.264***	-0.242***	-0.327***	-0.256***	-0.314***	-0.267***	-0.241***
	(0.057)	(0.057)	(0.060)	(0.057)	(0.060)	(0.057)	(0.066)
Credit Guarantee*SG Dummy							-0.414***
							(0.150)
Industry Dummies	yes	yes	yes	yes	yes	yes	yes
Year Dummies	yes	yes	yes	yes	yes	yes	yes
Regional Dummies	yes	yes	yes	yes	yes	yes	yes
Sample	205,488	205,488	199,348	205,488	199,376	205,488	205,488

Note: Standard errors are in parentheses. “Interest rate” is the ratio of a firm’s interest expenses to the sum of its short-term debt, long-term debt, and discounted notes receivable. 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 12: Parametric Hazard Model

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Parametric Hazards Model (Weibull Distribution)						
	Sample: Excess of debts and ordinary losses for more than two consecutive terms						
Trade Payables–Total Liability ratio	1.543***		1.357***			1.538***	1.543***
	(0.179)		(0.198)			(0.178)	(0.179)
Trade Payables–Total Liability ratio		0.869***					
(at the year of becoming distressed)		(0.176)					
Trade Payables Growth			0.728***				
if Growth Rate is Positive			(0.207)				
Trade Payables Growth			-1.266***				
if Growth Rate is Negative			(0.345)				
Total Loans–Total Liability ratio				-0.684***	-0.698***		
				(0.149)	(0.153)		
Total Loan Growth					-0.148		
if Growth Rate is Positive					(0.152)		
Total Loan Growth					-0.128		
if Growth Rate is Negative					(0.183)		
Log(Assets)	0.342***	0.359***	0.349***	0.366***	0.368***	0.334***	0.342***
	(0.020)	(0.020)	(0.021)	(0.020)	(0.020)	(0.020)	(0.020)
Log(1+Firm Age)	-0.038	-0.058	-0.015	-0.064	-0.056	-0.042	-0.041
	(0.046)	(0.046)	(0.047)	(0.046)	(0.047)	(0.046)	(0.046)
Interest Rate	0.112***	0.124***	0.111***	0.118***	0.117***	0.110***	0.112***
	(0.009)	(0.008)	(0.009)	(0.009)	(0.009)	(0.008)	(0.009)
Notes Payable/Trade Payables	0.634***	0.690***	0.594***	0.732***	0.710***	0.639***	0.635***
	(0.076)	(0.076)	(0.078)	(0.074)	(0.076)	(0.076)	(0.076)
(Land+Buildings)/Total Liability	-0.996***	-0.990***	-0.977***	-1.106***	-1.120***	-0.962***	-0.991***
	(0.115)	(0.116)	(0.116)	(0.117)	(0.119)	(0.115)	(0.115)
Cash/Total Liability	-7.582***	-7.278***	-7.472***	-7.297***	-7.247***	-7.597***	-7.581***
	(0.524)	(0.517)	(0.536)	(0.516)	(0.529)	(0.523)	(0.524)
Ordinary Income/Assets	-0.776***	-0.726***	-0.780***	-0.711***	-0.764***	1.702***	-0.776***
	(0.102)	(0.102)	(0.104)	(0.102)	(0.106)	(0.647)	(0.102)
Ordinary Income/Assets*Log(Assets)						-0.247***	
						(0.061)	
Sales/Assets	-0.127***	-0.095***	-0.146***	-0.100***	-0.107***	-0.119***	-0.128***
	(0.026)	(0.024)	(0.027)	(0.025)	(0.025)	(0.026)	(0.026)
Credit Guarantee	-0.087	-0.062	-0.110*	-0.079	-0.095	-0.088	-0.019
	(0.058)	(0.059)	(0.061)	(0.058)	(0.061)	(0.058)	(0.064)
Credit Guarantee*SG Dummy							-0.356**
							(0.143)
Industry Dummies	yes	yes	yes	yes	yes	yes	yes
Year Dummies	yes	yes	yes	yes	yes	yes	yes
Regional Dummies	yes	yes	yes	yes	yes	yes	yes
Sample	205,488	205,488	199,348	205,488	199,376	205,488	205,488

Note: Standard errors are in parentheses. “Interest rate” is the ratio of a firm’s interest expenses to the sum of its short-term debt, long-term debt, and discounted notes receivable. 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 13: Cox Proportional Hazards Model

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Cox Proportional Hazards Model						
	Sample: Excess of debts and ordinary losses for more than two consecutive terms						
Trade Payables–Total Liability ratio	1.483***		1.304***			1.475***	1.482***
	(0.179)		(0.199)			(0.179)	(0.179)
Trade Payables–Total Liability ratio		0.930***					
(at the year of becoming distressed)		(0.178)					
Trade Payables Growth			0.675***				
if Growth Rate is Positive			(0.209)				
Trade Payables Growth			-1.339***				
if Growth Rate is Negative			(0.345)				
Total Loans–Total Liability ratio				-0.658***	-0.670***		
				(0.149)	(0.153)		
Total Loan Growth					-0.129		
if Growth Rate is Positive					(0.152)		
Total Loan Growth					-0.167		
if Growth Rate is Negative					(0.184)		
Log(Assets)	0.365***	0.379***	0.374***	0.387***	0.392***	0.357***	0.365***
	(0.020)	(0.020)	(0.021)	(0.019)	(0.020)	(0.020)	(0.020)
Log(1+Firm Age)	0.038	0.022	0.058	0.015	0.018	0.036	0.035
	(0.046)	(0.046)	(0.047)	(0.046)	(0.047)	(0.046)	(0.046)
Interest Rate	0.115***	0.125***	0.114***	0.121***	0.119***	0.114***	0.115***
	(0.009)	(0.008)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Notes Payable/Trade Payables	0.661***	0.705***	0.619***	0.754***	0.733***	0.666***	0.662***
	(0.076)	(0.076)	(0.078)	(0.074)	(0.076)	(0.076)	(0.076)
(Land+Buildings)/Total Liability	-0.996***	-0.994***	-0.977***	-1.101***	-1.114***	-0.966***	-0.993***
	(0.115)	(0.116)	(0.116)	(0.117)	(0.119)	(0.115)	(0.115)
Cash/Total Liability	-7.923***	-7.660***	-7.829***	-7.653***	-7.619***	-7.932***	-7.923***
	(0.528)	(0.522)	(0.541)	(0.521)	(0.534)	(0.528)	(0.528)
Ordinary Income/Assets	-0.721***	-0.674***	-0.719***	-0.658***	-0.706***	1.472***	-0.720***
	(0.105)	(0.105)	(0.107)	(0.106)	(0.109)	(0.640)	(0.105)
Ordinary Income/Assets*Log(Assets)						-0.219***	
						(0.060)	
Sales/Assets	-0.128***	-0.100***	-0.147***	-0.101***	-0.109***	-0.120***	-0.128***
	(0.026)	(0.025)	(0.027)	(0.025)	(0.026)	(0.026)	(0.026)
Credit Guarantee	-0.325***	-0.305***	-0.363***	-0.320***	-0.352***	-0.325***	-0.249***
	(0.058)	(0.058)	(0.061)	(0.058)	(0.061)	(0.058)	(0.064)
Credit Guarantee*SG Dummy							-0.384***
							(0.144)
Industry Dummies	yes	yes	yes	yes	yes	yes	yes
Year Dummies	yes	yes	yes	yes	yes	yes	yes
Regional Dummies	yes	yes	yes	yes	yes	yes	yes
Sample	205,488	205,488	199,348	205,488	199,376	205,488	205,488

Note: Standard errors are in parentheses. “Interest rate” is the ratio of a firm’s interest expenses to the sum of its short-term debt, long-term debt, and discounted notes receivable. 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 14: Split-Population Hazard Model

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Split-Population Hazard Model						
	Sample: Excess of debts and ordinary losses for more than two consecutive terms						
Trade Payables–Total Liability ratio	1.597***		1.413***			1.575***	1.662***
	(0.194)		(0.214)			(0.195)	(0.198)
Trade Payables–Total Liability ratio		0.974***					
(at the year of becoming distressed)		(0.196)					
Trade Payables Growth			0.726***				
if Growth Rate is Positive			(0.220)				
Trade Payables Growth			-1.509***				
if Growth Rate is Negative			(0.345)				
Total Loans–Total Liability ratio				-0.699***	-0.715***		
				(0.158)	(0.161)		
Total Loan Growth					-0.064		
if Growth Rate is Positive					(0.153)		
Total Loan Growth					-0.217		
if Growth Rate is Negative					(0.192)		
Log(Assets)	0.397***	0.420***	0.402***	0.428***	0.429***	0.389***	0.395***
	(0.024)	(0.025)	(0.024)	(0.025)	(0.025)	(0.024)	(0.024)
Log(1+Firm Age)	0.050	0.028	0.061	0.024	0.018	0.046	0.046
	(0.047)	(0.047)	(0.048)	(0.047)	(0.048)	(0.047)	(0.048)
Interest Rate	0.133***	0.147***	0.130***	0.138***	0.135***	0.133***	0.131***
	(0.011)	(0.011)	(0.011)	(0.011)	(0.012)	(0.011)	(0.011)
Notes Payable/Trade Payables	0.668***	0.721***	0.621***	0.773***	0.754***	0.668***	0.641***
	(0.080)	(0.081)	(0.081)	(0.078)	(0.080)	(0.080)	(0.081)
(Land+Buildings)/Total Liability	-1.101***	-1.112***	-1.056***	-1.221***	-1.208***	-1.069***	-1.083***
	(0.124)	(0.126)	(0.124)	(0.127)	(0.129)	(0.124)	(0.125)
Cash/Total Liability	-8.226***	-7.963***	-8.084***	-7.981***	-7.900***	-8.230***	-8.172***
	(0.542)	(0.538)	(0.554)	(0.537)	(0.549)	(0.542)	(0.554)
Ordinary Income/Assets	-0.736***	-0.700***	-0.744***	-0.679***	-0.718***	2.439***	-0.768***
	(0.109)	(0.110)	(0.110)	(0.110)	(0.113)	(1.038)	(0.110)
Ordinary Income/Assets*Log(Assets)						-0.321***	
						(0.102)	
Sales/Assets	-0.131***	-0.101***	-0.155***	-0.102***	-0.112***	-0.123***	-0.142***
	(0.027)	(0.026)	(0.028)	(0.026)	(0.027)	(0.027)	(0.028)
Credit Guarantee	-0.287***	-0.256***	-0.341***	-0.272***	-0.332***	-0.281***	-0.261***
	(0.059)	(0.059)	(0.061)	(0.059)	(0.062)	(0.059)	(0.067)
Credit Guarantee*SG Dummy							-0.389***
							(0.151)
Industry Dummies	yes	yes	yes	yes	yes	yes	yes
Year Dummies	yes	yes	yes	yes	yes	yes	yes
Regional Dummies	yes	yes	yes	yes	yes	yes	yes
Sample	205,488	205,488	199,348	205,488	199,376	205,488	205,488

Note: Standard errors are in parentheses. “Interest rate” is the ratio of a firm’s interest expenses to the sum of its short-term debt, long-term debt, and discounted notes receivable. 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