Impaired Bank Health and Default Risk *

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Abstract

Empirical studies in corporate finance have long been interested in the role of bank in reducing the costs of financial distress. The purpose of this paper is to investigate how various measures of bank health as well as defaults of major trading partners affected probability of bankruptcy of medium size firms in Japan. Using probit models, we examine the causes of bankruptcy for unlisted Japanese companies in the late 1990s and the early 2000s. The environment and events in Japan provide a "natural experiment" that allows the empirical test. We find that several measures on bank-specific financial health have significant impacts on borrower's probability of bankruptcy, even when observable characteristics relating to these borrower's financial variables are controlled for. In particular, a close bank-firm relationship, which usually reduces the probability of bankruptcy, exacerbates the impacts under the financial crisis that damaged the bank health measures substantially.

Key words: Bankruptcy, Bank-firm relationship, Hold-up problem, Unlisted firms
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1. Introduction

Empirical studies in corporate finance have long been interested in the role of bank in reducing the costs of financial distress. One strand of research reveals indirect evidence on benefits of close bank-firm relationships. Using firm-level data in Japan, Hoshi, Kashyap, and Scharfstein (1990) demonstrated the role of bank in reducing the costs of financial distress for firms that are members of a *keiretsu* (corporate group linked through one main bank). The role of the main bank is particularly important during times of distress, when it changes the affiliated firm's management and the board directors (Kang and Shivdasani [1995]; Morck and Nakamura [1999]). Information gathering and monitoring performed by banks may help to overcome informational free-rider problems associated with diffuse debt-holding. Firms with strong bank-firm relationships may be able to overcome financial distress better, giving such firms a more stable, informed, and committed source of financing (Hall and Weinstein [2000]). Using data on small U.S. firms, authors such as Petersen and Rajan (1994) and Berger and Udell (1995) showed that a close bank relationship increases credit availability for small borrowers. Several other studies also suggest that small businesses benefit from a close bank relationship in European countries.[1]

Banking relationships, however, have a cost. As a firm works more closely with a bank, it finds it harder to raise funds through other means and may be held up by the bank (Sharpe [1990], Rajan [1992]). The proprietary information about borrowers that banks obtain through their relationships may give them an information monopoly. To the extent that the information monopoly makes switching the bank-firm relationship difficult, bank-specific financial health might affect a borrower's cost of funds, even when observable characteristics relating to borrower risk are controlled for. While bank-firm relationships have been found to be important in the United States, such links are likely to be even more important in a country that is far more reliant on bank financing, such as Japan. In particular, deteriorating bank health would have much larger impacts on small and medium firms that relied on a close bank relationship in reducing the costs of financial distress.

The purpose of this paper is to investigate how financial health of banks as well as defaults of major trading partners affected probability of bankruptcy of medium size firms in Japan. The environment and events in Japan provide a "natural experiment" that allows the empirical test. First, because of the importance of the main bank system, many Japanese firms rely more on bank finance. While the role of banks became relatively smaller for larger companies in the 1990s, banks still kept playing a

[1] See, for example, Harhoff and Körting (1998) and Ferri and Messori (2000)

dominant role in the financing of smaller firms. Second, Japan experienced a dramatic collapse in the financial condition of its banking system in the 1990s. We should thus be better able to identify the impacts of negative shocks on default risk when a large amount of losses on disposal of non-performing loans damaged financial health of many banks in the late 1990s. Third, suitable data are available to test the hypothesis based on bank- and firm-level data. We obtained a detailed list of major lenders for each unlisted company from Tokyo Shoko Research (TSR) Database Service. We then matched borrowers' financial data to the relevant financial data of the "main banks".

A strand of empirical research has supported that a close bank relationship had a cost when bank health deteriorated in Japan. Gibson (1995) found that firm investment was sensitive to the main bank's rating. Kang and Stulz (2000) showed that firms that relied more on bank finance suffered significantly larger wealth losses during the first 3 years of the 1990s. Klein, Peek, and Rosengren (2002) found that financial difficulties of Japanese banks reduced the number of FDI projects by Japanese firms into the United States.[2] All of these studies, however, used the data set on listed firms, so that their implications were relevant only for large firms in Japan. Previous studies thus say little about how large impacts the bank health had on default risk of small and medium borrowers. The use of the firm-level data of unlisted firms is useful in detecting the effects of bank health on its borrower's default risk because unlisted firms not only have stronger reliance on bank finance but also face higher default risk. In addition, reverse causality from firms to banks will be less of a problem in a firm-level regression for unlisted firms than for listed firms. The firm's default may damage the bank financial health if the firm's loans from its bank were substantial to the bank's capital. This is likely for some listed firms but less likely for unlisted firms. The use of unlisted firms' data thus allows us to avoid possible simultaneous bias without using ad hoc instrument variables.

In investigating the impacts of bank health on probability of bankruptcy, we explore the causes of two types of bankruptcies: the "bankruptcy for liquidation purposes" aimed at company liquidation (extinction) and the "bankruptcy for reconstruction purposes" whereby the company pays off its debts while remaining in business. Incorporating recent contributions on multinomial probit models, we estimate a trinomial probit model as well as a binominal probit model for a sample of 6266 unlisted

[2] In other related studies, authors such as Ito and Sasaki, (2002) and Woo (2003) explored the existence of "capital crunch" by using the data of individual Japanese Banks.

Japanese companies in the late 1990s and the early 2000s. Previous empirical studies have found that a company is more likely to fail if it is unprofitable, highly leveraged, and suffers cash-flow difficulties.[3] Our probit models confirm this standard result. We, however, find that several measures on bank-specific financial health as well as defaults of major trading partners have additional impacts on borrower's probability of bankruptcy, even when observable characteristics relating to these borrower's financial variables are controlled for.

In previous literature, there are several studies that investigated performance of small and medium firms using the firm-level data of unlisted firms in Japan. In particular, authors such as Omura et al. (2002) and Saito and Tachibanaki (2004) investigated determinants of defaults of unlisted firms in Japan. These previous studies, however, did not explore the bank effects on borrowers' performance by using a matched sample of borrowers and banks.[4] Our study is thus new in showing that several measures on bank-specific financial health such as ratios of nonperforming loans have additional impacts on borrower's probability of bankruptcy in Japan.

To measure the bank health, we use three alternative measures: (i) ratios of nonperforming loans (NPLs), (ii) stock prices, and (iii) bank failures. For comparison, we also investigate the impacts of defaults of parent companies and other major trade partners. Among the three bank health measures, ratios of NPLs are backward-looking and are only loosely related to a bank's economic value. We, in contrast, find that the backward-looking measure had as significant impacts as the forward-looking stock prices. This suggests that deterioration of both backward-looking and forward-looking measures had been important in tightening the bank's lending attitude and in increasing the borrowers' default risk under the financial turbulence in Japan. We find that failures of the main banks had no significant impact on borrower's probability of bankruptcy. Defaults of parent companies and other major trading partners, however, had very large impacts on borrower's probability of bankruptcy. This implies that defaults of non-financial firms had contagious effects in increasing default risk of vertically related smaller firms in the late 1990s and the early 2000s in Japan.

A noteworthy finding in the paper is that multiple banking relationships had two

[3] Altman (1968) is one of the earliest studies. Recent contributions include Lennox (1999), Shumway (2001), and Hillegeist, Keating, Cram, and Lundstedt (2003).
[4] Schaede (2005) discussed the financial system on small-firm financing in Japan. Fukuda, Kasuya, and Nakajima (2005) investigated the relationship between financial distress and corporate investment in Japan by using firm-level data. They, however, did not examine impacts of bank health on borrowers' default risk.

opposite impacts on borrower's probability of bankruptcy. We find that multiple bank relationships worsened the default risk of borrowing firms but reduced the hold-up problem. The result is a reconfirmation of previous finding by Houston and James (2001) that investigated the similar issue in a different framework. A bank-firm relationship becomes loose when the firm borrows from multiple banks. To the extent that the relation reduces the costs of financial distress, the number of banks lenders would have a negative correlation with the probability of bankruptcy. However, a hold-up problem under a close bank-firm relationship intensifies the link between bank-specific financial health and a borrower's cost of funds. The impacts of the bank health measures under the financial crisis would thus be mitigated when the number of bank lenders is large.

Our paper proceeds as follows. After presenting our hypothesis in Section 2, Section 3 specifies the basic model and explains our data. Section 4 reports our main empirical results. Section 5 provides our interpretations on the marginal impacts of the bank health deterioration on bankruptcy probabilities. Section 6 explores the impacts of multiple banking relationships. Section 7 summarizes our main results and refers to their implications.

2. Outline of the Model

(1) The Motivation and the Hypothesis

After the crash of the stock market, the number of bankruptcy in Japan steadily increased throughout the 1990s and the total amount of debt outstanding of bankrupt firms had its peak in 2000 (Figure 1). The number of bankruptcy was very moderate for listed companies. In contrast, there were dramatic increases of bankruptcies for small and medium firms in the late 1990s and in the early 2000s. Low profitability of small and medium firms might be one of the sources of their bankruptcy. The strong reliance on bank finance would, however, be another source that makes them harder to access alternative sources of funding.

The "Tankan Survey" of the Bank of Japan shows that lending attitudes of financial institutions became very tight in the late 1990s. The lending attitudes for large companies were, however, tight only temporarily. The tight attitudes for small and medium companies, in contrast, persisted and showed slow recovery throughout the 1990s and the early 2000s (Figure 2). The evidence supports the view that small and medium companies have more serious problems in finding alternative sources of funding during the financial turbulence.

Since the early 1990s, the Japanese banking sector had faced considerable problems deteriorating their loans. The problems became particularly serious in the late 1990s when several major financial institutions turned out to be in default. To the extent that the bank health does matter, deterioration of the bank health would tighten the bank's lending attitude and might increase the borrowers' default risk particularly for smaller firms. The hypothesis we will test in the following analysis is how large impacts several measures of the bank health had on probability of bankruptcy of unlisted firms in Japan in the late 1990s and the early 2000s.

In the analysis, we test directly the effects of a variety of bank's health measures on default risks of unlisted borrowing firms in Japan. According to previous empirical studies, a firm has a larger default risk when it has larger debt-asset ratio, larger interest payments, and smaller profits. In the following model, we include these borrower's financial variables as benchmark explanatory variables. We then add several bank-related variables to allow the identity of its main bank to affect a firm's default risk.

(2) Definition of "Bankruptcy"

To measure default risk, we define "bankruptcy" as "a company that is experiencing difficulties in its management and that can no longer discharge liabilities it must pay off".[5] We divide the bankruptcy into two categories: the "bankruptcy for liquidation purposes" and the "bankruptcy for reconstruction purposes". In the classification, "bankruptcy for liquidation purposes" includes "bankruptcy", "special liquidation", and most cases of voluntary liquidation, while "bankruptcy for reconstruction purposes" includes "the Corporate Reorganization Act", "the Civil Reorganization Act", "Commercial Law Dissolution", and small part of the voluntary liquidation. The former corresponds to Chapter 7 in the U.S. bankruptcy law and the latter to Chapter 11. The classification follows that of TSR Database Service. In the Unites States, there are a number of studies that compared the costs of two types of bankruptcies:

5 More specifically, we define "bankruptcy" in the event that a company is recognized as corresponding to any of the following 7 cases; (1) Drawing unpaid notes two times and business is suspended. (2) Dissolution of the company (when the representative admits being bankrupt). (3) Applying for Corporate Rehabilitation Law to the court. (4) Applying for dissolution arrangement under Commercial Code to the court. (5) Applying for Civil Rehabilitation Law to the court. (6) Applying for bankruptcy to the court. (7) Applying for commencement of special liquidation proceedings to the court. The above can be classified broadly into "voluntary liquidation" consisting of (1) and (2), and " legal liquidation" consisting of (3) and (4).

Chapter 7 vs. Chapter 11.[6] The evidence suggests that Chapter 11 cases were better at retaining value throughout the bankruptcy process. Exploring the sources of two types of bankruptcies would have important implications.

(3) Alternative Measures of the Bank Health

There are several alternative proxies to measure the bank health. In the following analysis, we use three bank health measures: (i) ratios of nonperforming loans (NPLs), (ii) stock prices, and (iii) bank failures. The first measure of bank health is ratios of NPLs. In Japan, the banks sometimes underreported the amount of nonperforming loans on their book to conceal the true extent of their problems. However, nonperforming loans continued to accumulate until 2001, causing a large amount of losses on disposal of non-performing loans for the banks. As a result, NPL ratios were regarded as one of important indicators to measure the bank health throughout the 1990s and in the early 2000s. In particular, the Japanese government repeatedly warned the banks that it was imperative to solve the non-performing loans problems in order to recover the confidence in the Japanese financial system. It is thus highly possible that increases in NPL ratios would increase the borrowers' default risk through tightening the banks' lending attitude.

The second measure is stock prices of banks. Stock prices are indicators that reflect the market valuation of banks. While ratios of NPLs are backward-looking, stock prices are forward-looking. The forward-looking market valuation of the bank is sometimes volatile and deviates from its economic value. However, the forward-looking measure has a preferable property, since what matters to the firm is the availability of the bank's help if it gets into financial distress.

The third measure is information on bank failures. Bank failures arise in an extreme case where the bank health deteriorated dramatically. The number of bank failures was, however, highly limited even during the period of financial turbulence in Japan. The measure may thus capture the impacts of catastrophic but very rare events on bank health deterioration. For comparison, we also explore the impacts of defaults of parent companies and major trade partners in the following analysis. For smaller firms, loans from parent companies and other major trading partners sometimes substitute short-term bank loans. The comparison might focus on the health deterioration impacts of substitutable loan suppliers.

[6] Some of recent contributions include Bris, Welch, and Zhu (2004).

3. The Model and the Data

(1) The Multinomial Probit Model

In order to test our hypothesis, we estimate a trinomial-probit model as well as a binomial-probit model for a (unbalanced) panel data of Japanese unlisted companies. When estimating the trinomial-probit model, we divide the firms into three categories: (A) firms that went bankrupt for liquidation purposes, (B) firms that went bankrupt for reconstruction purposes, and (C) firms that did not go bankrupt. Let individual firm i choose among a set of mutually exclusive alternatives: Category A, B, and C. Assume that the (unobserved) latent variable for Category A, B, and C are expressed as linear functions of explanatory variables

$$\begin{aligned} y^{A}_{it}{}^{*} &= \alpha + \beta' x_{it} + \gamma' z_{it} + \varepsilon^{A}_{it}, \\ y^{B}_{it}{}^{*} &= \delta + \lambda' x_{it} + \phi' z_{it} + \varepsilon^{B}_{it}, \\ y^{C}_{it}{}^{*} &= 0, \end{aligned} \tag{1}$$

where x_{it} is a k×1 vector of financial variables, z_{it} is a m×1 vector of bank health measures, β and λ are k×1 coefficient vectors, γ and ϕ are m×1 coefficient vectors, and i indexes individuals. We normalize (1) by restricting the latent variable for Category C to be zero. $(\varepsilon^{A}_{it}, \varepsilon^{B}_{it})$ is a vector of alternative-specific disturbances that follow independent bivariate normal distribution with zero mean and covariance matrix

$$\begin{bmatrix} 1 & \rho \\ \rho & 1 \end{bmatrix} \tag{2}$$

Category A is chosen if $y^{A}_{it}{}^{*} > y^{B}_{it}{}^{*}$ and $y^{A}_{it}{}^{*} > y^{C}_{it}{}^{*}$, Category B is chosen if $y^{B}_{it}{}^{*} > y^{A}_{it}{}^{*}$ and $y^{B}_{it}{}^{*} > y^{C}_{it}{}^{*}$, and Category C is chosen otherwise. We can thus define the trinomial probit model as follows

$$\begin{aligned} y^{A}_{it} &= 1 \quad \text{if } \alpha + \beta' x_{it} + \gamma' z_{it} + \varepsilon^{A}_{it} \geq \delta + \lambda' x_{it} + \phi' z_{it} + \varepsilon^{B}_{it} \text{ and } \alpha + \beta' x_{it} + \gamma' z_{it} + \varepsilon^{A}_{it} > 0, \\ &= 0 \quad \text{otherwise}, \\ y^{B}_{it} &= 1 \quad \text{if } \delta + \lambda' x_{it} + \phi' z_{it} + \varepsilon^{B}_{it} \geq \alpha + \beta' x_{it} + \gamma' z_{it} + \varepsilon^{A}_{it} > 0, \\ &= 0 \quad \text{otherwise}, \\ y^{C}_{it} &= 1 \quad \text{if } \alpha + \beta' x_{it} + \gamma' z_{it} + \varepsilon^{A}_{it} < 0 \text{ and } \delta + \lambda' x_{it} + \phi' z_{it} + \varepsilon^{B}_{it} < 0, \\ &= 0 \quad \text{otherwise}, \end{aligned} \tag{3}$$

where $y^{A}_{it} = 1$ if the company went bankrupt for liquidation purposes, $y^{B}_{it} = 1$ if the

company went bankrupt for reconstruction purposes, and $y^{C}_{it} = 1$ if the company did not go bankrupt.

It is easy to see that when $\alpha = \delta$, $\beta = \lambda$, $\gamma = \phi$, and $\varepsilon^{A}_{it} = \varepsilon^{B}_{it}$, the trinomial probit model is degenerated into a standard binomial probit model where either Category A or Category B is chosen if $y^{A}_{it}{}^{*} = y^{B}_{it}{}^{*} > y^{C}_{it}{}^{*}$ and Category C is chosen otherwise. When estimating the binomial-probit model, we divide the firms into two categories: (a) firms that went bankrupt and (b) firms that did not go bankrupt.

(2) The data of financial variables

The explanatory vector x_{it} denotes a vector of financial variables of unlisted companies. For the financial variables, we use "debt-asset ratio", "interest payments-output ratio", "profits-asset ratio", and "special losses-asset ratio". The choice of the variables follows several previous studies in Japan. We define each of "debt-asset ratio", "profits-asset ratio", and "special losses-asset ratio" as total bank borrowings outstanding, operating profits, and special losses respectively normalized by the total asset. We also define "interest payments-output ratio" as total interest payments divided by total sales plus liquid asset.

Bankruptcy is usually triggered by default on debt servicing. A company is thus more likely to fail if it is unprofitable and highly leveraged. For firms with low growth opportunities, high leverage reduces a firm's ability to finance investment through a liquidity effect. In extreme cases, a firm's debt overhang could be large enough to prevent it from raising funds to finance positive net present value projects. In contrast, a company with healthy cash-flow has relatively easy to access to internal finance, so it is less likely to go bankrupt than a company with cash-flow problems. We therefore expect that a firm is likely to have a larger default risk when it has larger debt-asset ratio, larger interest payments, smaller profits, and larger special losses.

We collected the firm-level financial data of Japanese non-financial firms that are *not* listed on any stock exchange in Japan. The data are taken from TSR Database Service. Unless the data are missing, the data set covers the period from 1996 through 2002. The data cover all available financial data of non-financial corporations with capital of 100 million yen and over. We, however, excluded the data of public firms, non-profit organizations, firms that had no borrowings from banks, and firms that relevant financial variables are missing. It allows us to use the data of 6266 Japanese unlisted firms. Among the 6266 firms, 150 went bankrupt for reconstruction purposes and 168 for liquidation purposes from 1997 to 2003.

One may argue that we should use not only the data of medium size firms but also the

data of smaller size firms. The use of smaller size firms' data may provide some useful information because the smaller firms have stronger reliance on bank finance and face higher default risk. However, the accounting data of smaller unlisted firms are likely to be missing and are less reliable. There thus exist costs and benefits in using the data of smaller size firms in the analysis.

Table 1-1 reports the average, standard deviation, maximum, and minimum of each financial variable for all firms and bankrupt firms in our sampled unlisted companies. We see that "debt-asset ratio", "interest payments-output ratio", and "special losses-asset ratio" are higher for bankrupt firms, while "profits-asset ratio" is much smaller for bankrupt firms. The simple comparison supports the view that a company is more likely to fail if it is unprofitable, highly leveraged, and suffers cash-flow difficulties.

Table 1-2 reports the corresponding data of 2138 listed companies in Japan. "Debt-asset ratio" and "interest payments-output ratio" are on average higher for our unlisted companies than for the listed companies. Standard deviation of "debt-asset ratio" is, however, larger for the unlisted companies. "Profits-asset ratio" and "special losses-asset ratio" are smaller for our unlisted companies. However, when we focus on bankrupt firms, the difference between the unlisted and the listed companies is not large for each financial variable.

(3) The data of the bank health

The explanatory vector z_{it} denotes a vector of several alternative measures on financial health of the "main banks". As for three alternative measures of the bank health, we constructed the data by the following steps. First, we identified the name of the firm's lenders based on CD Eyes supplied by TSR Database Service. Like the Japan Company Handbook, CD Eyes provides a list of major lenders for each unlisted companies. The order of the listed lenders is based on how close the bank-firm relationships are. We defined the "main bank" as a bank that appeared first in the list. We then collected the relevant financial data of the "main banks" from Financial Statements of All Banks published by the Japanese Bankers Association. The data set covers the period from 1996 through 2003.

To calculate a proxy for ratios of NPLs, we use risk management loans divided by total asset. Using the standards set by the Federation of Bankers Associations of Japan, each bank discloses the amount of "risk management loans" each year. Risk management loans comprise of "past due loans" in arrears by 3 months or more, and "restructured loans" with changes in terms and conditions, as well as loans to borrowers

in legal bankruptcy. For large banks, the standards after 1998 became comparable to the United States SEC standards adopted for the public disclosure of bad loans. However, the standards, covering a wider range of non-performing loans, were different before 1998. Moreover, the definition of risk management loans changed frequently for other smaller banks (that is, regional banks, second regional banks, Shinkin Banks, and Shinyo Kumiai). In calculating the NPL ratios, we thus use only those of the major banks (that is, city banks, trust banks, and long-term credit banks) and distinguish those before and after 1998 as two different variables in the analysis.

The stock prices we use in the following analysis are those at the end of each fiscal year. We took their logs to penalize lower values larger. Because of availability, the data covers only those for listed banks, although most of the main banks are listed ones in our sample. We excluded stock prices of failed banks in the analysis, even when they were kept listed in the stock market. We, however, added a dummy to unlisted banks for which the stock prices are missing.

We capture the impacts of bank failures by a dummy variable. The bank failure dummy takes one when the main bank failed and zero otherwise. Bank failures arise in an extreme case where the bank health deteriorated dramatically. For comparison, we also explore the impacts of defaults of parent companies and major trade partners in the analysis. CD Eyes provides a list of parent companies and major trading partners for each unlisted companies. Some of the companies in the list are unlisted companies. We, however, use only listed companies as parent companies and major trading partners because reverse causality from the unlisted firm will be less of a problem when parent companies and major trading partners are listed firms. Information of bank failures is based on the Financial Services Agency, while default information of parent companies and major trade partners is based on Tokyo Shoko Research (TSR) Database Service.

Table 2 reports types of the "main" banks and distributions of the number of lending bank lenders. It states that nearly 60% of the "main" banks are either city banks, long-term credit banks, or trust banks, and 28% of the "main" banks are the first regional banks. This implies that large listed banks still play dominant roles as "main" banks even for most of unlisted medium size firms in our sample.

Table 3 reports basic statistics (i.e., average, standard deviation, minimum, and maximum) of NPL ratios and stock prices of the "main" banks. Even average of NPL ratios amounts to 4.09% during our sample period. The standard deviation of NPL ratios is also high, implying that ratios of NPLs that were high above 10% for several banks. On average, NPL ratios tend to be higher for bankrupt firms than for surviving

ones, while stock prices are smaller for bankrupt firms. The difference, however, does not seem large in the table.

4. Empirical Results

(1) The impacts of the selected financial variables

Table 4 summarizes the estimation results of our binomial and trinomial probit models. To allow industry-specific factors, it reports the results with industrial dummies. Before looking at the bank health effects, we quickly check whether the selected financial variables have sensible impacts on probabilities of bankruptcies in the table. "Debt-asset ratio", "interest payments-output ratio", and "special losses-asset ratio" have positive impacts, while "profits-asset ratio" has negative impacts. All of the impacts are statistically significant in increasing bankruptcy probability in the binomial probit model. The results are consistent with previous empirical evidence in that a firm is likely to have a larger default risk when it has larger debt-output ratio, larger interest payments, and smaller profits. Among the selected financial variables, "profits-asset ratio" had the largest impact in the magnitude and "debt-asset ratio" had the second largest.

Even in the trinomial probit model, "debt-asset ratio" and "interest payments-output ratio" are statistically significant in increasing bankruptcy probability for both reconstruction and liquidation purposes. "Debt-asset ratio" had a larger impact for liquidation purposes. Reflecting the fact that interest payments are suspended for troubled firms, "interest payments-output ratio", however, had a larger impact for reconstruction purposes. "Special losses-asset ratio" is, in contrast, statistically significant only for liquidation purposes. This may imply that large capital losses were a source of liquidation for troubled firms. "Profits-asset ratio" had the largest impact in the magnitude. But reflecting the heterogeneous impacts, its significance level is marginal.

As for the dummy variables, some of the industry dummies have statistically significant impacts. In particular, the dummy for construction industry always has a significantly positive impact, while that for transportation and communication industry always has a significantly negative impact. The dummy for unlisted banks is negative. However, its statistical significance level is marginal.

(2) The impacts of the alternative measures of bank health

More interesting results are observed when we look at the impacts of the three

alternative measures of bank health: (i) ratios of NPLs, (ii) stock prices, and (iii) bank failures. It is easy to see that both NPL ratios and stock prices have expected impacts on borrower's probability of bankruptcy, even when observable characteristics relating to these borrower's financial variables are controlled for. That is, the coefficient of stock prices took negative sign, while those of NPL ratios took positive sign. This implies that the impaired bank health measures tightened bank's lending attitude and consequently increased borrowers' default risk in the late 1990s and the early 2000s.

Both of the NPL ratios before and after 1998 had statistically significant impacts in increasing probabilities in the binomial probit model. Solving the non-performing loans problems was regarded as one of important indicators to recover the confidence in the Japanese financial system. It is thus highly possible that the banks' attempts to improve these ratios increased the borrowers' default risk through tightening the banks' lending attitude. The alternative measures on NPL ratios, however, had different impacts in the trinomial probit model. The NPL ratios before 1998 had significant impacts only for liquidation purposes, while the NPL ratios after 1998 had significant impacts only for reconstruction purposes.

The stock prices had a statistically significant negative impact in increasing bankruptcy probability in the binomial probit model. The stock prices are indicators that reflect the forward-looking market valuation of the banks. The result implies that a decline in the market valuation of the bank increased the borrower's bankruptcy probability. The stock prices are, however, statistically significant only for reconstruction purposes in the trinomial probit model.

Finally, failures of the main bank had a positive impact but the impact was not statistically significant. In the late 1990s and in the early 2000s, the credit guarantee system provided special business stabilization guarantees (safety net guarantees) to small and medium companies when correspondent financial institutions went bankrupt in Japan. The insignificant impacts may provide an indirect evidence that the credit guarantee system worked in the late 1990s and in the early 2000s. Defaults of parent companies and major trade partners, in contrast, had significant impacts in increasing bankruptcy risk for reconstruction purposes. The impacts are particularly large for defaults of parent companies.

5. Interpretations of the Marginal Impacts

In the last section, we showed that the two bank health measures as well as defaults of parent companies and major trade partners had expected impacts on borrower's

probability of bankruptcy, even when observable characteristics relating to these borrower's financial variables are controlled for. In a bank-centered system like Japan, poor bank performance should be more costly for smaller firms that obtain most of their external financing from the bank with which they established a relationship. It is thus highly possible that small and medium firms that relied more on bank finance faced significantly large default risk when the bank health deteriorated. Our empirical results clearly support this view.

The estimated coefficients, however, suggest that marginal impacts vary across different explanatory variables, particularly in the trinomial probit model. The purpose of this section is to explore how different impacts each bank health measure had in increasing two types of bankruptcies. In the analysis, we define a hypothetical "average firm" which takes average values of all financial variables and bank health measures among the sampled firms that had one of the major banks as the main bank after 1998. We then investigate how bankruptcy probability of the average firm would increase when each of the health measures deteriorated.

Table 5 summarizes the results. It reports the changes of the bankruptcy probability when the NPL ratios after 1998 increased by 1% point or when the stock prices declined by 1%. It also reports the changes of the bankruptcy probability when the main bank failed, when a trading partner defaulted, or when a parent company defaulted respectively. The NPL ratios and the stock prices had similar impacts on the bankruptcy probability. In the binomial probit model, the probability of bankruptcy would increase by 0.09% points for 1% increase of the NPL ratios, while it would increase by 0.08% points if the stock prices of the main bank decline by 1%. The marginal impacts are relatively moderate. The impacts are, however, far from negligible undergoing financial turbulence where the NPL ratios piled up and the stock prices dropped dramatically. They would have been critical under the financial crisis.

The trinomial probit model shows that the marginal impacts on bankruptcy are more important for reconstruction purposes than for liquidation purposes. For reconstruction purposes, the probability of bankruptcy would increase by 0.09% points for 1% increase of the NPL ratios, while it would increase by 0.07% points for 1% decline of the stock prices. After 1998, the Financial Services Agency (FSA) established the basic guidelines for financial inspections and gradually started its strict financial inspections of banks. Under the circumstances, the banks increased reconstruction of their troubled client firms when the amount of nonperforming loans piled up. Moreover, because of their forward-looking properties, a decline of the stock price was a market signal that the Japanese bank would be in trouble in the near future.

Responding to the market signal, the bank might increase reconstruction of its troubled client firms to recover its market value.

As for the marginal effects of the default dummies, a main bank failure and a major trading partner's default had smaller impacts than a parent company's default. The impacts of the rare events on bankruptcy are, however, far from negligible for reconstruction purposes. If the main bank fails, the probability of bankruptcy would increase by 0.56% points for reconstruction purposes, while it would increase only by 0.08% points for liquidation purposes. If the major trading partner defaults, the probability of bankruptcy would increase by 0.58% points for reconstruction purposes, while it would increase only by 0.18% points for liquidation purposes.

The table suggests that the catastrophic effects are very large when a parent company defaults. If one of the parent companies defaults, the probability of bankruptcy would increase by 3.34% points in the binomial probit model. In the trinomial model, the probability of bankruptcy for reconstruction purposes would increase by 3.26% points. The impacts are extremely big, particularly in increasing bankruptcy probability for reconstruction purposes. This implies that defaults of parent firms had contagious effects in increasing default risk of vertically related smaller firms in the late 1990s and the early 2000s in Japan.

It is noteworthy that all of the default dummies had larger marginal effects on bankruptcy for reconstruction purposes than that for liquidation purposes. This probably reflects the fact that main bank failures or defaults of trading partners and parent companies are external shocks that are not directly related to financial health of the unlisted firms. The external shocks increase default risk of the unlisted firms. But, when they are not accompanied by health deterioration of the unlisted firms, it is likely that the firms choose bankruptcy for reconstruction purposes rather than that for liquidation purposes.

6. The Role of Multiple Banking Relationships

The benefits from a bank-borrower relationship stem mainly from having a single bank with proprietary information about the borrower, which may make more credit available at lower cost. Therefore, other things being equal, borrowing from multiple banks may be costly (higher transaction costs, duplicated effort, free-rider problem, etc.) and informationally inefficient relative to relationship lending by a single bank. Firms may, however, benefit from multiple banks in order to avoid a "hold-up" problem in which a single bank may exploit its market power and extract excessive rents. In

particular, to the extent that a borrower faces switching costs in a relationship with an individual bank, it would be costly to borrow from a single lender if its primary bank is in financial distress. This implies that default risk would be more sensitive to our bank health measures if the bank-firm relationship is close.

In this section, we examine these implications based on our probit models. To measure a favorable impact of a close bank-borrower relationship, we include the number of bank lenders as an explanatory variable. To the extent that a close bank-borrower relationship has a role in reducing the costs of financial distress for borrowers, we expect that the number of bank lenders has a positive impact on the bankruptcy probability. We also add a coefficient dummy of multiple banking relationships to two bank health measures, the NPL ratios and the stock prices. The coefficient dummy takes one if the number of its bank lenders is equal to or greater than four and zero otherwise. To the extent that a close bank-borrower relationship exacerbates a "hold-up" problem, the coefficient dummy would reduce the impact of bank health deterioration on the bankruptcy probability. We thus expect that the coefficient dummy has negative sign for the NPL ratios and positive sign for the stock prices.

Table 6 summarizes the estimation results of our probit models. The table reports the case where we add the coefficient dummies to the NPL ratios after 1998 and the stock prices. As in Table 4, "debt-asset ratio", "interest payments-output ratio", and "special losses-asset ratio" have positive impacts, while "profits-asset ratio" has negative impacts. Without the coefficient dummies, the impacts of the three alternative measures of the bank health are also similar to those in Table 4. The inclusion of the number of bank lenders and coefficient dummies did not change our basic results.

More interesting results are, however, observed when we look at the impacts of the number of bank lenders. The number of bank lenders itself has a significant positive impact on the bankruptcy probability. This implies that given the bank health measures, a close bank-firm relationship reduces the probability of bankruptcy. The implication is reconfirmed in Figure 3 that shows percentages of bankrupt firms for each number of banks. When the number of banks is less than three, the percentage of bankrupt firms is less than 0.52% even for all bankruptcies. When the number of banks is between four and five, the percentage goes up to 0.9% but is still less than 1%. However, when the number of banks exceeds six, the percentage is always greater than 1%. In particular, when the number of banks is ten, the percentage exceeds 2%. The results are essentially the same even if we classify the types of bankruptcies into two

categories.

In Table 6, each coefficient dummy, in contrast, reduces the impact of bank health deterioration on the bankruptcy probability. The sign of each coefficient dummy was negative for the NPL ratios and positive for the stock prices, although the coefficient dummy was significant only for the stock prices. This implies that when various measures of the bank health deteriorated, multiple banking relationships would mitigate tightened bank's lending attitude and reduce borrowers' default risk in the late 1990s and the early 2000s.

The result implies that multiple bank relationships have both costs and benefits. They are costly when causing too much competition ex post, which may discourage lending to small and medium firms that have few alternative sources of funding. They are, however, beneficial when reducing the value of information acquisition to any one individual bank avoiding the hold-up problem.

7. Conclusions

After the collapse of the Japanese stock market in the early 1990s, the Japanese banking sector started facing considerable problems limiting its ability to renew loans and extend new loans to firms. The problems became particularly serious in the late 1990s when several major financial institutions turned out to be in default. If firms are highly dependent on obtaining funds from banks with which they have a historical relationship, one would expect that firms that relied more on finance from troubled banks suffered significantly larger default risks. Our empirical result supports this view particularly for the firms with a close banking relationship using the firm-level data of unlisted Japanese companies in the late 1990s and the early 2000s.

In his survey article, Boot (2000) pointed out that banking relationships have negative sides not only for the hold-up problem but also for the soft-budget constraint problem. A bank with an impaired balance-sheet might attempt to 'gamble for resurrection' and hence might increase risky lending to zombie firms. The banks could reduce the reported amount of nonperforming loans on their book and inflate their reported capital as long as it makes sufficient credit available to the firm to enable it to make interest payments on the outstanding loans from the bank. Consequently, a bank may continue lending to troubled firms to provide sufficient financing to keep otherwise economically bankrupt firms alive. Some of recent studies supported the view for listed firms (for example, Peek and Rosengren [2003]). However, our results suggest that the view is less likely to hold for unlisted firms. For small and medium firms, poor bank

performance should be more costly because they have fewer alternatives to bank financing. It is therefore highly possible that smaller firms' ability to raise external financing was impaired and became more likely to default when the financial condition of Japanese banks deteriorated.

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Table 1-1. Basic Statistics of the Financial Data: Case of the Unlisted Firms

(%)

	all firms	bankrupt firms
Debt/total asset （average）	43.10	65.63
（standard deviation）	37.92	37.62
（maximum）	2846.30	358.18
（minimum）	0.00	9.79
Special Loss/total asset （average）	2.34	6.18
（standard deviation）	8.57	21.26
（maximum）	507.61	242.92
（minimum）	0.00	0.00
Interest Payments/Output (average)	0.88	1.50
（standard deviation）	2.44	1.83
（maximum）	239.20	21.29
（minimum）	0.00	0.00
Profits/total asset （average）	2.45	0.21
（standard deviation）	5.92	7.13
（maximum）	63.54	17.67
（minimum）	-235.01	-82.74

Note: The data of bankrupt firms are those of a year ahead of their bankrupcies.

Table 1-2. Basic Statistics of the Financial Data: Case of the Listed firms

(%)

	all firms	bankrupt firms
Debt/total asset （average）	33.21	45.00
（standard deviation）	86.33	23.25
（maximum）	4638.80	160.71
（minimum）	0.01	4.94
Special Loss/total asset （average）	3.24	8.80
（standard deviation）	8.36	15.21
（maximum）	324.06	74.31
（minimum）	0.00	0.01
Interest Payments/Output (average)	0.43	1.15
（standard deviation）	0.42	0.75
（maximum）	7.74	4.27
（minimum）	0.00	0.18
Profits/total asset （average）	4.46	-0.04
（standard deviation）	12.21	2.61
（maximum）	485.98	7.56
（minimum）	-110.60	-6.73

Notes 1) The number of firms is 2138, of which 63 firms went bankrupt.

2) The sample period is 1996 to 2001.

3) th data of bankrupt firms are those of a year ahead of their bankrupcies.

Source) Japan Development Bank Company Data Base.

Table 2. Types of Lending Banks

Main Banks

(%)

City, Trust, Long-term Credit Banks	57.16
First Regional Banks	27.91
Second Regional Banks	4.09
Shinkin and Shinkumi	5.38
Unknown	5.44

Table 3. Basic Statisitics of the Main Banks

	all firms	bankrupt firms
NLP ratio (%) (average)	4.09	4.49
（standard deviation）	3.18	3.29
（maximum）	33.97	33.97
（minimum）	1.43	1.43
Stock price (yen) （average）	616.39	558.80
（standard deviation）	438.77	426.70
（maximum）	1930.00	1930.00
（minimum）	57.00	57.00

Note: The data of bankrupt firms are those of a year ahead of their bankrupcies.

Table 4-1.Probit Model Estimation Result

	Coef.		standard err.
Const.	0.69		(0.63)
Debt/asset	0.50	***	(0.06)
Special Loss/asset	0.04	***	(0.01)
Interest Payments/Output	0.17	***	(0.03)
Profits/asset	-1.15	**	(0.53)
NPL ratio (96-97)	0.12	***	(0.04)
NPL ratio (98-02)	0.07	***	(0.03)
Stock price	-0.06	*	(0.03)
Main bank default dummy	0.25		(0.19)
Major trading partner default dummy	0.36	***	(0.09)
Parent company default dummy	0.82	***	(0.22)
Industry dummy (Construction)	0.34	***	(0.06)
Industry dummy (Manufacture)	-0.21	***	(0.06)
Industry dummy (Communication and Transportation)	-0.59	***	(0.15)
Industry dummy (Real estate)	-0.26	***	(0.10)
Industry dummy (Service)	-0.27	***	(0.10)
Main bank unknown dummy	-0.02		(0.13)
Unlisted bank dummy	-0.38	*	(0.20)

Note: ***,**,* denote staristical significance at the 1%,5%,10% levels respectively.

Table 4-2.Multinomial Probit Model Estimation Result

	(B) Reconstruction			**(A) Liquidation**		
	Coef.		standard err.	Coef.		standard err.
Const.	0.71		(0.78)	-0.15		(0.84)
Debt/asset	0.29	***	(0.08)	0.57	***	(0.07)
Special Loss/asset	0.02		(0.02)	0.05	***	(0.02)
Interest Payments/Output	0.27	***	(0.04)	0.09	**	(0.04)
Profits/asset	-1.12	*	(0.63)	-0.94		(0.69)
NPL ratio (96-97)	0.03		(0.06)	0.17	***	(0.05)
NPL ratio (98-02)	0.11	***	(0.04)	0.02		(0.04)
Stock price	-0.08	*	(0.04)	-0.04		(0.04)
Main bank default dummy	0.39	*	(0.24)	0.12		(0.23)
Major trading partner default dummy	0.42	***	(0.10)	0.22	*	(0.12)
Parent company default dummy	0.99	***	(0.24)	0.46		(0.34)
Industry dummy (Construction)	0.29	***	(0.09)	0.32	***	(0.08)
Industry dummy (Manufacture)	-0.09		(0.08)	-0.31	***	(0.08)
Industry dummy (Communication and Transportation)	-0.49	***	(0.19)	-0.64	***	(0.21)
Industry dummy (Real estate)	-0.44	***	(0.15)	-0.16		(0.12)
Industry dummy (Service)	-0.15		(0.12)	-0.41	***	(0.14)
Main bank unknown dummy	-0.08		(0.16)	0.03		(0.17)
Unlisted bank dummy	-0.40		(0.27)	-0.37	*	(0.26)
rho (correlation coef.)	0.26		(0.48)			

Note: ***,**,* denote staristical significance at the 1%,5%,10% levels respectively.

Table 5-1.Marginal effect (Probit Model)

(% point)

	Bankruptcy
Debt/asset	0.69
Special Loss/asset	0.06
Interest Payments/Output	0.24
Profits/asset	-1.59
NPL ratio (98-02)	0.09
Stock price	-0.08
Main bank default dummy	0.48
Major trading partner default dummy	0.75
Parent company default dummy	3.34

Table 5-2.Marginal effect (Multinominal Probit Model)

(% point)

	Reconstruction	Liquidation
Debt/asset	0.23	0.35
Special Loss/asset	0.02	0.03
Interest Payments/Output	0.22	0.05
Profits/asset	-0.90	-0.57
NPL ratio (98-02)	0.09	0.01
Stock price	-0.07	-0.02
Main bank default dummy	0.56	0.08
Major trading partner default dummy	0.58	0.18
Parent company default dummy	3.26	0.51

Table 6-1. Probit Model Estimation Result

	Coef.		standard err.
Const.	0.62		(0.65)
Debt/asset	0.50	***	(0.06)
Special Loss/asset	0.04	***	(0.01)
Interest Payments/Output	0.17	***	(0.03)
Profits/asset	-1.29	**	(0.54)
NPL ratio (96-97)	0.10	**	(0.04)
NPL ratio (98-02)	0.11	*	(0.06)
Coef. Dummy of NPL ratio	-0.07		(0.06)
Stock price	-0.10	***	(0.04)
Coef. Dummy of Stock price	0.04	**	(0.02)
Number of bank lenders	0.04	***	(0.01)
Main bank default dummy	0.25		(0.19)
Major trading partner default dummy	0.35	***	(0.09)
Parent company default dummy	0.82	***	(0.22)
Industry dummy (Construction)	0.36	***	(0.06)
Industry dummy (Manufacture)	-0.19	***	(0.06)
Industry dummy (Communication and Transportation)	-0.59	***	(0.15)
Industry dummy (Real estate)	-0.24	**	(0.10)
Industry dummy (Service)	-0.25	**	(0.10)
Main bank unknown dummy	0.19		(0.15)
Unlisted bank dummy	-0.41	**	(0.20)

Note: ***,**,* denote staristical significance at the 1%,5%,10% levels respectively.

Table 6-2. Multinomial Probit Model Estimation Result

	(B) Reconstruction			**(A) Liquidation**		
	Coef.		standard err.	Coef.		standard err.
Const.	0.72		(0.80)	-0.27		(0.85)
Debt/asset	0.28	***	(0.09)	0.57	***	(0.07)
Special Loss/asset	0.02		(0.02)	0.05	***	(0.02)
Interest Payments/Output	0.27	***	(0.04)	0.09	**	(0.04)
Profits/asset	-1.31	**	(0.65)	-1.02		(0.70)
NPL ratio (96-97)	0.01		(0.06)	0.16	***	(0.05)
NPL ratio (98-02)	0.12		(0.08)	0.09		(0.08)
Coef. Dummy of NPL ratio	-0.04		(0.09)	-0.10		(0.08)
Stock price	-0.15	***	(0.05)	-0.06		(0.04)
Coef. Dummy of Stock price	0.07	**	(0.03)	0.02		(0.02)
Number of bank lenders	0.04	**	(0.02)	0.03	**	(0.02)
Main bank default dummy	0.39		(0.24)	0.10		(0.24)
Major trading partner default dummy	0.41	***	(0.10)	0.22	*	(0.12)
Parent company default dummy	0.99	***	(0.24)	0.45		(0.33)
Industry dummy (Construction)	0.32	***	(0.09)	0.34	***	(0.08)
Industry dummy (Manufacture)	-0.07		(0.08)	-0.30	***	(0.08)
Industry dummy (Communication and Transportation)	-0.48	**	(0.19)	-0.63	***	(0.21)
Industry dummy (Real estate)	-0.41	***	(0.15)	-0.14		(0.12)
Industry dummy (Service)	-0.12		(0.12)	-0.39	***	(0.14)
Main bank unknown dummy	0.13		(0.19)	0.22		(0.20)
Unlisted bank dummy	-0.45	*	(0.27)	-0.39		(0.26)
rho (correlation coef.)	0.22		(0.51)			

Note: ***,**,* denote staristical significance at the 1%,5%,10% levels respectively.

Figure 1 Bankruptcies in Japan

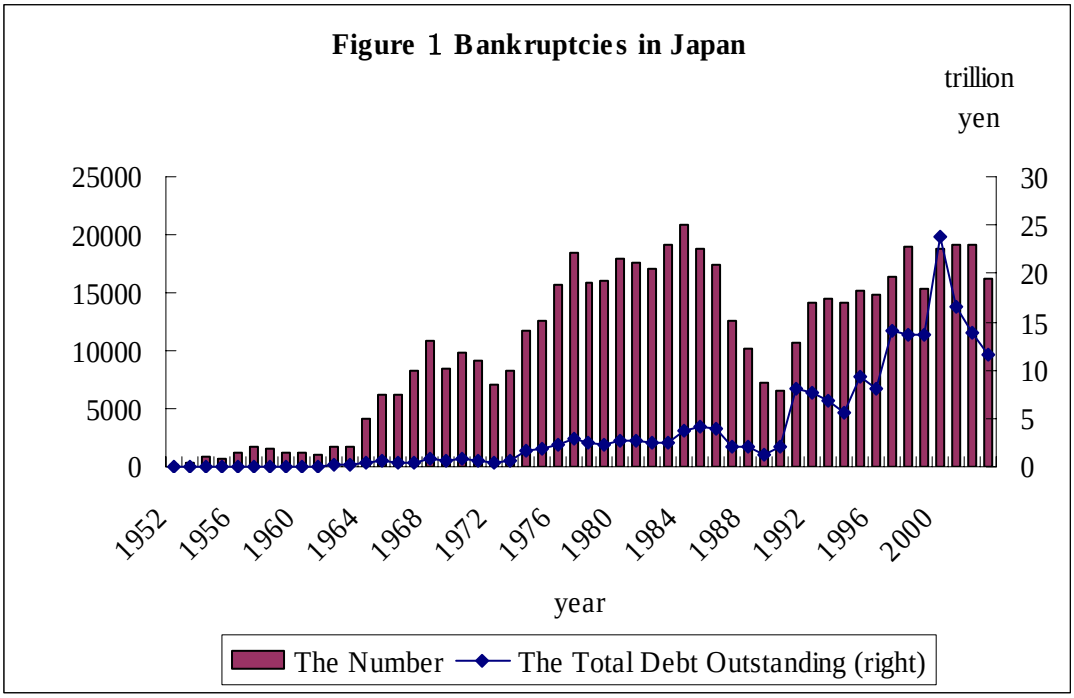

Figure 2. The "Tankan" DI: Lending Attitude

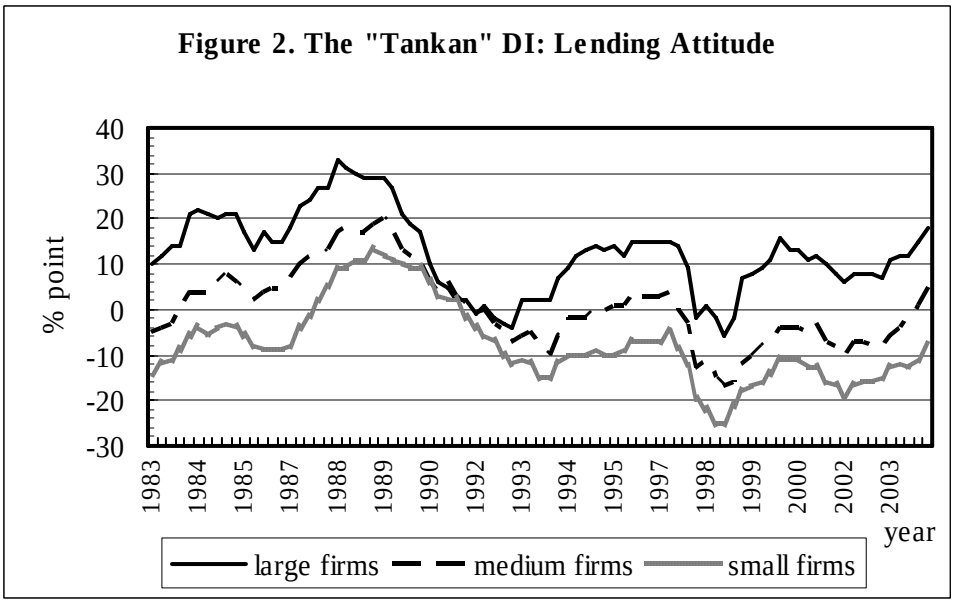

Figure 3. Percantages of Bankrupt Firms