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Bank Distress and Productivity of Borrowing Firms: Evidence from Japan

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Preliminary and Incomplete

Fumio Akiyoshi†, Keiichiro Kobayashi‡

Abstract

We investigate the effects of bank distress on the productivity of borrowing firms by using data on listed companies in the Japanese manufacturing industry during the 1990s. We find some evidence suggesting that deterioration in the financial health of banks, such as a decline in the capital-asset ratio, decreased the productivity of their borrowers during the period of the severe financial crisis (FY1997–1999). Although large nonperforming loans had posed a serious problem in the Japanese economy since the collapse of the asset prices bubble in 1991, the resolution of the problem was postponed during the early 1990s. The Japanese economy plunged into a serious banking crisis from 1997 to 1999. Our finding empirically confirms the common view that a banking crisis negatively affects the productivity of the corporate sector.

1 Introduction

This paper attempts to empirically show the effects of bank distress on the productivity of borrowing firms by using data on listed companies in the Japanese manufacturing

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industry during the 1990s. Many empirical studies conclude that deterioration in the financial health of Japanese banks had adverse effects on the investment of their borrowers during the 1990s (Gibson, 1995, 1997; Kang and Stulz, 2000; Nagahata and Sekine, 2005; Fukuda et al., 2005a, 2005b).

Meanwhile, there is little agreement as to whether the productivity of firms was affected by the deterioration in the financial health of banks. Ogawa (2007) reports that nonperforming loans at banks had no effects on firms' investments in research and development that were closely related to the productivity growth of firms. In contrast, Fukuda et al. (2007) report that the productivity of firms declined when unhealthy banks increased the provision of long-term loans to the firms. These previous studies encounter common difficulties in dealing with the endogeneity problem of the financial health of banks: The health of banks was likely to be affected by the productivity of firms. Our study, which solves the endogeneity problem by using valid instruments for bank health, sheds light on the unexplored relationship between the financial health of banks and the productivity of their borrowers.[1]

Our study is closely related to the studies on the causes of the long stagnation in the Japanese economy during the 1990s. Many researchers argue that a prolonged decline in the total factor productivity (TFP) growth resulted in the economic slowdown after the collapse of the asset price bubble (Hayashi and Prescott, 2002; Kobayashi and Inaba, 2005).[2] The decline in the TFP growth may be partly attributed to the distress in the banking sector. This paper attempts to examine whether the bank distress caused the

[1]Some studies examine the effects of bank distress on the (expected) profitability of the borrowers using the event study framework. These studies investigate the changes in the stock prices of borrowing firms surrounding the day of an event such as the announcement of bank failure. Slovin et al. (1993) examine the case of the failure of the Continental Illinois Bank, while Yamori and Murakami (1999), Kang and Stulz (2000), and Miyajima and Yafeh (2003) examine the cases of bank distress in Japan during the 1990s. Our study is different from these studies in that we directly estimate the changes in the productivity of borrowers when the financial health of banks deteriorated.

[2]Kawamoto (2004) points out that there is no evidence of a decline in the true technological progress for the Japanese economy during the 1990s when he controls for capital utilization and reallocation of inputs.

decline in the productivity in the Japanese economy during the 1990s.

We find that a decline in the capital-asset ratio of a bank decreased the productivity of the borrowers during the severe financial crisis (FY1997–1999). Some researchers point out that a credit crunch occurred during this period (Woo, 2003; Watanabe, 2005). Our finding suggests that a banking crisis has adverse effects on the productivity of firms through a credit crunch. See Section 6 for more details.

This paper is organized as follows. In Section 2, we briefly describe Japan's banking crisis during the 1990s. Section 3 presents the methodology of our empirical study. Section 4 presents our finding that a deterioration in the financial conditions of banks, such as a decline in the capital-asset ratio, decreased the productivity of their borrowers. Section 5 presents the robustness checks of our results. Section 6 discusses the causes of the decline in productivity. Section 7 presents the conclusion.

2 Banking Crisis in Japan

In this section, we present an overview of the banking crisis in Japan.[3] The Japanese banks aggressively increased their lending to real estate-related industries in the late 1980s, when land prices soared. However, the collapse of the land price boom in 1991 turned many of the real estate-related loans into nonperforming ones. The Japanese banks, anticipating the quick recovery of land prices, postponed the writing off of the nonperforming loans and supported their distressed borrowers. Contrary to their expectation, the land prices consistently fell during the 1990s. As a result, huge loan losses negatively affected the financial health of the banks. The bank distress culminated in a widespread liquidity crisis in late 1997.[4]

In November 1997, the bankruptcy of Sanyo Securities resulted in the first postwar default in the interbank market. The default precipitated the sharp contraction of the interbank market, and many financial institutions suffered the liquidity crunch. Two

[3]See Miyajima and Yafeh (2003) for a detailed chronology of the banking crisis in Japan.

[4]Hoshi and Kashyap (2001: 276–280) provide a detailed description of the banking crisis in the late 1990s.

major financial institutions, namely, Hokkaido Takushoku Bank and Yamaichi Securities, failed during the liquidity crisis. The turbulence in the banking sector did not end although the government injected ¥1.8 trillion into 18 major and 3 regional banks in March 1998. Two major banks, namely, the Long-term Credit Bank and Nippon Credit Bank, failed in late 1998. The government once again injected ¥7.5 trillion into 15 major banks in March 1999. Finally, the banking crisis ended in early 2000 because of the recapitalization by the government and the announcement of consolidation among major banks.

After the crisis, there was steady progress in the consolidation among banks and the disposal of nonperforming loans. The 10 city banks operating as of early 1997 were reorganized into five groups by early 2005. The nonperforming loans of major banks, which had reached ¥26.8 trillion in March 2002, were reduced to ¥7.4 trillion by March 2005.[5] In April 2005, the Japanese financial system returned to normal for the first time in 15 years, when the government declared an end to the problem of the nonperforming loans.

3 Empirical Methodology

3.1 Data

We study the effects of bank health on the level of the productivity of manufacturing firms during the 1990s. Specifically, we examine the manufacturing firms listed on any of the three major stock exchanges in Japan, Tokyo, Osaka, and Nagoya for FY1993–FY2002. A fiscal year runs from April to March. There were more than 1300 listed manufacturing firms during the sample period.

We use the TFP as a measure for the productivity of firms.[6] Following the approach

[5]The data of nonperforming loans are based on the Financial Reconstruction Law. The data are available from the Web site of the Financial Services Agency. The Financial Services Agency. "Status of Non-Performing Loans." March 15, 2008 <http://www.fsa.go.jp/en/regulated/npl/index.html >

[6]We calculate the TFP using the index number approach. The Solow residual is included as a special case of the index number approach. The estimation of the Solow residual usually necessitates strong

of Good et al. (1999) and Fukao and Kwon (2006), we construct a hypothetical representative firm in the entire manufacturing industry in each year.[7] The TFP level of each firm in each fiscal year is measured relative to that of a hypothetical firm in FY1990. The TFP level of a firm i in year t relative to that of a hypothetical firm in year 0 (the base year) is calculated as in the following equation:

$$\begin{aligned} \ln TFP_{it} &= (\ln Y_{it} - \overline{\ln Y_t}) - \sum_{k}^{n} \frac{1}{2}(S_{k,it} + \overline{S_{k,t}})(\ln X_{k,it} - \overline{\ln X_{k,t}}) \\ &\quad + \sum_{s=1}^{t}(\overline{\ln Y_s} - \overline{\ln Y_{s-1}}) - \sum_{s=1}^{t}\sum_{k=1}^{n} \frac{1}{2}(\overline{S_{k,s}} + \overline{S_{k,s-1}})(\overline{\ln X_{k,s}} - \overline{\ln X_{k,s-1}}) \quad (1) \end{aligned}$$

where $\ln Y_{it}$ is the logarithm of the output of firm i in year t, $\mathrm{S}_{k,it}$ is the cost share of the input k of firm i in year t, and $\ln X_{k,it}$ is the logarithm of the input k of firm i in year t. $\overline{\ln Y_t}$, $\overline{S_{k,t}}$, and $\overline{\ln X_{k,t}}$ denote the averages of $\ln Y_{it}$, $\mathrm{S}_{k,it}$, and $\ln X_{k,it}$, respectively, across all the manufacturing firms in year t. We assume a hypothetical manufacturing firm with $\overline{\ln Y_t}$, $\overline{S_{k,t}}$, and $\overline{\ln X_{k,t}}$ in year t. Thus, in equation (1), the first two terms describe the difference between firm i and a hypothetical firm in year t while the last two terms chain together the hypothetical firms back to the base year. The output of a firm is the total sales. The inputs of a firm are intermediate input, labor, and capital.[8] The changes in working hours and capital utilization can affect the estimation of the productivity of firms. Unfortunately, we cannot obtain the firm-level data on working hours and capital utilization. We partially control for the effects of these factors by using the sector-level

assumptions such as marginal cost pricing and constant returns. See Bartelsman and Doms (2000) for details.

[7] We classify the manufacturing industry into 17 sectors. However, we do not construct a representative firm for each sector to compare the productivity of firms in the different sectors. The 17 sectors consist of foods, textile products, wooden products, pulp and paper products, publication and printing, chemical products, petroleum refinery, rubber products, ceramic, stone and clay products, iron and steel, non-ferrous metals, metal products, general machinery, electrical machinery, transportation equipment, precision instruments, and miscellaneous manufacturing products.

[8] In calculating the TFP, our sample excludes those observations for which the data on the cost share of inputs are unavailable. We also exclude the observations for which the capital-labor ratio has a value that is in the top or the bottom 1 percent in the total observations during FY1990–2002.

data.

We focus on the relationship between firms and their main banks because many researchers argue that main banks play a special role in the case of Japanese firms (Aoki and Patrick, 1994). However, identifying a main bank for each firm is not an easy task, because there is no rigid definition of a main bank. Following Gibson (1995) and Hori et al. (2004), we identify a main bank for each firm by using *Kaisha Shikiho* (Japan Company Handbook), published by Toyo Keizai.[9] The book reports the list of banks that each firm deals with. The first bank in the list is identified as the main bank for the firm. If a governmental financial institution is the first bank in the list, the second bank is identified as the main bank. For example, 17 major banks and 35 regional banks were identified as main banks as of FY1997.

We use three alternative measures to evaluate the health of a main bank: (1) the capital-asset ratio in terms of market value (MCAR), (2) the Bank for International Settlement (BIS) capital-asset ratio (BCAR), and (3) the difference between the two measures of the capital-asset ratio (GAP). The MCAR is derived by dividing market capitalization by the same risk-weighted assets as the BCAR. To obtain market capitalization, we obtain the product of the number of outstanding shares of each bank and the share price at the end of the fiscal year. The GAP is calculated by subtracting the BCAR from the MCAR.

The BCAR has been widely used in the previous studies as a measure of bank health. For example, Peek and Rosengren (2005) use the deviation of a bank's reported BIS capital-asset ratio from the minimum requirement to measure the health of the bank. However, Woo (2003) and Hosono and Sakuragawa (2005) point out that the BCAR reported by banks may not accurately reflect their condition because banks can easily manipulate the assessment of nonperforming loans and the provision for loan losses. Instead, they propose the MCAR as a measure of bank health, assuming that the stock market can accurately evaluate the asset quality of each bank. Hosono and Sakuragawa (2005) also find that the difference between the MCAR and the reported BCAR affected

[9] We refer to the summer issue of *Kaisha Shikiho* for the construction of data.

the Japanese bank lending during the 1990s. Following their arguments, we also use the MCAR and GAP as measures of bank health.

The capital-asset ratio of a bank is supposed to decline when the bank health deteriorates. Thus, the MCAR, BCAR, and GAP should have positive effects on the productivity of a firm if the deterioration in bank health negatively affects the productivity of the firm.

Some characteristics of firms can also affect their productivity. Fukao et al. (2005) find that larger firms have higher productivity. Moreover, Hanazaki and Horiuchi (2000) and Fukao et al. (2005) report that firms with larger foreign ownership have higher productivity. Jensen (1986) points out that debt improves firm efficiency by reducing the agency costs of free cash flows. As the theory predicts, Hanazaki and Horiuchi (2000) find that firms relying more on debt financing have higher productivity.

In constructing the TFP and other variables for each firm, we use *Kigyo Zaimu Deta Banku* (company financial statements data bank), compiled by the Development Bank of Japan.[10] Financial data on banks are obtained from the Nikkei NEEDs database and the financial statements of each banks. The data on the stock prices of each bank are collected from the Stock Price CD-ROM and Monthly Statistics Report, which are published by Toyo Keizai and the Tokyo Stock Exchange, respectively. The appendix provides details about the construction of our data.

3.2 Empirical Model

In order to examine the relationship between bank distress and the productivity of their borrowers, we focus on the TFP of individual firms. Specifically, we test whether the variables measuring the health of a main bank of a firm have significant effects on the TFP level of the firm. We specify the empirical model as follows:

$$\ln TFP_{it} = \alpha + \beta \ln TFP_{it-1} + \gamma BANK\,HEALTH_{jt} + \sum_s \delta_s X_{sit-1}$$

[10] We use nonconsolidated data of each firm because it provides detailed information on the investment expenditure on each asset type, which is essential for calculating the capital stock of each firm.

$$+\sum_t \theta_t YEAR_t + \eta_i + \varepsilon_{it}, \tag{2}$$

where $\ln\text{TFP}_{it}$ is the logarithm of the TFP level of firm i at the end of the fiscal year t. $\ln\text{TFP}_{it-1}$ is included as the lagged dependent variable to allow for state dependence. BANK HEALTH_{jt} is a variable measuring the health of a main bank j for firm i. We use the three alternative measures for BANK HEALTH: the MCAR, BCAR, and GAP. X_{sit-1} is a variable for the characteristics of firm i that may have effects on the TFP. We use one-year lagged variables of X to mitigate the endogeneity problem. The variables X include lnASSETS, FOREIGN, and DEBT. lnASSETS is the logarithm of the book value of a firm's total assets; FOREIGN is the proportion of a firm's shares held by foreigners; and DEBT is the ratio of the book value of a firm's debt to the book value of its total assets. YEAR_t is a year dummy to control for the aggregate shock common to all firms. η_i represents the unobservable fixed effects for firm i, and ε_{it} is the error term.

We eliminate the fixed effects η_i by differencing equation (2), and obtain the following equation:

$$\begin{aligned} \Delta \ln TFP_{it} &= \beta \Delta \ln TFP_{it-1} + \gamma \Delta BANK\,HEALTH_{jt} + \sum_s \delta_s \Delta X_{sit-1} \\ &\quad + \sum_t \theta_t \Delta YEAR_t + \Delta \varepsilon_{it}. \end{aligned} \tag{3}$$

The ordinary least squares (OLS) estimation of equation (3) generally results in inconsistent estimators, because the lagged dependent variable is correlated with the error term. Following the method suggested by Anderson and Hsiao (1981), we use $\ln\text{TFP}_{it-2}$ as an instrument for $\Delta \ln\text{TFP}_{it-1}$ in order to estimate equation (3).[11]

The assumption that BANK HEALTH is an exogenous variable in our empirical model may be invalid because the productivity of firms can affect the health of the main bank. The poor performance of firms caused by inefficient management may increase the nonperforming loans of the main bank. An increase in bad loans damages the health

[11] We also estimate the equation using the Generalized Method of Moments (GMM) proposed by Arellano and Bond (1991). However, we do not adopt the estimation results because the test of overidentifying restrictions strongly suggests that some of the instruments are correlated with the error term.

of the main bank. This simultaneous causality results in biased estimators.[12] In order to solve the endogeneity problem of BANK HEALTH, we need an instrument that is correlated with Δ BANK HEALTH but uncorrelated with $\Delta\varepsilon$ in equation (3).[13]

Following Watanabe (2005), we focus on the lending behavior of banks in the 1980s. Specifically, as the instrument for ΔBANK HEALTH, we use LOAN89—each bank's share of lending in FY1989 to real estate-related industries (the real estate, construction, and financial services industries).[14] The optimism associated with the boom in land prices drove banks to aggressively increase their lending to real estate-related industries in the 1980s. When the boom collapsed and land prices fell sharply in the 1990s, many of the real estate loans turned into nonperforming ones. Ueda (2000) reports that there is a clear positive correlation between the nonperforming loan ratio of each bank and the share of loans to real estate-related industries. Massive losses resulting from the writing off of nonperforming loans impaired the banks' capital. Thus, there should be a negative correlation between LOAN89 and ΔBANK HEALTH. Meanwhile, there should be no correlation between LOAN89 and $\Delta\varepsilon$ because the current productivity of firms does not affect the banks' previous loan portfolio choice.

Equation (3) is estimated in two ways. First, we treat BANK HEALTH as an exogenous variable. Then, we treat BANK HEALTH as an endogenous variable and use LOAN89 as the instrument for ΔBANK HEALTH. In the first stage, we regress ΔBANK HEALTH on LOAN89 and the interaction terms between LOAN89 and year dummies so that we can allow the relationship between ΔBANK HEALTH and LOAN89 to vary over time.

[12] Stock and Watson (2006: 324–325) provide a detailed explanation of the simultaneous causality bias.

[13] As an alternative way to deal with the endogeneity problem, we use a one-year lagged BANK HEALTH instead of BANK HEALTH. However, we obtain poor results.

[14] When a bank merges with other banks, we recalculate the lending share by aggregating the data of the merger participants.

4 Empirical Results

4.1 Descriptive Statistics

Figure 1 depicts a yearly time series of the average TFP level of listed manufacturing firms. The TFP improved steadily until FY1996 and fell sharply in FY1997, when the banking crisis occurred. After the brief recovery during FY1998–1999, the TFP fell again with the advent of the recession of the early 2000s.

[Insert Figure 1 about here.]

Table 1 shows the descriptive statistics of the TFP and other variables.[15] We define the period of FY1997–1999 as the period of banking crisis, taking into account the fact that the crisis erupted in November 1997 and ended in early 2000. Thus, the sample period is divided into three periods: FY1993–1996 (the precrisis period), FY1997–1999 (the crisis period), and FY2000–2002 (the postcrisis period).

The increase in the TFP during FY1997–1999 was due to the recovery of the TFP during FY1998–1999. The decrease in the TFP during FY2000–2002 was due to the recession. With regard to the measures for bank health, the MCAR and BCAR indicate different trends. The MCAR declined sharply throughout the sample period, while the BCAR remained stable. As a result, the GAP—the difference between the MCAR and BCAR—turned from a positive value to a negative one during FY1997–1999. The negative value of GAP implies that the MCAR was lower as compared to the reported BCAR. The discrepancy between the two measures for the capital-asset ratio was larger in FY2000–2002.

[Insert Table 1 about here.]

[15] We exclude aberrant observations from our sample. The aberrant observations are defined as those for which any one variable in the estimation equation has a value that is in the top or the bottom 1 percent of the total observations during FY1992–2002.

4.2 Basic Results

Table 2 presents the regression results of equation (3). The upper panel of the table presents the results obtained by treating BANK HEALTH as an exogenous variable, while the lower panel presents the results obtained by treating it as an endogenous variable.[16] The results of each panel are reported for each of the three observed periods. The three columns for each period show the results using the three alternative measures for BANK HEALTH: the MCAR, BCAR, and GAP.

For FY1993–1996, there is no strong relationship between bank health and the level of productivity of firms. We find a positive and statistically significant effect of MCAR on the productivity of firms when we treat it as an endogenous variable. However, the effect is statistically significant only at the 10 percent level.

For FY1997–1999, we find a strong relationship between bank health and the level of productivity of firms. The MCAR and GAP have positive and statistically significant effects on the productivity of firms regardless of whether or not they are treated as endogenous variables. The magnitude of the effects is economically meaningful. The estimated coefficient of MCAR is 0.759 when we treat it as an endogenous variable. This implies that a rise in the MCAR from 0.06 to 0.12 (about two standard deviations) induces a rise in the level of productivity by 4.6 percent points. The estimation results suggest that a firm whose main bank is in distress has a lower level of productivity. With regard to the BCAR, we cannot obtain reliable results. In the upper panel, the effect of BCAR is positive but statistically insignificant. In the lower panel, the effect of BCAR is positive and statistically significant. However, the J-statistic suggests that the instruments for the BCAR are not exogenous. As Hosono and Sakuragawa (2005) point out, the accounting discretion exercised by banks can drive a wedge between the reported BIS capital-asset ratio and the true financial condition of the banks. The discretionary

[16]The F-statistics for the first-stage regression for BANK HEALTH may overstate the relevance of the instruments because ΔBANK HEALTH may be correlated with the instruments for lagged Δ lnTFP, and not the instruments for Δ BANK HEALTH in equation (3). We check this possibility by estimating the model for which lagged lnTFP is not included in the explanatory variables. Although not reported here, ΔBANK HEALTH is sufficiently correlated with its instruments.

accounting practices of banks may cause the poor estimation results for the BCAR.

For FY2000–2002, we find no consistent relationship between bank health and the level of productivity of firms. Positive and statistically significant effects of the MCAR and GAP on the productivity of firms are observed in the upper panel but not in the lower panel. These facts suggest that the regression results in the upper panel suffer from the simultaneous causality bias.

Our regression results indicate that the level of productivity of firms was affected by the health of the main bank only during FY1997–1999, when the banking crisis occurred. Our results suggest that the turmoil in the banking sector had adverse effects on the manufacturing sector. We discuss this point later.

The results of other variables are qualitatively similar for each period. The coefficient of lagged lnTFP is positive and highly significant.[17] The results indicate the strong state dependence of the productivity of firms. Unexpectedly, lnASSETS is found to be negatively related to the productivity of firms. Our result is in sharp contrast to that of Fukao et al. (2005). This may be because we use the lagged variable for firm size, while Fukao et al. (2005) use the current variable. The coefficient of FOREIGN has an expected positive sign; however, it is almost statistically insignificant. DEBT has a positive and statistically significant effect on the productivity of firms. The result is consistent with that of Hanazaki and Horiuchi (2000).

[Insert Table 2 about here.]

5 Robustness Checks

In the above section, we obtained the results that deterioration in bank health lowered the level of productivity of manufacturing firms only during FY1997–1999. However, the

[17] The coefficients of lagged lnTFP are close to one for FY1993–1996 and FY1997–1999. Wooldridge (2002: 304) points out a problem in the estimation when the coefficient of lagged dependent variable is close to one. We check whether the problem affects the regression results by estimating the model that assumes the coefficient of lagged lnTFP to be one. Although not reported here, the results are qualitatively similar to those reported in Table 2.

value of BANK HEALTH (the MCAR, BCAR, and GAP) not only changes when the financial condition of the main bank changes but also when the main bank merges with other banks. The measures for the health of a main bank also changes when a firm adopts another bank as its main bank. We verify whether the basic results are affected by bank mergers among banks or the replacement of main banks by firms. Table 3 presents the regression results, excluding the observations for which the main bank merged with other banks or was replaced by another bank. The table only shows the results treating BANK HEALTH as an endogenous variable.[18] A large decrease in the number of observations for FY2000–2002 is due to the merger among major banks. The results are similar to those of the lower panel of Table 2. We can confirm that the basic results are not affected by bank mergers or replacements of main banks.

[Insert Table 3 about here.]

We verify whether the effect of bank health on the productivity of firm varies according to the dependency of the firm on bank debt. The firms that depend less on bank debt are supposed to be less subject to deterioration in bank health. The medians of bank debt to the total asset ratio for FY1993–1996, FY1997–1999, and FY2000–2002 are 0.134, 0.140, and 0.135, respectively. The firms with a bank debt to total asset ratio above the median are classified as bank-dependent firms, and the remaining, as less bank-dependent firms.

Table 4 presents the regression results for bank-dependent firms and less bank-dependent firms. The upper panel of the table presents the results for bank-dependent firms, and the lower panel, those for less bank-dependent ones. The results of each panel are reported for each of the observed periods (FY1993–1996, FY1997–1999, and FY2000–2002). The three columns for each period show the results using the three alternative measures for BANK HEALTH.

For FY1997–1999, the MCAR and GAP have positive and statistically significant effects on the level of productivity of firms for bank-dependent firms. In contrast, we

[18] We also implement the regressions treating BANK HEALTH as an exogenous variable. Although not reported here, the results are basically the same as those reported in the tables below.

find no relationship between bank health and the productivity of firms for less bank-dependent firms. These results are consistent with our expectation that the effect of bank health has less impact on the productivity of the firms that rely less on bank debt. For other periods, we find no statistically significant relationships between bank health and the productivity of firms for bank-dependent firms, and for less bank-dependent ones.

[Insert Table 4 about here.]

We also examine whether the effect of bank health on the productivity of firms is affected by the firm's access to the capital market. We focus on the frequency of issuance of bonds by firms during FY1993–1998.[19] As of FY1998, 769 firms had never issued any bonds, while 630 firms had issued bonds at least once during the past six years. The former are classified as nonbond issuers, and the latter, as bond issuers.

Table 5 presents the regression results for nonbond issuers and bond issuers. The upper panel of the table presents the results for nonbond issuers, while the lower panel presents the results for bond issuers. The results of each panel are reported for each of the observed periods. The three columns for each period show the results using the three alternative measures for BANK HEALTH.

For FY1997–1999, we find positive and statistically significant relationships between the two measures of bank health—the MCAR and GAP—and the productivity of firms for nonbond issuers. We find that only the MCAR has a positive and statistically significant effects on the productivity of firms for bond issuers. Further, the effect is statistically significant only at the 10 percent level. These results suggest that the deterioration in bank health had adverse effects primarily on the firms for whom access to bond markets was constrained during FY1997–1999. For FY1993–1996, the MCAR has a positive and statistically significant effects on the productivity of firms for bond issuers but not for nonbond issuers. The unexpected results may suggest a spurious relationship between bank health and the productivity of firms for this period. For FY2000–2002, we find no

[19] Unfortunately, we cannot obtain the data on the issuance of bonds by firms after FY1999.

statistically significant relationships between bank health and the productivity of firms for either nonbond issuers or bond issuers.

We find that the effects of bank health on the productivity of firms are observed for the firms that heavily relied on bank debt and the firms for whom access to the capital market was constrained. The results are consistent with our interpretation that the financial conditions of banks had serious impacts on the productivity of their borrowers during FY1997–1999.

[Insert Table 5 about here.]

6 Discussion

In this section, we discuss the reason that bank health significantly affected the productivity of manufacturing firms only during FY1997–1999. We argue that a credit crunch caused by the banking crisis might have affected the productivity of firms during this period.

For FY1997–1999, the Japanese economy experienced the most serious banking crisis in the postwar period. Some researchers point out that a credit crunch occurred during the banking crisis (Ogawa, 2003; Woo, 2003; Watanabe, 2005). Bernanke and Lown (1991) define "a bank credit crunch" as "a significant leftward shift in the supply curve for bank loans, holding constant both the safe real interest rate and the quality of potential borrowers."[20]

Figure 2 presents the "lending attitude of financial institutions" diffusion index in Principal Enterprises *Tankan* (Short-term Economic Survey of Enterprises in Japan) reported by the Bank of Japan (BOJ). The responding firms are asked to select one of three alternatives: (1) Accommodative, (2) Not so severe, and (3) Severe. The diffusion index is constructed by subtracting the percentage share of firms responding "Severe"

[20]Bernanke and Lown (1991) present the seminal paper on this subject. They argue that the deterioration in the capital of banks caused the unusual slowdown in the lending activity in New England in the early 1990s.

from that of firms responding "Accommodative." The Principal Enterprises *Tankan* surveys 373 manufacturing firms that are basically selected from among listed firms having a capital greater than one billion yen.[21]

The diffusion index fell precipitously in December 1997 and took negative values for the period from March 1998 to June 1999. In September 1999, the diffusion index took a positive value for the first time in a year and a half. This suggests that even large manufacturing firms experienced a serious credit crunch during the banking crisis, although they were relatively healthy as compared to firms in troubled industries such as the construction and real estate industries.

[Insert Figure 2 about here.]

Some empirical studies provide further evidence of the occurrence of a credit crunch during the banking crisis. Woo (2003) examines the lending behavior of the Japanese banks during FY1990–1997, and finds a positive and significant effect of bank capital on the new loan growth in FY1997. He points out that, in FY1997, there occurred not only severe distress of the financial system but also a significant strengthening of bank regulation such as the introduction of the prompt corrective action framework. He argues that these factors caused the weakly capitalized banks to slow down their lending. Watanabe (2005) examines the bank lending to the manufacturing industry during FY1995–2000, and confirms that a positive and significant relationship existed between bank capital and the loan growth in FY1997–1998. These empirical results support that a credit crunch occurred during the banking crisis.

A credit crunch can have adverse effects on firm activity. Bernanke and Lown (1991) argue, "by limiting access to working capital, reduced lending could force firms to shed workers and delay investment plans, reducing output in both the short and long run." Ogawa (2003) examines the effects of loan supply on firm investment by using the lending attitude of financial institutions diffusion index of the BOJ as a proxy for the supply condition of loans. He finds that the supply condition of loans had a significant impact on the investment even for large firms.

[21] See the December 2002 survey for details.

The banking crisis caused the weakly capitalized banks to cut back on lending to firms. A sharp decrease in the supply of loans negatively affected the efficiency of firm management by disrupting production. This is consistent with our finding that the positive relationship between bank health and the productivity of manufacturing firms was observed only during FY1997–1999.

We also check whether our finding can be explained by the evergreening behavior of banks. As Peek and Rosengren (2005) point out, unhealthy banks have an incentive to continue or increase lending to troubled and inefficient firms in order to conceal their problem loans. Such forbearance lending could lead to a positive relationship between bank health and the productivity of firms. However, many empirical studies report that Japanese banks were engaged in forbearance lending to nonmanufacturing firms rather than manufacturing firms (Sekine et al., 2003; Caballero et al., 2006). Moreover, the evergreening behavior of banks was observed throughout the 1990s, which is inconsistent with our finding that bank health had an effect on the productivity of firms only during FY1997–1999. These facts do not support the hypothesis that the evergreening behavior of banks caused a decline in the productivity of manufacturing firms during FY1997–1999.

7 Conclusion

We analyze how deterioration in bank health during the 1990s affected the productivity of firms, using data on listed companies in the Japanese manufacturing industry. We find some evidence suggesting that deterioration in the main bank health caused a decrease in the productivity of the borrowers in FY1997–1999. Moreover, the relationship between main bank health and the productivity of firms is observed more clearly in bank-dependent firms. However, we cannot find a significant relationship between main bank health and the productivity of firms either in FY1994–1996 or FY2000–2002.

It is a widely accepted that a credit crunch during a banking crisis should lowers the productivity of borrowing firms; however, this is not empirically confirmed in the existing literature. Our findings on manufacturing firms in Japan provide a supporting

evidence for this view.

Data Appendix

TFP

In calculating the TFP level of a firm, we use the total sales [K2820] as the output.[22] The total sales of each firm are deflated by the BOJ's output price index for each sector. The inputs of a firm consist of intermediate input, labor, and capital. The intermediate input is obtained by subtracting the sum of the wages [K4050 + K5750] and depreciation [K6800] from the sum of the cost of sales [K2840] and sales administrative expense [K2970]. The intermediate input of each firm is deflated by the BOJ's input price index for each sector. The labor input is obtained as the product of the number of employees [K0440] and hours worked per employee. The data on the working hours for each sector are available from the Monthly Labour Survey by the Ministry of Health, Labour, and Welfare.

Capital stock for a firm is defined as the sum of the six categories of tangible fixed assets: (1) buildings, (2) structures, (3) machinery, (4) ships, (5) autos/trucks, and (6) tools/fixtures.[23] First, we estimate the book value of investment in each category of the tangible fixed assets, taking into account the sold or retired assets. The book value of investment in each category of tangible fixed assets during year t (NI_t) is expressed as $NI_t = \Delta TA_t - (ASR_t - ADSR_t)$, where ΔTA is an increase in the tangible fixed assets [K6270, K6280, K6290, K6300, K6310, K6320], ASR is the acquisition value of sold or retired assets, and ADSR is the book value of accumulated depreciation for sold or retired assets.[24] We then deflate the book value of investment in each category of

[22] K**** denotes an item number in *Kigyo Zaimu Deta Banku* (company financial statements data bank).

[23] We refer to Hori et al. (2004) and Tanaka (2004) in constructing the data on capital stock for each firm.

[24] ASR_t is calculated as $ASR_t = A_{t-1} - A_t + \Delta TA_t$, where A is the acquisition value of assets [K6410, K6420, K6430, K6440, K6450, K6460]. $ADSR_t$ is calculated as $ADSR_t = AD_{t-1} - AD_t + DEP_t$, where AD is the book value of the accumulated depreciation for assets [K6530, K6540, K6550, K6560, K6570,

tangible fixed assets by the BOJ's corporate goods price index.

The real value of each category of the tangible fixed assets in year t (K_t) is calculated by the perpetual inventory method as follows: $K_t = (1-\delta)K_{t-1} + I_t$, where I is the real value of investment in the tangible fixed assets, and δ is the depreciation rate. Following Hayashi and Inoue (1991), we set δ as 0.047 for buildings, 0.0564 for structures, 0.09489 for machinery, 0.1470 for ships, 0.1470 for autos/trucks, and 0.08838 for tools/fixtures. We select FY1977 as the base year when the real value of the tangible assets is assumed to be equal to the book value. Thus, the initial value of K for firms listed before FY1977 is set at the book value in FY1977, while that for firms listed after FY1977 is set at the book value in the fiscal year when the firms were listed.

Capital input is obtained as the product of the capital stock and capital utilization index. The data on capital utilization index for each sector are available from the JIP Database 2006 of the Research Institute of Economy, Trade and Industry (RIETI).

We calculate the cost shares of the three inputs: intermediate input, labor, and capital. The intermediate input cost is obtained by subtracting the sum of wages [K4050 + K5750] and depreciation [K6800] from the sum of the cost of sales [K2840] and sales administrative expense [K2970]. The labor cost is defined as wages [K4050 + K5750]. The capital cost is defined as the sum of the capital cost of the six categories of tangible fixed assets. The capital cost of each category of tangible fixed assets in year t (Cost_t) is expressed as follows: $Cost_t = q_t(r_t + \delta)K_t$, where q is the price of the tangible fixed assets, r is the interest rate, δ is the depreciation rate, and K is the real value of the tangible fixed assets. The data on the price of the tangible fixed assets are obtained from the BOJ's corporate goods price index. The data on interest rates are obtained from the "Yields to Subscribers and Issue Terms of Interest-bearing Government Bonds" compiled by the BOJ.

K6580], and DEP is the accounting depreciation [K6630, K6640, K6650, K6660, K6670, K6680].

Other Variables for Firm Characteristics

The data on ASSETS are obtained from the book value of the total assets [K1880]. The data on FOREIGN are obtained from the proportion of a firm's shares held by foreigners [K0200]. For DEBT, we divide the outstanding amount of debts, bonds, and commercial papers [K1960 + K1990 + K2000 + K2250 + K2300 + K2350] by the book value of the total assets [K1880]. The bank debt to total asset ratio is derived by dividing the outstanding amount of debts [K1960 + K2000 + K2350] by the book value of the total assets [K1880]. For the frequency of issuance of bonds, we refer to the amount of bond issuance [K6830, K6870, K6910].

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Table 1. Descriptive statistics (mean)

	FY1993-1996	FY1997-1999	FY2000-2002
Variables for firm characteristics			
TFP (FY1990=1)	0.989	0.991	0.984
	(0.078)	(0.067)	(0.063)
ln*ASSETS*	17.722	17.690	17.699
	(1.320)	(1.310)	(1.322)
FOREIGN	0.053	0.052	0.055
	(0.076)	(0.078)	(0.090)
DEBT	0.252	0.244	0.223
	(0.165)	(0.177)	(0.174)
Variables for bank characteristics (*BANK HEALTH*)			
MCAR	0.127	0.089	0.048
	(0.039)	(0.032)	(0.028)
BCAR	0.092	0.107	0.105
	(0.006)	(0.012)	(0.009)
GAP	0.035	-0.018	-0.057
	(0.038)	(0.033)	(0.026)
Obs	4635	3368	3339

The table presents the mean values for the variables in our empirical model. Standard deviations are in the parentheses. TFP is the total factor productivity for a firm. The TFP level for a firm in a fiscal year is measured relative to that for a hypothetical firm in FY1990, which is defined to be one. lnASSETS is the logarithm of the book value of a firm's total assets. FOREIGN is the proportion of a firm's shares held by foreigners. DEBT is the ratio of the book value of a firm's debt to the book value of its total assets. MCAR is the capital-asset-ratio of a main bank for a firm in terms of market value. BCAR is the Basel capital-asset-ratio of a main bank for a firm. GAP is MCAR minus BCAR.

Table 2. Basic rgression results

Dependent variable: ln*TFP*	Results treating BANK HEALTH (MCAR, BCAR, and GAP) as exogenous								
	FY1993-1996			FY1997-1999			FY2000-2002		
MCAR	-0.072			0.246 ***			0.165 **		
	(0.047)			(0.076)			(0.075)		
BCAR		0.230			0.217			-0.301 **	
		(0.170)			(0.144)			(0.123)	
GAP			-0.096 **			0.130 **			0.143 ***
			(0.045)			(0.062)			(0.048)
lagged ln*TFP*	0.985 ***	0.973 ***	0.968 ***	0.869 ***	0.951 ***	0.863 ***	0.501 ***	0.526 ***	0.495 ***
	(0.057)	(0.054)	(0.057)	(0.074)	(0.079)	(0.074)	(0.061)	(0.064)	(0.060)
ln*ASSETS*	-0.103 ***	-0.104 ***	-0.102 ***	-0.129 ***	-0.146 ***	-0.128 ***	-0.065 ***	-0.067 ***	-0.065 ***
	(0.013)	(0.012)	(0.013)	(0.018)	(0.019)	(0.018)	(0.012)	(0.013)	(0.012)
FOREIGN	0.048	0.048	0.046	0.104	0.065	0.099	0.019	0.001	0.018
	(0.038)	(0.038)	(0.038)	(0.065)	(0.065)	(0.065)	(0.050)	(0.051)	(0.050)
DEBT	0.145 ***	0.151 ***	0.145 ***	0.214 ***	0.232 ***	0.213 ***	0.148 ***	0.153 ***	0.146 ***
	(0.021)	(0.021)	(0.021)	(0.028)	(0.030)	(0.028)	(0.026)	(0.026)	(0.025)
F-statistics (lagged ln*TFP*)	380.37 ***	409.61 ***	375.08 ***	319.64 ***	309.15 ***	320.63 ***	274.56 ***	258.10 ***	273.80 ***
Obs	3410	3503	3321	2243	2236	2245	2224	2113	2223

Dependent variable: ln*TFP*	Results treating BANK HEALTH (MCAR, BCAR, and GAP) as endogenous								
	FY1993-1996			FY1997-1999			FY2000-2002		
MCAR	0.374 *			0.759 ***			-0.194		
	(0.210)			(0.228)			(0.324)		
BCAR		-1.044			0.931 **			1.810	
		(1.047)			(0.425)			(1.835)	
GAP			0.293			0.566 ***			-0.185
			(0.399)			(0.194)			(0.295)
lagged ln*TFP*	0.951 ***	0.979 ***	0.937 ***	0.893 ***	0.944 ***	0.876 ***	0.535 ***	0.584 ***	0.542 ***
	(0.057)	(0.055)	(0.060)	(0.075)	(0.079)	(0.074)	(0.067)	(0.085)	(0.074)
ln*ASSETS*	-0.099 ***	-0.106 ***	-0.099 ***	-0.134 ***	-0.144 ***	-0.131 ***	-0.067 ***	-0.073 ***	-0.069 ***
	(0.013)	(0.013)	(0.013)	(0.018)	(0.019)	(0.018)	(0.012)	(0.014)	(0.013)
FOREIGN	0.042	0.044	0.041	0.120 *	0.072	0.106	0.021	0.003	0.024
	(0.038)	(0.038)	(0.038)	(0.066)	(0.065)	(0.067)	(0.051)	(0.056)	(0.052)
DEBT	0.147 ***	0.154 ***	0.145 ***	0.215 ***	0.231 ***	0.212 ***	0.154 ***	0.162 ***	0.153 ***
	(0.021)	(0.021)	(0.021)	(0.029)	(0.030)	(0.029)	(0.026)	(0.029)	(0.027)
F-statistics (lagged ln*TFP*)	95.63 ***	102.13 ***	94.74 ***	110.93 ***	106.55 ***	110.91 ***	94.01 ***	86.82 ***	94.00 ***
F-statistics (*BANK HEALTH*)	47.55 ***	14.84 ***	8.41 ***	95.66 ***	89.42 ***	47.47 ***	12.52 ***	4.46 ***	12.20 ***
J-statisitics	1.68	4.00	3.28	0.09	12.88 ***	1.66	1.23	0.65	1.20
Obs	3410	3503	3321	2243	2236	2245	2224	2113	2223

The upper panel of the table presents the results of the IV estimation treating BANK HEALTH as exogenous. The lower panel presents the results of the GMM estimation treating BANK HEALTH as endogenous. Refer to the footnote of Table 1 about the definitions of the regression variables. The Results for year dummies are not reported here. The F-statistics (an endogenous variable) presents the result of the F-test for the instruments in the first-stage regression for the endogenous variable. Robust standard errors are in parentheses. ***, **, * indicate statistical significance level of 1, 5, and 10%, respectively.

Table 3. Rgression results excluding observations with mergers or switches of main banks (Treating BANK HEALTH as endogenous)

Dependent variable: ln*TFP*	Results treating BANK HEALTH (MCAR, BCAR, and GAP) as endogenous								
	FY1993-1996			FY1997-1999			FY2000-2002		
MCAR	0.249			0.740 ***			-0.043		
	(0.183)			(0.229)			(0.226)		
BCAR		-1.259			0.630			1.458	
		(1.039)			(0.415)			(1.982)	
GAP			0.073			0.564 ***			-0.040
			(0.286)			(0.194)			(0.216)
lagged ln*TFP*	0.958 ***	0.983 ***	0.951 ***	0.884 ***	0.938 ***	0.870 ***	0.421 ***	0.450 ***	0.422 ***
	(0.059)	(0.057)	(0.061)	(0.074)	(0.078)	(0.073)	(0.071)	(0.075)	(0.073)
ln*ASSETS*	-0.100 ***	-0.107 ***	-0.100 ***	-0.132 ***	-0.145 ***	-0.130 ***	-0.066 ***	-0.066 ***	-0.066 ***
	(0.013)	(0.014)	(0.013)	(0.018)	(0.019)	(0.018)	(0.014)	(0.015)	(0.014)
FOREIGN	0.069 *	0.065 *	0.065 *	0.113 *	0.065	0.100	-0.007	-0.034	-0.006
	(0.038)	(0.039)	(0.038)	(0.066)	(0.065)	(0.067)	(0.057)	(0.061)	(0.058)
DEBT	0.150 ***	0.159 ***	0.148 ***	0.212 ***	0.229 ***	0.208 ***	0.166 ***	0.161 ***	0.166 ***
	(0.021)	(0.022)	(0.022)	(0.028)	(0.030)	(0.028)	(0.028)	(0.031)	(0.028)
F-statistics (lagged ln*TFP*)	87.99 ***	94.48 ***	87.00 ***	109.02 ***	104.61 ***	109.02 ***	67.47 ***	62.16 ***	67.47 ***
F-statistics (*BANK HEALTH*)	51.66 ***	15.10 ***	14.17 ***	97.75 ***	87.65 ***	46.87 ***	13.52 ***	2.48 *	13.23 ***
J-statisitics	2.90	3.30	3.65	0.00	12.54 ***	1.10	0.97	0.60	0.97
Obs	3257	3345	3167	2228	2213	2228	1546	1468	1546

The table presents the results of the GMM estimation treating BANK HEALTH as endogenous. We exclude the observations for which the main bank merged with other banks or was switched to another bank. Refer to the footnote of Table 1 about the definitions of the regression variables. The Results for year dummies are not reported here. The F-statistics (an endogenous variable) presents the result of the F-test for the instruments in the first-stage regression for the endogenous variable. Robust standard errors are in parentheses. ***, **, * indicate statistical significance level of 1, 5, and 10%, respectively.

Table 4. Rgression results for bank-dependent firms and less bank-dependent firms (Treating BANK HEALTH as endogenous)

	Results for bank-dependent firms								
Dependent variable: ln*TFP*	FY1993-1996			FY1997-1999			FY2000-2002		
MCAR	0.572			0.656 **			-1.113		
	(0.365)			(0.334)			(1.073)		
BCAR		-0.955			0.429			2.157	
		(1.407)			(0.652)			(2.470)	
GAP			0.163			0.733 **			-0.732
			(0.492)			(0.323)			(0.717)
lagged ln*TFP*	0.940 ***	1.003 ***	0.943 ***	1.012 ***	1.061 ***	1.011 ***	0.642 ***	0.575 ***	0.636 ***
	(0.091)	(0.088)	(0.092)	(0.100)	(0.108)	(0.101)	(0.161)	(0.121)	(0.162)
ln*ASSETS*	-0.054 ***	-0.059 ***	-0.051 ***	-0.117 ***	-0.121 ***	-0.120 ***	-0.056 ***	-0.064 ***	-0.061 ***
	(0.018)	(0.018)	(0.018)	(0.023)	(0.024)	(0.023)	(0.018)	(0.020)	(0.019)
FOREIGN	-0.041	-0.039	-0.048	0.219	0.092	0.190	0.110	0.024	0.088
	(0.058)	(0.063)	(0.059)	(0.135)	(0.131)	(0.138)	(0.119)	(0.104)	(0.110)
DEBT	0.204 ***	0.217 ***	0.200 ***	0.287 ***	0.304 ***	0.289 ***	0.170 ***	0.150 ***	0.159 ***
	(0.031)	(0.032)	(0.032)	(0.042)	(0.044)	(0.042)	(0.048)	(0.040)	(0.044)
F-statistics (lagged ln*TFP*)	53.01 ***	58.37 ***	52.76 ***	57.35 ***	54.64 ***	57.27 ***	54.27 ***	49.08 ***	54.21 ***
F-statistics (*BANK HEALTH*)	24.66 ***	5.82 ***	3.29 **	49.34 ***	38.77 ***	21.09 ***	9.81 ***	2.48 ***	10.37 ***
J-statisitics	0.75	2.69	2.66	2.32	7.25 ***	0.85	0.60	1.41	0.89
Obs	1675	1730	1616	1135	1124	1137	1112	1053	1111

	Results for less bank-dependent firms								
Dependent variable: ln*TFP*	FY1993-1996			FY1997-1999			FY2000-2002		
MCAR	0.111			0.374			0.111		
	(0.257)			(0.278)			(0.308)		
BCAR		-0.569			0.998			0.162	
		(1.201)			(0.638)			(1.532)	
GAP			0.037			0.208			0.095
			(0.384)			(0.207)			(0.295)
lagged ln*TFP*	0.990 ***	0.987 ***	0.985 ***	0.863 ***	0.950 ***	0.852 ***	0.538 ***	0.558 ***	0.537 ***
	(0.075)	(0.073)	(0.077)	(0.122)	(0.131)	(0.121)	(0.092)	(0.094)	(0.093)
ln*ASSETS*	-0.151 ***	-0.152 ***	-0.150 ***	-0.178 ***	-0.206 ***	-0.178 ***	-0.087 ***	-0.085 ***	-0.087 ***
	(0.018)	(0.018)	(0.018)	(0.033)	(0.034)	(0.032)	(0.020)	(0.020)	(0.020)
FOREIGN	0.089 *	0.084 *	0.090 *	0.072	0.072	0.071	0.012	-0.010	0.010
	(0.049)	(0.049)	(0.049)	(0.068)	(0.071)	(0.068)	(0.060)	(0.063)	(0.060)
DEBT	0.132 ***	0.131 ***	0.133 ***	0.229 ***	0.261 ***	0.232 ***	0.178 ***	0.170 ***	0.178 ***
	(0.029)	(0.029)	(0.029)	(0.052)	(0.053)	(0.051)	(0.041)	(0.044)	(0.042)
F-statistics (lagged ln*TFP*)	49.94 ***	51.89 ***	49.59 ***	48.92 ***	45.60 ***	48.92 ***	42.45 ***	39.89 ***	42.45 ***
F-statistics (*BANK HEALTH*)	16.58 ***	10.76 ***	6.30 ***	39.45 ***	50.35 ***	29.58 ***	6.17 ***	4.17 ***	6.00 ***
J-statisitics	1.09	2.00	1.14	2.90 *	3.87 **	3.59 *	0.28	0.49	0.31
Obs	1735	1773	1705	1108	1112	1108	1112	1060	1112

The table presents the results of the GMM estimation treating BANK HEALTH as endogenous. The upper panel of the table presents the results for bank-dependent firms while the lower panel for less bank-dependent ones. Refer to the footnote of Table 1 about the definitions of the regression variables. The Results for year dummies are not reported here. The F-statistics (an endogenous variable) presents the result of the F-test for the instruments in the first-stage regression for the endogenous variable. Robust standard errors are in parentheses. ***, **, * indicate statistical significance level of 1, 5, and 10%, respectively.

Table 5. Rgression results for nonbond issures and bond issures (Treating BANK HEALTH as endogenous)

	Results for nonbond issures								
Dependent variable: ln*TFP*	FY1993-1996			FY1997-1999			FY2000-2002		
MCAR	-0.022			0.763 **			-0.103		
	(0.286)			(0.315)			(0.367)		
BCAR		-2.793			0.709			0.883	
		(2.488)			(0.582)			(2.241)	
GAP			-0.558			0.707 **			-0.093
			(0.462)			(0.298)			(0.338)
lagged ln*TFP*	0.892 ***	0.907 ***	0.906 ***	0.890 ***	0.965 ***	0.876 ***	0.489 ***	0.531 ***	0.490 ***
	(0.079)	(0.079)	(0.083)	(0.102)	(0.105)	(0.103)	(0.095)	(0.109)	(0.097)
ln*ASSETS*	-0.106 ***	-0.109 ***	-0.107 ***	-0.109 ***	-0.116 ***	-0.107 ***	-0.075 ***	-0.084 ***	-0.076 ***
	(0.018)	(0.019)	(0.018)	(0.022)	(0.023)	(0.022)	(0.016)	(0.019)	(0.016)
FOREIGN	0.122 **	0.123 **	0.134 **	0.223 **	0.083	0.233 **	0.164 **	0.146	0.168 *
	(0.052)	(0.055)	(0.056)	(0.103)	(0.103)	(0.105)	(0.083)	(0.089)	(0.088)
DEBT	0.125 ***	0.147 ***	0.128 ***	0.217 ***	0.218 ***	0.213 ***	0.120 ***	0.130 ***	0.120 ***
	(0.028)	(0.032)	(0.029)	(0.039)	(0.040)	(0.039)	(0.036)	(0.037)	(0.036)
F-statistics (lagged ln*TFP*)	58.04 ***	63.79 ***	57.53 ***	54.46 ***	54.83 ***	54.52 ***	52.79 ***	49.17 ***	52.79 ***
F-statistics (*BANK HEALTH*)	27.90 ***	6.71 ***	5.32 ***	50.43 ***	38.74 ***	21.32 ***	6.26 ***	1.71	5.44 ***
J-statisitics	3.69	1.07	1.24	0.53	7.37 ***	0.00	0.02	0.03	0.02
Obs	1751	1809	1698	1201	1187	1202	1206	1148	1206

	Results for bond issures								
Dependent variable: ln*TFP*	FY1993-1996			FY1997-1999			FY2000-2002		
MCAR	0.751 **			0.528 *			-0.395		
	(0.304)			(0.312)			(0.613)		
BCAR		0.711			0.834			2.784	
		(0.967)			(0.633)			(2.399)	
GAP			1.238			0.327			-0.402
			(0.761)			(0.231)			(0.534)
lagged ln*TFP*	1.031 ***	1.094 ***	0.960 ***	0.931 ***	0.957 ***	0.919 ***	0.603 ***	0.639 ***	0.632 ***
	(0.083)	(0.083)	(0.102)	(0.111)	(0.119)	(0.111)	(0.090)	(0.117)	(0.114)
ln*ASSETS*	-0.098 ***	-0.102 ***	-0.090 ***	-0.172 ***	-0.191 ***	-0.171 ***	-0.061 ***	-0.057 **	-0.064 ***
	(0.019)	(0.019)	(0.020)	(0.030)	(0.032)	(0.030)	(0.020)	(0.023)	(0.021)
FOREIGN	-0.006	-0.016	0.013	0.052	0.084	0.039	-0.070	-0.089	-0.072
	(0.056)	(0.054)	(0.062)	(0.083)	(0.084)	(0.083)	(0.069)	(0.078)	(0.071)
DEBT	0.163 ***	0.154 ***	0.159 ***	0.236 ***	0.267 ***	0.237 ***	0.188 ***	0.191 ***	0.189 ***
	(0.032)	(0.031)	(0.033)	(0.044)	(0.046)	(0.044)	(0.037)	(0.043)	(0.039)
F-statistics (lagged ln*TFP*)	41.47 ***	42.73 ***	40.94 ***	60.87 ***	53.62 ***	60.92 ***	43.29 ***	39.95 ***	43.28 ***
F-statistics (*BANK HEALTH*)	17.82 ***	16.48 ***	4.16 ***	44.55 ***	52.99 ***	32.29 ***	6.86 ***	3.69 **	8.16 ***
J-statisitics	1.42	6.78 **	2.56	0.74	5.44 **	1.40	1.41	0.38	1.19
Obs	1659	1694	1623	1042	1049	1043	1018	965	1017

The table presents the results of the GMM estimation treating BANK HEALTH as endogenous. The upper panel of the table presents the results for nonbond issuers while the lower panel for bond issuers. Refer to the footnote of Table 1 about the definitions of the regression variables. The Results for year dummies are not reported here. The F-statistics (an endogenous variable) presents the result of the F-test for the instruments in the first-stage regression for the endogenous variable. Robust standard errors are in parentheses. ***, **, * indicate statistical significance level of 1, 5, and 10%, respectively.

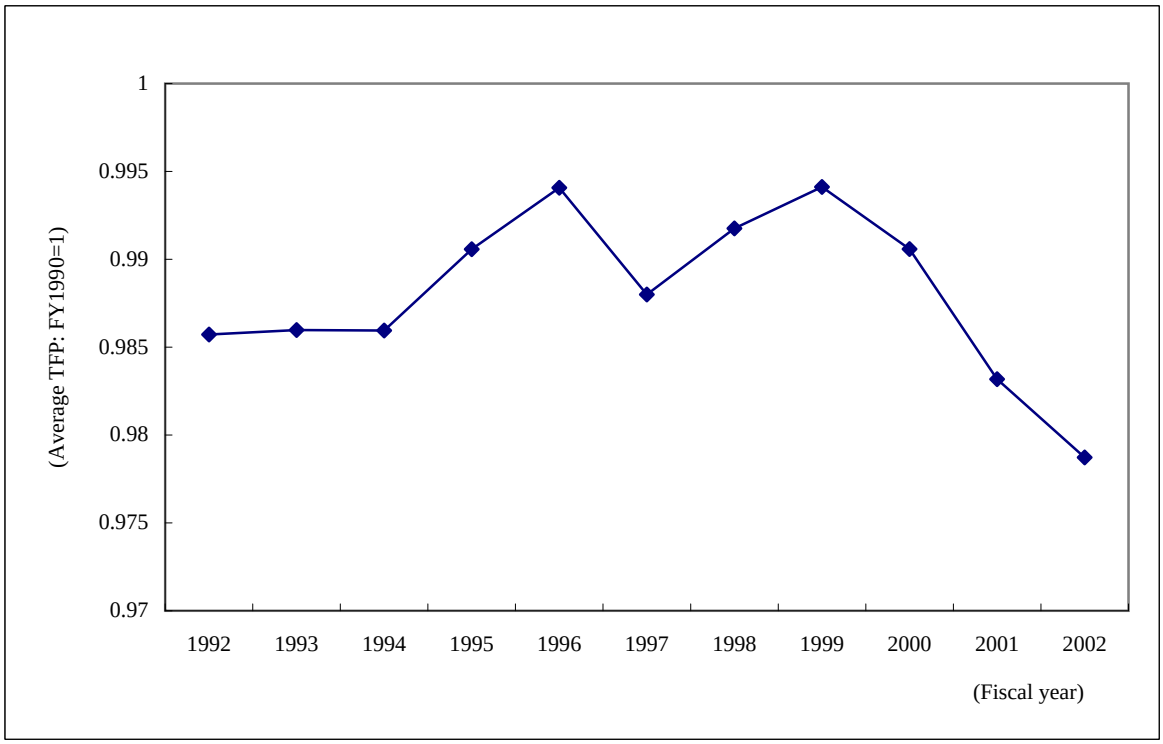

Figure1. A yearly time series of the average TFP level

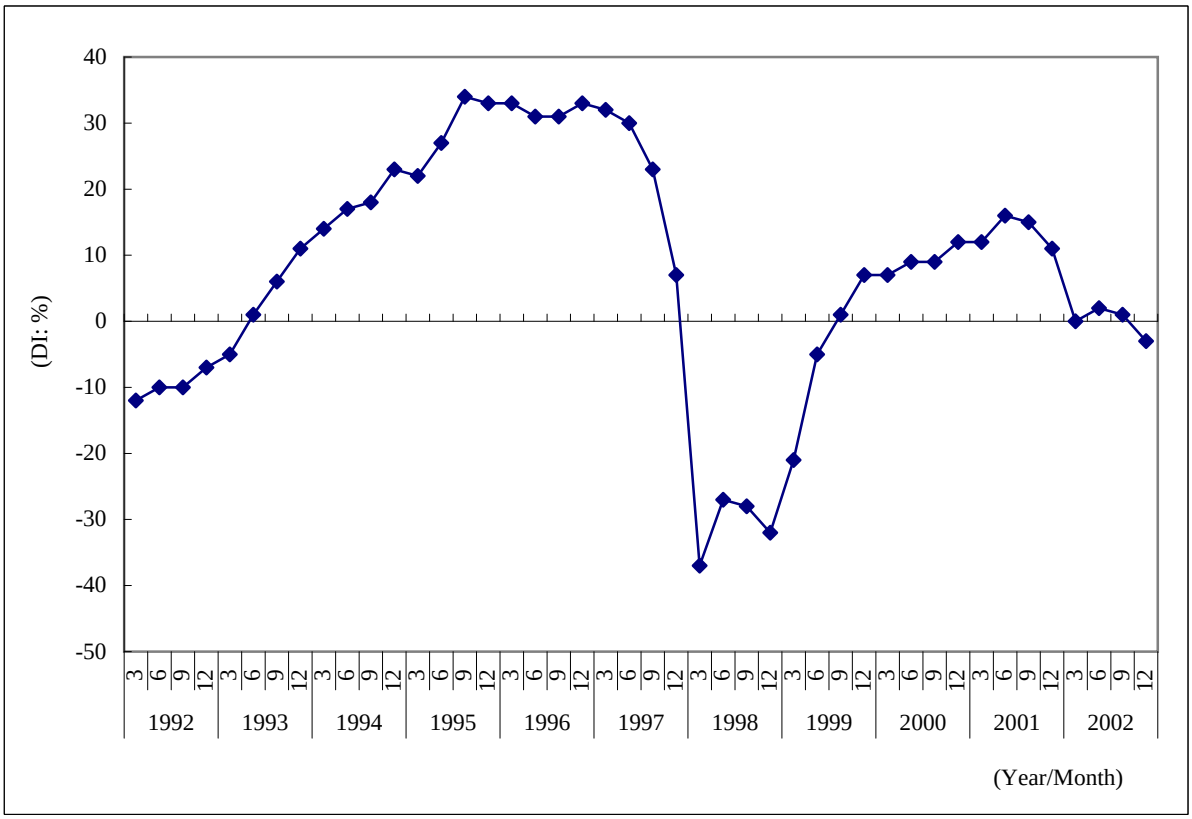

Figure 2. Diffusion index of lending attitude of financial institutions for listed manufacturing firms

The diffusion index is constructed by subtracting the percentage share of firms responding ``Severe'' from that of firms responding ``Accommodative''.
Source: The BOJ's Pricipal Enterprises *Tankan* (Short-term Economic Survey of Enterprise in Japan).