Have Banks Contributed to Efficient Management in Japan's Manufacturing?

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Abstract

This paper statistically reexamines the conventional view that the main bank relationship has been an important element of corporate governance in Japan. According to the view, in postwar Japan, the main bank relationship has contributed to efficient management of borrower firms in place of the capital market that disciplines corporate management in the Anglo-American economy. Our analysis finds that neither the main bank relationship nor other capital market factors, which the standard governance theory regards as important determinants of managerial efficiency, consistently influenced efficiency of manufacturing firms' management defined by the total factor productivity (TFP). Instead, market competition, particularly competitive pressures from abroad, is found to have consistently enhanced management efficiency. Thus, the conventional view exaggerates importance of the main bank relationship in the Japanese corporate governance framework.

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1. Introduction

     Banks mobilize financial resources from savers via bank deposits that are liquid stores of value functioning as an essential instrument of the payment system. Banks also allocate funds to fund-users (mainly firms) by examining or monitoring their credibility. They realize economies of scale both by pooling funds from a large number of savors and by diversifying loan portfolios. Banks are regarded as being delegated by a large number of small savors to economize on monitoring costs (Diamond (1984)). No doubt, they play an important role in a market economy. In particular, at the early stages of industrial development where efficient monitors are badly needed, banks are believed to stimulate rapid industrial developments (Gerschenkron (1962)). This is true of Japan in the postwar era (i.e., the so-called high growth period from the late 1950s to the early 1970s). The warfare destroyed Japan's production capacity, and the occupation army's policy of resolving the *zaibatsu* groups immediately after Word War II fundamentally changed structure of capital markets increasing importance of banking sector in the Japanese corporate finance (Okazaki (1996)). Postwar Japan apparently achieved a 'miraculous' industrial development under the bank-centered financial system.

     Some scholars go so far as to argue that banks were important in postwar Japan not because they constituted a simple conduit between ultimate savers and investors but because they were essential to the corporate governance. According to their view, banks monitored and disciplined management of borrower firms via intimate long-term relationships with the firms. This long-term relationship is often called 'the main bank relationship.' The main bank relationship is based not only on a standard loan contract but also on a cross shareholding between banks and their client firms. Banks sometimes dispatched officers to borrower firms, particularly when they were in financial difficulty. The bank officers would intervene in the management and play an active role in restructuring of these firms. From a theoretical perspective, the main bank relationship could be regarded as a sort of state-contingent contract under which corporate managers are allowed a lot of latitude in controlling business when business shows normal profitability, but the control right would be swiftly transferred from managers to banks in the case of financial distress. This bank-based mechanism is regarded as having exerted the same disciplinary influence on Japan's corporate management as the capital market has done in the U.S. corporate governance framework (e.g., Prowse (1995)). This view concerning functions of the bank-centered financial system has been so prevalent that we will call it the conventional view. The voluminous book edited by

Aoki and Patrick (1994) contributes to circulation of the conventional view.[1]

The non-performing loan problem that surfaced in the 1990s has shaken the function of Japan's bank-centered financial system. A number of banks went bankrupt due to a shortage of capital. The remaining banks have been forced to take a conservative attitude toward credit supply in order to recover their capital bases. This conservatism of banks seems to have broken the traditional intimate relationships between banks and firms. Banks and other financial institutions reportedly abandoned the policy of cross shareholding with client firms by selling shares of those firms (e.g., Nikkei Shimbun, December 28, 1999).[2]

The 'main bank relationship' has been closely correlated with the financial 'keiretsu' based on the big city banks' network with their client firms. The mergers between the big city banks announced in quick succession since 1999 are, however, expected to obfuscate the landscape of the financial 'keiretsu.' If, as the conventional view claims, banks have been essential for efficient corporate management in the Japanese corporate governance framework, those changes in the financial system caused by the bank crisis will endanger the efficiency of the industrial sector. The recent prolongation of economic depression may have something to do with the malfunction of the banking sector.

However, is the conventional view valid? The miserable performance of banks observed during the last decade casts doubt on the hypothesis that banks are excellent corporate governance monitors. For example, we cite the case of jyusen. These were non-bank finance companies specializing in mortgage loans. These companies were established by groups of major banks. The major owners of those companies were big Japanese banks. Moreover, these companies borrowed a large amount of funds from their mother banks to supply mortgage loans related to real estate developments and housing. Quite intimate personnel relationships existed between jyusen and their mother banks. Thus, the mother banks were nothing but the main banks of the jyusen companies. Nevertheless, the banks failed to discipline the managers of those

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[1] In the corporate governance envisaged by the conventional view, how banks are disciplined for efficient management is an open issue. Aoki (1994) argues that the traditional personnel relationships prevailing between the regulatory authorities, particularly the Ministry of Finance, and banks via so-called amakudari practices have resolved this issue. Horiuchi and Shimizu (2000), however, criticize this argument.

[2] According to the figures estimated by Nissei Kiso-Kenkyusho (1999), the percentage of inter-corporate shareholding decreased 21.5% to 16.0% during the period from 1987 to 1998. In particular, the banks' relative presence in the cross shareholding decreased by more than a half from 6.7% to 3.2% during the same period.

companies. All the *jyusen* companies were liquidated in 1995 due to the huge amount of non-performing loans. Public funds were injected in the liquidation process to dispose their non-performing loans.

Needless to say, the recent bank crisis in itself is not the definite evidence to deny the constructive role of banks assumed by the conventional view. Similarly, the remarkable industrial growth attained under the bank-centered financial system does not necessarily mean that the bank relationships contributed to efficient management of industrial firms. We need a statistical examination to confirm the validity of the conventional view. The purpose of this paper is to statistically test the conventional view that the main bank relationship increased managerial efficiency of industrial firms in Japan.

Prior research: There are many empirical studies tackling this issue. Almost all of them analyze relationships between managerial efficiency and various factors observed in the financial and capital markets. For example, Hoshi, Kashyap, and Scharfstein (1991) find that the '*keiretsu*' relationship significantly reduces liquidity constraints on firms' investment expenditures in the Tobin's Q type investment function.[3]   The liquidity constraint is considered as an outcome of the agency problem associated with firms' external financing (Fazzari, Hubbard, and Petersen (1988)). Thus, this result is interpreted as evidence that the main bank relationship is effective in mitigating the agency problem. Prowse (1992) argues that the block holding by financial institutions including banks effectively disciplines corporate management, thereby increasing the book value of profits of the client firms. Lichtenberg and Pushner (1994) confirm Prowse's argument by finding a significantly positive relationship between banks' shareholding and increments in total factor productivity of borrower firms. Thus, most empirical studies support the conventional view.

But there remains some ambiguity. For example, by consistently treating financial data of the sampled companies, Hayashi (2000) obtains results contradicting the conclusion of Hoshi et al. (1991).[4]   We should also point out that the book value of profits is quite elusive because the accounting values of assets and other items are from time to time divergent from their economic values, and because there is some room for

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[3]   The 'keiretsu' groups were formed based on the relationship between non-financial firms and major banks and affiliated non-bank financial institutions. Thus, in the following we will regard the main bank relationship as interchangeable with '*keiretsu*' groups.

[4]   Kaplan and Zingales (1997) reexamine Fazzari et al. (1988) to obtain results

managers to window dress for profitability. Higher accounting profits do not necessarily mean a higher level of managerial efficiency. If the capital market were truly efficient, the Tobin's Q would be a sufficient statistics. However, the Japanese capital market seems to have been far from efficient. It is rather doubtful whether the Tobin's Q approach adopted by Hoshi et al. (1991) is a reliable method to measure managerial efficiency of Japanese firms.

We follow Lichtenberg and Pushner (1994) by using total factor productivity (TFP) to measure firms' managerial efficiency. But in this paper we also emphasize importance of market competition, which is neglected by Lichtenberg and Pushner (1994). We should not confine our attention to the factors related to the financial-capital market when considering mechanisms of corporate governance. As Nickell, Nicolitsas, and Dryden (1997) point out, market competition disciplines a firm's managers because it will weed out an inefficiently managed firm. Nickell et al. (1997) conclude market competition contributes to efficient management in the U.K. industry. We follow this analysis to include factors representing the degree of market competition in our empirical analysis in addition to the factors related to the financial-capital market. We find that the competitive pressure measured by the degree of exposure to global markets has been consistently important in disciplining Japanese manufacturing firms. In contrast to this, the main bank relationship did not contribute to efficient management of the manufacturing firms. Other factors such as the ownership structure and debt burdens, which the theory of corporate governance usually considers important, do not influence corporate management in a systematic way. Although the empirical study in this paper is tentative, the results suggest that the conventional view exaggerates the contribution of the main bank relationship to efficient corporate management in Japan's manufacturing sector.

2. Productivity Growth in Manufacturing

The following empirical analyses are based on financial statistics from 1,661 manufacturing firms from 1956 (fiscal year) to 1996 (fiscal year). All firms are either listed on stock exchanges or registered in the OTC market. We exclude those firms whose financial statements include abnormal figures for various reasons from our sample. Since the time span of a sampled firm depends on when the firm was listed on a stock exchange or registered in the OTC market, the number of sampled firms changes

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contradicting the liquidity constraints hypothesis.

over time. Due to its huge size, it was impossible to analyze the data set as a whole by the PANEL method. We divide the sample period into four sub-periods: i.e., 1957-1970, 1971-1980, 1981-1990, and 1991-1996. The number of sampled firms in each period is presented in Table 1.

Figure 1 shows the annual growth rate in real value-added (RVAD) of the sampled manufacturing firms from 1957 to 1996. From the late 1950s to the first half of the 1970s, the RVAD grew on the average at higher than 15% per year. On the other hand, both labor input and capital increased at only a few percent per year during the period (Table 1).[5]   The increases in these inputs cannot account for the high growth in the real value added (RVAD) in manufacturing. This suggests that the total factor productivity of the Japanese manufacturing industry was extremely high during the high growth era. Is this high growth rate attributable to financial factors such as the main bank relationship? This is one question to be answered in this paper.

Since the mid-1970s, the growth rate in RVAD tended to decline. The average of RVAD growth rate was 8.5% during the 1980s and 2.4% during the period from 1991 to 1996 respectively. Although growth rates in labor and capital inputs decreased during these periods, they do not account for a sharp decline that the RVAD in manufacturing showed. Can we explain this by means of financial factors? This is another question in this paper.

A basic production function: A firm i is assumed to produce RVAD $V_i(t)$ at t-year following a Cobb-Douglas type production function:

$$V_i(t) = T_i(t) K_i(t)^{ai} L_i(t)^{(1-ai)}, \tag{1}$$

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[5]   The real capital of a firm is estimated in the following way. First, we estimate real investment I_t of each firm by deflating its nominal amount of investment expenditure by the nonresidential investment deflator provided by the EPA's national income statistics. The obsolescence rate of real capital d_t for each industry is estimated from the data in the EPA's Annual Report on Capital Stock of Private Enterprises. Assuming that the obsolescence rate of real capital is common to all the firms in an industry, we estimate a time series of real capital for each firm by making use of both I_t and d_t. This method produces estimated growth rates in real capital substantially lower than those estimated by the EPA. For example, the EPA estimates the annual average growth rate in real capital to be 5.3% for the period of 1978-1986, whereas according to our method the corresponding figure is 0.6%. Thus, our method seems to underrate the real capital growth. However, the EPA's estimate may be overrated, because the average annual growth rate in real capital estimated by Hayashi and Inoue (1991) for the same time period is 3.1% much lower than the EPA's estimate. We do not think our method of estimating real capital distorts the following analysis in this paper.

where $K_i(t)$, $L_i(t)$, and $T_i(t)$ are respectively real capital input, the number of employees, and the total factor productivity (TFP) at the t-year. The technological parameter of the production function is represented by a_i, which is assumed to be variable cross industry but common for firms belonging to the same industry. The growth rate of per capita RVAD $[d(V_i(t)/L_i(t))/dt]/(V_i(t)/L_i(t))$ can be represented by the growth rate in the capital-labor ratio $[d(K_i(t)/L_i(t))/dt]/(K_i(t)/L_i(t))$ and the growth rate in TFP $[dT_i(t)/dt]/T_i(t)$ in the following way:

$$[d(V_i(t)/L_i(t))/dt]/(V_i(t)/L_i(t))$$
$$= a_i[d(K_i(t)/L_i(t))/dt]/(K_i(t)/L_i(t)) + [dT_i(t)/dt]/T_i(t). \qquad (2)$$

In the following, we investigate how various factors related to the capital markets and market competition influence efficiency of a firm's management that is measured by the growth rate of TFP.

3. Factors of Corporate Governance

We assume the TFP growth of a firm to depend on its managerial efficiency. Then, we look at candidate variables that, according to the standard theory of corporate governance, are supposed to influence on management efficiency. Specifically, we note the ownership structure of a firm, the debt burden, and the degree of market competition to which the firm is exposed.

Capital market factors: The theory of corporate governance emphasizes the importance of the existence of large shareholders who are motivated to monitor management of their firms. The diversified shareholding deprives investors of an incentive to monitor management, and thereby reducing disciplinary effect of the capital market. We present the degree of ownership concentration by the proportion of shares held by largest twelve shareholders OWNER. The standard theory expects OWNER to be positively related to efficiency of corporate management. Financial institutions including banks are regarded as important monitors of corporate management due to their specialty of analyzing information and data concerning management. We may assume that the proportion of shares held by financial institutions FINST is positively correlated to the efficiency of corporate management measured by the growth rate of per capita RVAD. We also add the proportions of shares held by non-financial companies CORP, by foreigners FOREIGN, and by private personals PERSON.

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Some scholars argue that the cross shareholding prevailing in the Japanese corporate sector is effective in mitigating agency problems associated with transactions between firms (Berglof and Perotti (1994)). Some others claim that the cross shareholding works to enhance the autonomy of corporate managers from the capital market discipline and endangers efficient management (Lichtenberg and Pushner (1994)). We add CORP to the set of explanatory variables to examine which argument is empirically supported. Foreign ownership in the Japanese companies increased gradually but steadily during the decade from the mid-1970s. And after a short break during the bubble period of the late 1980's foreign investment has regained this upward trend. Foreign investors are sometimes regarded as having different investment targets than domestic investors in the sense that foreigners tend to give priority to profitability over the size of the business or relationships with other companies. If it is true, the relative shares held by foreign investors is expected to positively influence managerial efficiency.

According to Jensen (1986) and (1989), debt has a disciplinary impact on corporate management, because managers are forced to pursue efficient management in order to repay debt constantly. If freed from the debt burden, they will indulge themselves in seeking perquisites. Jensen (1989) suggests that the Japanese firms were effectively disciplined during the high growth period because they maintained a high level of leverage. He went so far as to predict that the declining tendency in firms' dependence on debt financing (Table 1) would endanger efficient management in Japan. Actually, the TFP growth rate decreased since the late 1970s. Was the Jensen's prediction realized? In order to catch this disciplinary influence of debt burden, we add the debt-total asset ratio DEBT to the set of explanatory variables.

Market competition: We try to measure the degree of market competition a firm faces by three indexes. The first one is the proportion of sales occupied by the top five firms (SALE) in a specific industry. Thus a lower SALE implies a higher degree of market competition in the industry. However, the contestable market hypothesis (Baumol, Panzar and Willing (1982)) shows that the higher market concentration of sales does not necessarily mean a higher degree of monopoly. Thus, it is ambiguous whether SALE is a reliable measure of monopoly in a specific industry.

An alternative to SALE is excess profits. As Nickell et al. (1997) argue, higher excess profits imply that the industry is less competitive. We interpret the industry average of return on total assets (RETURN) as a proxy variable for excess profit. Thus, the higher RETURN implies the higher excess profits and the higher degree of

monopoly in the industry. To control for variation in nominal interest rates over time, we use RETURN less the long-term interest rate on government bonds as a variable in our statistical analysis. However, it is well known the book value of return is elusive. Corporate managers who enjoy monopolistic positions could manipulate the returns by diverting resources to useless or less profitable ends. In this case, return on total assets is not a good measure of the degree of monopoly within an industry.

Another alternative to SALE is the degree of exposure of firms to global competition. The Japanese government started the policy of liberalizing trade for manufacturing in the early 1960s. The Japanese manufacturing firms had to face rather fierce competition from abroad due to this opening up policy. We define the degree of exposure to global competition of a specific industry by the sum of the import penetration ratio (imports/(domestic production + imports – exports)) and the export ratio (exports/domestic production + imports)). This competition index is presented by EXIM.[6]

The main bank relationship: Since the long-term relationship between firms and banks are mostly based on implicit contracts, it is not always easy to identify a main bank for a specific firm. The multi-dimensional function of Japanese banks makes the identification more difficult. This paper classifies the sampled firms into the group of those that keep 'stable main bank relationships' with banks. We consulted the Keizai Chosa-kyokai's Study on the *Keiretsu* to identify the names of main banks for individual firms. The group of firms with stable main bank relationship is defined as those firms that did not change their main banks from 1975 to 1996 at all. On the other hand, we define the firms with 'unstable main bank relationship' as the firms that changed their main banks more than three times during the period or whose main banks cannot be identified. As has been explained, our sample excludes some firms due to abnormality of their financial statistics, and sample spans of individual firms are variable in the original data base. Thus, the numbers of firms belonging to categories of those with 'stable main bank relationship' and those with unstable main bank relationship are changeable over the sample period (Table 2). For instance, 465 firms are defined as firms with stable main bank relationships and 268 firms are defined as firms with unstable main bank relationships in the first sub-period (1957-1970). Other

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[6] Articles investigating the relationship between the import penetration rate in an industry and the productivity of a firm belonging to the industry includes Nickell, Wadhwani, and Wall (1992), Nickell, Nicolitsas, and Dryden (1997), Harrison (1994), and MacDonald (1994).

firms are ambiguous with respect to the main bank relationship. It is a little surprising how many firms are ambiguous in terms of their main bank relationships.

Table 2 compares averages of relevant variables of the firms with stable main banks relationship with those of the firms with unstable main bank relationship in four time periods: i.e., 1956-1970, 1971-1980, 1981-1990, and 1991-1996. The annual growth rate in real value added (RVAD) is a little higher (but not significantly so) for the 'unstable main bank firms' than for the 'stable main bank firms.' The DEBT figures show that the firms with an unstable main bank relationship were less dependent on debt than those with a stable main bank relationship. While financial institutions' ownership was larger in the case of firms with a stable main bank relationship than in the case of firms with an unstable main bank relationship, non-financial firms hold larger stakes in the latter firms than in the former firms. In the following, we test whether a main bank relationship enhances efficiency of corporate management in comparison to an unstable one.

4. Results of Statistical Tests

We test some hypotheses regarding the influence of the main bank relationship on managerial efficiency of individual firms by the PANEL analysis (the random effects method). Specifically, the following three questions are examined:

(1) Was the main bank relationship effective in raising the efficiency of corporate management measured in terms of growth rates in TFP?

(2) Was the main bank relationship a substitute for the various disciplinary factors of the capital market that have often been reported to be observed in the U.S. and the U.K.?

(3) Was the main bank relationship effective in improving performance of the firms in financial distress?

4.1 Did the main bank relationship enhance managerial efficiency in manufacturing?

Our first model to explain the growth rate in per capita RVAD is

$$[d(V_i(t)/L_i(t))/dt]/(V_i(t)/L_i(t))$$
$$= a_i\,[(dK_i(t)/dt)/K_i(t) - (dL_i(t)/dt)/L_i(t)] + b_i\,X_i(t) + c_i\,Y_i(t)$$
$$+ d_i\,MAIN_i + e_i\,DI(t) + u_i(t) \tag{3}$$

where $X_i(t)$ is a vector of explanatory variables related to market competition in the

industry to which this firm belongs, $Y_i(t)$ is a vector containing explanatory variables related to capital market discipline, $DI(t)$ is a diffusion index to control the cyclical movement in the growth rate in $(V_i(t)/L_i(t))$, and $MAIN_i$ is a dummy variable taking one if the firm has the stable main bank relationship and taking zero otherwise. Assuming the technical parameter a_i is invariant across firms within the same industry, we use cross terms of $[(dK_i(t)/dt)/K_i(t) - (dL_i(t)/dt)/L_i(t)]$ and industry dummies in our PANEL analysis. We are interested in whether $MAIN_i$ has significantly positive coefficient, and whether there are any variables related to either market competition or capital market discipline that significantly account for the growth rate in per capita value added. In order to economize space, we present t-statistics of relevant explanatory variables (i.e., $X_i(t)$, $Y_i(t)$, and $MAIN_i$) in Table 3.[7]

Table 3 shows that $MAIN_i$ did not positively influence the growth rate in per capital real value added (or TFP) at all for all sub-periods. In the third sub-period (the period during the 1980s), $MAIN_i$ negatively correlated to TFP. This result suggests that the main bank relationship did not enhance the managerial efficiency of manufacturing firms. In contrast to this, $EXIM_i(t)$ positively correlated with TFP growth for all sub-periods. Although the data on $FOREIGN_i$ is not available for the first period, it also positively correlated with the growth rate in TFP from the second to the third period.

RETURN also positively influenced TFP growth in all the sub-periods. If this variable truly represents the degree of monopoly in each industry, the result suggests market competition did not contribute to managerial efficiency, which contradicts with both what the EXIM results suggest above and what Nickell et al. (1997) found for the U.K. industry. As has already been explained, however, accounting profits are elusive. The firms with low returns on total assets may be those in which insiders manipulate profits for the benefit of themselves at the expense of outside investors. If so, this result does not necessarily contradict what the results of EXIM show.

Other variables related to capital market discipline did not show significant influence on TFP growth in a consistent way. For example, $DEBT_i$ positively influenced TFP growth in the first and fourth sub-periods. This seems consistent with what Jensen (1989) predicts. But this result was not obtained for the second and third sub-periods. Except for $FOREIGN_i$, no variables related to ownership structure correlate with TFP growth rate in a consistent way.[8]   In sum, our PANEL analysis of equation (3) gave a

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[7]   The variables of ownership structure are closely related with each other. In order to avoid multicollinearity, we separately estimated an equation containing only one variable of ownership structure.

[8]   Lichtenberg and Pushner (1994) find positive influence of ownership by financial

negative answer to the question of whether the main bank relationship enhanced managerial efficiency in manufacturing.

4.2 Was the main bank a substitute for the capital market?

The conventional view claims that the main bank relationship has been a substitute for the capital market in disciplining corporate managers. For example, according to this view, hostile takeovers often observed in both the U.S. and the U.K. is unnecessary in Japan, because banks have exerted similar disciplinary pressures on managers of client firms via long-term relationships. In the following, we test the validity of this view.

Specifically, we estimate the following equation regarding the growth rate in per capital RVAD for two groups of the sampled firms: those with a stable main bank relationship and those with an unstable main bank relationship:

$$[d(V_i(t)/L_i(t))/dt]/(V_i(t)/L_i(t))$$
$$= a_i\,[(dK_i(t)/dt)/K_i(t) - (dL_i(t)/dt)/L_i(t)] + b_i\,X_i(t) + c_i\,Y_i(t)$$
$$+ e_i\,DI(t) + u_i(t), \qquad\qquad (4)$$

Notation is the same as formulation (3). We have already compared some performance variables of the two groups in Table 2. We test whether estimated parameters b_i's and c_i's are significantly different between these two groups of sampled firms. In order to avoid the difficulty of heteroscedasticity between the two groups, we make use of a two-stage estimation method. First, we estimate equation (4) for the two groups separately to obtain variances of disturbance $u_i(t)$ of the respective sample groups. Then, after adjusting data by utilizing estimated variances in disturbance terms of the two groups, we estimated the following equation for the pooled sample of the two groups:

$$[d(V_i(t)/L_i(t))/dt]/(V_i(t)/L_i(t))$$
$$= a_i\,[(dK_i(t)/dt)/K_i(t) - (dL_i(t)/dt)/L_i(t)] + (1+b_i^{'}MAIN_i)b_iX_i(t)$$
$$+ (1+c_i^{'}MAIN_i)c_iY_i(t)+ e_i\,DI(t) + v_i(t) \qquad\qquad (5)$$

where, as have already been explained, $MAIN_i$ is a dummy variable representing the stable main bank relationship. We are interested in whether the cross terms $MAIN_i\ X_i(t)$

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institutions and negative influence of non-financial firms' ownership on managerial efficiency. However, our analysis did not produce the same results.

and $MAIN_i$ $Y_i(t)$ are statistically significant.[9]

Table 4 summarizes results of the estimations. The figures in the lowest line show F statistics of the null hypothesis that all the coefficient of cross terms $MAIN_i$ $X_i(t)$ and $MAIN_i$ $Y_i(t)$ are zero. According to Table 4, the null hypothesis is not rejected except for the second sub-period (i.e., the period of the 1970s). For the third period, the cross term $MAIN_i$ $EXIM_i$ is negatively significant. This suggests that the main bank relationship has worked to mitigate competitive pressures on management from global markets in this sample period. On the other hand, the cross term $MAIN_i$ $Y_i(t)$ are insignificant for all periods except for FOREIGN in the second sub-period (equation (2)). Overall, the F-statistics does not reject the null hypothesis that the main bank relationship did not change relation between the capital market parameters $Y_i(t)$ and the growth rate in per capita RVAD.

We can confirm the significance of the cross terms between $MAIN_i$ and individual variables related to the capital market $Y_i(t)$ by examining their t-statistics. Table 4 shows that the cross term $MAIN_i$ $FOREIGN_i$ is negatively significant for the second sub-period. But it is insignificant both in the third and the fourth sub-period. The cross term $MAIN_i$ $DEBT_i$ is not significant at all for all sub-periods.

Thus, the statistical test regarding substitutability between the main bank relationship and the capital market mechanisms with respect to corporate governance leads to a rather negative conclusion against the conventional view. We have been unable to find consistent evidence supporting the view that the main bank relationship has been able to replace capital market discipline and has a positive influence on management efficiency of client firms.

4.3 How did the main bank relationship influence firms in distress?

Some scholars argue that the main bank is particularly important when its client firm gets into managerial trouble (Sheard (1994)). The main bank intervenes into the firm's management to press incumbent managers for restructuring of the business and successfully forces the firm to reduce debt (Kim and Limpaphayom (1998)). The intervention of the main bank is so constructive that the performance of client firms tend to recover more quickly than those firms that recover from financial distress without help of a main bank (Hoshi, Kashyap, and scharfstein (1990)). However, the financial distress of a firm triggers a transfer of control right from the current managers to the creditors under the standard debt contract. Does the main bank relationship have

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[9] This method is justified only if the disturbance $v_i(t)$ in equation (5) follows the normal distribution. We assume this is the case in this paper.

any special meaning for firms in financial distress?

In order to investigate this issue, we selected up firms in financial distress from our original sample. First, we consulted Directory of Japanese Companies History (*Nihon Kaisha-shi Soran*) published by Toyokeizai Shimpo-sha to identify firms that experienced a management crisis during the sample period. Then, from the group of these firms, we selected those that have shown negative net wealth as the firms of financial distress. By this method, we identified a little less than one hundred firms in financial distress for each sub-period. Table 5 compares performance of the distressed firms with that of other firms. The distressed firms showed lower growth rates in RVAD and larger debt-total asset ratio DEBT than other firms did. But the other performance criteria of the distressed firms are not greatly different from those of other firms.

We divide the firms in financial distress into two groups: the firms with a stable main bank relationship and the firms with an unstable main bank relationship. Table 5 also compares performances of these two groups. We should be careful not to derive any definite conclusion from this comparison based on a small sample. But the firms with an unstable main bank relationship appeared to have a greater growth rate in RVAD than the firms with a stable main bank relationship both in the first and in the second sub period. We tested the influence of the main bank relationship on management governance of firms in financial distress based on the sample of these two groups by the same statistical methods adopted in the previous section. The results are summarized in Table 6. According to Table 6, there is no evidence to show that the main bank relationship significantly changed governance structure for the firms in financial distress. Thus, the conventional view regarding the main bank functions is not supported even here.

4.4 How did financial deregulation influence governance mechanisms?

The Japanese government started to deregulate the financial system at the beginning of the 1980s. In spite of the apparent deregulation, however, financial authorities continued to intervene in financial markets mainly in order to keep the financial system's status quo established in the high growth era (Hamada and Horiuchi (1987), and Hanazaki and Horiuchi (1998)). Thus, it is ambiguous whether the deregulation changed the basic characteristics of Japan's bank-centered financial system during the 1980s. Nevertheless, it is an interesting question whether the deregulation since the early 1980s changed the main bank's influence in the corporate governance framework. Mayer (1988) predicts that financial deregulation would give firms alternative means of fund raising to bank loans, which would undermine effectiveness

of long-term relationships between banks and firms. Hellman, Murdock and Stiglitz (1996) argue that the full-scale competition induced by the financial deregulation deprives traditional banking of the rents that was important in disciplining banks for efficient monitoring in the corporate governance. Do our statistical tests find any influence of the financial deregulation on the effectiveness of the main bank relationship as those scholars argue?

The statistics summarized in Table 3 and 4 shows that contribution of the main bank relationship to managerial efficiency was not observed since the late 1950s, not having been eclipsed since the 1980s when the financial deregulation was started. The huge size of the database prevents a formal test of structural changes over the sample period in estimated production functions such as equation (3). Here, we take up the three truncated sample periods of the early 1970s (1971-74), the early 1980s (1981-84), and the late 1980s (1985-1989) to test structural changes in estimated functions. Due to limitations on data availability, the estimated equation has only limited number of explanatory variables related to the ownership structure. The results are summarized in Table 7. (In order to avoid difficulty of heteroscedasticity, we adopted two-stage PANEL estimation.) The F-value in each column presents a result of F-test of the null hypothesis that the structure of the estimated equation is invariant between the two truncated sample periods. We can confirm which explanatory variable changes its explanation power significantly over the two periods by using t-statistics for the cross term between the variable and a dummy variable assigned to a specific sample period.

The result shows that the main bank dummy is powerless in explaining TFP growth as before. According to F-values in Table 7, however, there was a significant structural change in the estimated TFP function between the early 1970s when the financial deregulation was not started, and either the early 1980s or the late 1980s when the government liberalized the financial system to some extent. But these results do not indicate a significant influence of deregulation on the financial side of corporate governance, because t-statistics for the cross terms between financial variables and a dummy of the truncated sample period show no significant breaks. In other words, the structural changes in the estimated equations were caused not by the financial deregulation in the 1980s but by changes in the technological conditions and in the influence of market competition.

5. Concluding Remarks

Japanese manufacturing achieved remarkably high productivity growth in the

postwar period. According to our empirical study, neither growth in productive inputs nor factors related to the financial system can fully account for this good performance. Our empirical analysis did not find clear-cut evidence to support the conventional view that the main bank relationship has enhanced efficient management in the Japanese corporate governance framework. Our result is in a sharp contrast to what have been argued by many preceding researchers who emphasized the effectiveness of the bank-centered financial system in promoting industrial development.

On the other hand, this paper found that the market competition measured by the degree of exposure of an industry to global markets has consistently contributed to efficient corporate management in Japan's manufacturing. Although the magnitude of its contribution is not enough to explain the high growth in manufacturing productivity, this result is suggestive. The Japanese government adopted the policy of liberalizing trade mainly in the manufacturing sectors as of the early 1960s. Since then manufacturing firms have had to face fierce international competition. They have often been forced to restructure their business in order to survive global competition. Thus, market competition has disciplined managers of Japan's manufacturing firms and helped ensure efficient management. As Frankel and Romer (1999) show, international trade stimulates economic growth. Our analysis suggests that this positive impact of international trade comes from its disciplinary effect on corporate management.

In contrast to this, the financial service industries including banking have been protected from full-scale competition by the government policy for long time. The disciplinary influence of market competition has been absent from the financial service industries. As long as the competition-restricting regulation was effective to give existing financial institutions a handsome amount of profits, the inefficiency in the financial system did not become obvious. However, the structural changes in corporate finance started at the 1980s made the competition-restricting regulation less and less effective. Finally, the inefficiency of the financial system was revealed in the form of a serious non-performing loan problem in the banking sector (Hanazaki and Horiuchi (1998)).

Thus, the empirical analysis in this paper suggests that the conventional view exaggerates the importance of banks in the Japanese framework of corporate governance. The recent bank crisis is disturbing because banks have been unable to smoothly respond to the industrial sectors' demand for liquidity. But the analysis of this paper suggests that the banking crisis does not exert bad influence on the corporate governance mechanisms in contrast to what the conventional view would expect.

Figure 1: Growth in RVAD (Manufacturing: 1957-1996)
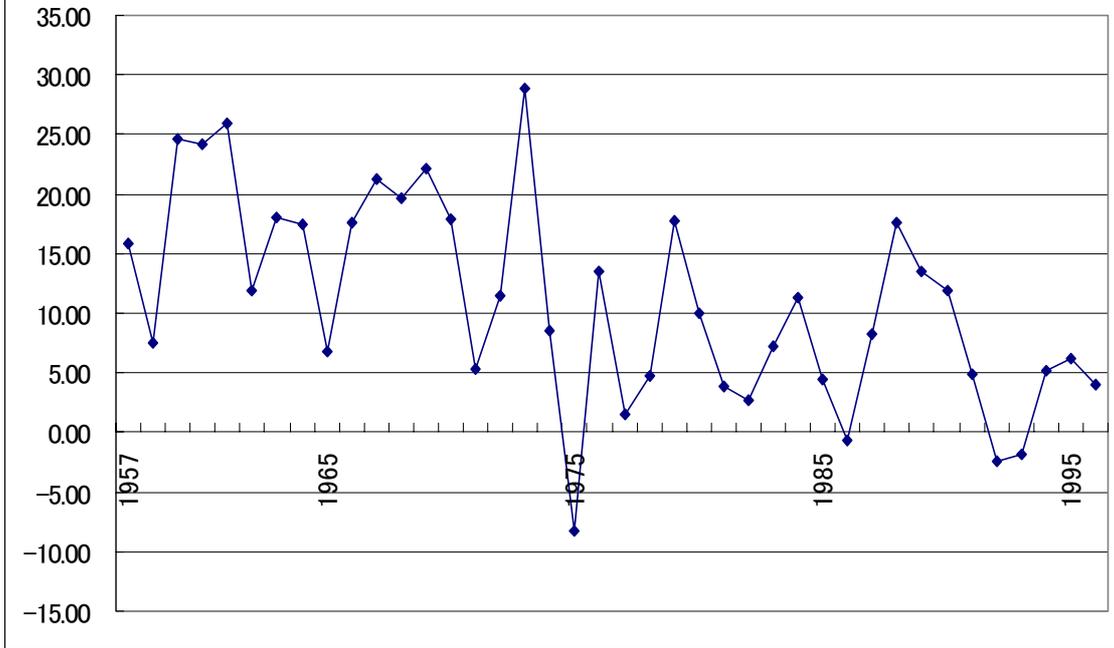
Table 1: Main statistics of sampled firms (annual averages per period)

	1956-1970	1971-1980	1981-1990	19991-1996
No of firms	959	962	1,347	1,579
RVAD	17.8 (23.0)	10.1 (27.5)	8.5 (22.6)	2.4 (17.7)
LABOR	3.9 (10.2)	-1.0 (8.0)	0.4 (5.9)	-0.3 (5.5)
CAPITAL	3.1 (6.8)	2.4 (7.0)	1.6 (6.7)	1.7 (7.8)
SALE	76.3 (20.0)	54.0 (19.0)	59.9 (20.7)	61.2 (21.3)
RETURN	3.2 (3.0)	0.4 (2.9)	1.0 (2.3)	0.4 (2.2)
EXIM		15.1 (7.9)	19.5 (12.0)	21.4 (14.4)
DEBT	69.1 (14.2)	72.2 (17.7)	64.3 (19.3)	57.3 (19.6)
OWNER		48.7 (15.1)	48.8 (13.8)	50.2 (14.2)
FOREIGN		2.7 (7.5)	4.7 (8.2)	5.3 (8.3)
FINST			30.7 (15.6)	30.6 (15.7)
CORP			30.7 (18.8)	31.4 (18.3)
PERSON			31.6 (15.0)	31.2 (15.7)

(Notes) RVAD: the annual growth rate of real value added. LABOR: the annual growth rate of employees. CAPITAL: the annual growth rate in real capital. (We estimate real capital stock of a firm at each year based on the depreciation rates published by the EPA.) SALE: the ratio of sales concentration by the biggest 5 firms in each industry. RETURN: the rate of profits over total assets. EXIM: The degree of international competition defined by the formulation [import/(domestic product + import - export) + export/(domestic product + import)]. DEBT: the outstanding debt per total assets. OWNER: the proportion of shares owned by largest 12 shareholders. FOREIGN: the proportion of shares held by foreigners. FINST: the proportion of shares held by financial institutions. CORP: the proportion of shares held by non-financial companies. PERSON: the proportion of shares held by private persons. Figures in parentheses are standard deviations.

Table 2: Comparison between the firms with stable main bank relationship and th
with unstable main bank relationship (%: standard deviations in parentheses)

		With stable main banks	With unstable main banks
1957–1970	NOFirms	465	268
	RVAD	17.8 (21.6)	18.1 (24.0)
	CAPITAL	3.4 (6.8)	2.9 (7.1)
	LABOR	4.1 (9.7)	4.1 (10.6)
	SALE	78.5 (19.0)	74.0 (20.6)
	RETURN	3.3 (3.0)	3.3 (3.0)
	DEBT	69.3 (13.4)	67.1 (15.4)
1971–1980	NOFirms	452	282
	RVAD	9.3 (25.7)	10.9 (26.5)
	CAPITAL	2.4 (6.4)	2.5 (7.5)
	LABOR	−1.1 (7.8)	−0.6 (8.2)
	SALE	54.7 (18.1)	54.4 (19.7)
	RETURN	0.3 (3.0)	0.6 (2.9)
	EXIM	15.5 (8.3)	14.6 (7.4)
	DEBT	73.8 (15.6)	68.7 (19.2)
	OWNER	46.5 (15.2)	50.9 (14.8)
	FOREIGN	2.4 (6.3)	3.0 (8.4)
1981–1990	NOFirms	517	324
	RVAD	7.5 (21.5)	8.1 (22.3)
	CAPITAL	1.5 (5.3)	1.7 (8.2)
	LABOR	0.0 (5.7)	0.5 (5.5)
	SALE	60.6 (20.1)	59.6 (20.5)
	RETURN	0.8 (2.3)	1.0 (2.3)
	EXIM	20.0 (12.7)	18.6 (10.1)
	DEBT	66.7 (17.1)	62.2 (21.2)
	OWNER	45.9 (13.2)	50.1 (13.8)
	FOREIGN	5.1 (8.0)	4.6 (8.5)
	FINST	35.9 (15.6)	28.2 (15.0)
	CORP	27.7 (17.2)	32.8 (20.1)
	PERSON	28.7 (13.3)	32.3 (20.1)
1991–1996	NOFirms	516	329
	RVAD	1.9 (15.9)	2.1 (16.3)
	CAPITAL	1.9 (6.2)	1.6 (9.4)
	LABOR	−0.9 (5.1)	−0.6 (5.2)
	SALE	63.9 (21.0)	60.4 (20.6)
	RETURN	0.2 (2.2)	0.4 (2.2)
	EXIM	22.2 (15.3)	20.1 (11.3)
	DEBT	62.6 (17.0)	56.7 (20.5)
	OWNER	45.1 (12.5)	49.7 (13.8)
	FOREIGN	5.7 (7.7)	5.0 (8.5)
	FINST	38.7 (15.2)	30.7 (15.5)
	CORP	27.7 (16.4)	34.0 (19.2)
	PERSON	26.2 (11.7)	28.8 (13.2)

Table 3: Factors influencing on per-capita RVAD growth (t-statistics)

	Period 1	Period 2		Period3		
		(1)	(2)	(1)	(2)	(3)
SALE	-4.20***	-0.20	-0.28	0.78	0.91	0.85
RETURN	19.75***	18.95***	18.83***	8.91***	8.77***	8.98***
EXIM		3.55***	3.58***	5.18***	5.07***	5.26***
DEBT	5.52***	1.27	1.72*	0.15	0.58	0.05
OWNER		2.87***		1.93*		
FOREIGN			2.74***		2.20**	
FINST						-2.18**
CORP						
PERSON						
MAIN	-0.39	-0.64	-1.00	-1.81*	-2.37**	-1.45
Adst.R2	0.090	0.053	0.053	0.054	0.054	0.054
SER	21.42	26.44	26.43	21.77	21.77	21.77
LM het.test	27.48	42.26	43.18	34.89	32.91	36.99
NOB	9,804	7,336	7,336	10,117	10,117	10,117
NOFirms	959	962	962	1,347	1,347	1,347

	(4)	(5)	Period 4				
			(1)	(2)	(3)	(4)	(5)
SALE	0.79	0.78	0.60	0.64	0.65	0.53	0.62
RETURN	8.83***	8.87***	8.33***	8.29***	8.38***	8.16***	8.33***
EXIM	5.23***	5.20***	3.52***	3.38***	3.52***	3.43***	3.52***
DEBT	0.34	0.38	3.44***	3.94***	3.44***	3.76***	3.47***
OWNER			-0.90				
FOREIGN				4.76***			
FINST					-0.37		
CORP	0.00					-3.04***	
PERSON		0.59					0.52
MAIN	-2.23**	-2.12**	-0.52	-0.59	-0.14	-0.81	-0.18
Adst.R2	0.054	0.054	0.054	0.056	0.054	0.055	0.054
SER	21.77	21.77	17.27	17.26	17.28	17.26	17.27
LM het.test	34.27	35.20	5.64	12.23	5.69	6.00	5.63
NOB	10,117	10,117	8,109	8,109	8,109	8,109	8,109
NOFirms	1,347	1,347	1,579	1,579	1,579	1,579	1,579

(Notes) The asterisks ***, **, and * indicate the explanatory variables are significant at the 1%, 5%, and 10% levels respectively.

Table4：Growth in per capita RVAD and factors of corporate governance （absolute values of t-statistics in parentheses)

	Period 1	Period 2 (1)	(2)	Period 3 (1)	(2)	(3)
SALE	-0.059 (2.630)***	-0.025 (0.826)	-0.031 (1.042)	-0.001 (0.036)	-0.001 (0.052)	-0.003 (0.096)
MAIN	0.012 (0.459)	-0.012 (0.322)	0.005 (0.128)	0.006 (0.187)	0.012 (0.356)	0.010 (0.317)
PROFIT	1.606(10.318)***	1.342(6.900)***	1.307 (6.744)***	0.743 (3.639)***	0.710 (3.507)***	0.706 (3.472)***
MAIN	-0.183 (1.002)*	0.750 (3.143)***	0.782 (3.285)***	0.396 (1.579)	0.420 (1.682)*	0.455 (1.813)*
EXIM		0.236 (3.021)***	0.227 (2.909)***	0.182 (3.332)***	0.179 (3.270)***	0.185 (3.392)***
MAIN		-0.080 (0.875)	-0.065 (0.709)	-0.119 (1.863)*	-0.123 (1.926)*	-0.119 (1.880)**
DEBT	0.083 (2.696)**	0.014 (0.475)	0.042 (1.388)	0.008 (0.324)	0.0159 (0.658)	0.0136 (0.559)
MAIN	0.019 (0.489)	0.006 (0.155)	-0.020 (0.498)	-0.005 (0.152)	-0.006 (0.192)	-0.012 (0.344)
OWNER		0.088 (2.246)**		0.040 (1.004)		
MAIN		-0.039 (0.824)		0.032 (0.647)		
FOREIGN			0.202 (2.920)***		0.068 (1.093)	
MAIN			-0.190 (2.012)**		0.055 (0.706)	
FINST						0.015 (0.401)
MAIN						-0.053 (1.191)
CORP						
MAIN						
PERSON						
MAIN						
CONST.	-0.081 (0.606)	-0.062 (0.424)	0.0340 (0.263)	-0.487 (3.195)***	-0.432 (3.333)***	-0.431 (3.087)***
MAIN	-0.103 (0.620)	0.095 (0.514)	0.081 (0.485)	-0.014 (0.072)	0.028 (0.170)	0.144 (0.812)
Adjusted R2	0.0883	0.0657	0.0658	0.0560	0.0561	0.0560
F Value	1.0200	2.1687+	2.8390+	1.5518	1.7970	1.8597

Table4: (Continued)

(4)	(5)	Period 4 (1)	(2)	(3)	(4)	(5)
-0.002 (0.073)	-0.003 (0.109)	0.006 (0.248)	0.002 (0.079)	0.006 (0.255)	0.006 (0.242)	0.003 (0.123)
0.009 (0.270)	0.010 (0.311)	-0.000 (0.012)	0.005 (0.165)	0.002 (0.075)	0.000 (0.017)	0.005 (0.170)
0.712 (3.498)***	0.723 (3.564)***	0.973 (4.810)***	0.984 (4.907)***	0.984 (4.870)***	0.970 (4.801)***	0.976 (4.865)***
0.428 (1.710)*	0.371 (1.479)	0.191 (0.771)	0.194 (0.786)	0.199 (0.803)	0.195 (0.786)	0.211 (0.855)
0.183 (3.361)***	0.186(3.379)***	0.0509 (1.185)	0.042 (0.978)	0.051 (1.188)	0.0511 (1.183)	0.0534 (1.240)
-0.115 (1.813)**	-0.121 (1.893)*	0.009 (0.181)	0.016 (0.322)	0.011 (0.217)	0.005 (0.108)	0.011 (0.215)
0.013 (0.526)	0.012 (0.488)	0.064 (2.780)***	0.075 (3.217)***	0.062 (2.669)***	0.064 (2.759)***	0.066 (2.896)***
-0.011 (0.316)	-0.005 (0.143)	0.003 (0.080)	-0.002 (0.066)	0.004 (0.133)	0.004 (0.122)	0.003 (0.088)
		0.003 (0.090)				
		-0.069 (1.495)				
			0.138 (2.420)**			
			-0.002 (0.368)			
				-0.016 (0.501)		
				0.022 (0.539)		
-0.007 (0.270)					0.001 (0.043)	
0.045 (1.248)					-0.042 (1.231)	
	-0.027 (0.804)					-0.042 (1.177)
	-0.044 (1.000)					-0.002 (0.041)
-0.395 (3.020)***	-0.353 (2.540)**	-0.531 (3.039)***	-0.568 (4.000)***	-0.485 (3.048)***	-0.523 (3.544)***	-0.446 (2.893)***
-0.005 (0.028)	0.104 (0.596)	0.140 (0.613)	-0.098 (0.534)	-0.130 (0.630)	0.008 (0.044)	-0.093 (0.473)
0.0558	0.0551	0.0792	0.0803	0.0782	0.0789	0.0784
2.1413+	1.8351	0.3839	0.1845	0.2751	0.4992	0.1252

Table 5 : Data of the firms in financial distress (%: standard deviations in parentheses)

		Firms in financial distress		Other firms
			Stable main banks	Unstable main banks	
1st sub-period (1956-70)	NOFirms	87	25	21	872
	RVAD	15.66 (38.28)	14.31 (2.82)	17.38 (50.82)	18.17 (22.14)
	CAPITAL	2.21 (8.90)	3.10 (7.46)	1.05 (5.92)	3.22 (6.82)
	LABOR	2.49 (11.11)	2.92 (9.92)	1.78 (11.49)	4.07 (10.11)
	SALE	76.22 (18.86)	78.89 (16.86)	70.10 (19.50)	76.31 (20.17)
	RETURN	2.53 (3.13)	2.84 (3.52)	2.58 (3.25)	3.29 (2.99)
	DEBT	76.74 (14.85)	75.15 (15.52)	77.35 (15.80)	68.41 (14.01)
2nd sub-period (1971-80)	NOFirms	70	20	16	900
	RVAD	9.42 (74.76)	5.49 (95.86)	11.58 (50.71)	10.21 (25.16)
	CAPITAL	0.67 (5.94)	0.01 (5.24)	0.60 (5.83)	2.46 (7.02)
	LABOR	-3.43 (8.79)	-4.97 (7.78)	-2.69 (8.05)	-0.82 (7.93)
	SALE	52.16 (18.36)	53.85 (15.93)	52.10 (21.44)	54.15 (19.00)
	RETURN	-0.23 (3.17)	-0.90 (3.37)	0.18 (2.94)	0.48 (2.91)
	EXIM	14.93 (9.18)	16.88 (9.65)	14.75 (12.80)	15.08 (7.83)
	DEBT	91.49 (21.39)	88.86 (18.76)	92.38 (26.23)	70.94 (16.69)
	OWNER	56.04 (16.15)	51.05 (15.45)	60.04 (15.41)	48.25 (14.89)
	FOREIGN	1.76 (5.75)	0.67 (1.69)	0.58 (1.48)	2.81 (7.58)
3rd sub-period (1981-90)	NOFirms	93	26	21	1257
	RVAD	6.77 (41.90)	6.53 (40.38)	2.11 (32.19)	8.69 (21.58)
	CAPITAL	-0.41 (5.99)	-0.58 (5.28)	-0.72 (4.33)	1.73 (6.70)
	LABOR	-1.06 (8.10)	-0.67 (7.19)	-1.33 (7.51)	0.50 (5.79)
	SALE	59.21 (20.17)	60.46 (16.59)	55.60 (20.81)	59.88 (20.69)
	RETURN	0.59 (2.36)	0.49 (2.61)	0.69 (1.99)	1.01 (2.31)
	EXIM	21.38 (15.21)	22.60 (13.95)	19.84 (17.03)	19.37 (11.69)
	DEBT	80.70 (19.42)	77.96 (17.86)	80.29 (16.54)	63.24 (18.90)
	OWNER	56.86 (13.57)	52.60 (14.05)	59.46 (12.50)	48.36 (13.65)
	FOREIGN	2.79 (6.03)	2.71 (5.71)	1.89 (3.56)	4.81 (8.33)
	FINST	20.33 (13.83)	27.31 (14.99)	14.79 (9.79)	31.38 (15.46)
	CORP	45.11 (18.08)	38.10 (17.36)	51.71 (16.44)	29.81 (18.45)
	PERSON	28.60 (12.91)	28.14 (11.70)	28.87 (13.00)	31.76 (15.14)
4th sub-period (1991-96)	NOFirms	80	26	21	1503
	RVAD	-0.15 (31.36)	1.64 (27.72)	-0.74 (20.15)	2.63 (17.25)
	CAPITAL	-0.42 (5.50)	0.51 (4.61)	-0.02 (3.70)	1.81 (7.88)
	LABOR	-2.98 (10.73)	-1.80 (10.03)	-2.44 (8.01)	-0.26 (5.45)
	SALE	65.33 (19.93)	65.90 (18.58)	64.61 (18.66)	60.98 (21.38)
	RETURN	-0.20 (2.14)	-0.21 (2.18)	-0.32 (1.98)	0.47 (2.23)
	EXIM	23.62 (17.66)	24.35 (14.57)	20.65 (16.79)	21.25 (14.25)
	DEBT	70.59 (21.38)	72.58 (15.19)	69.41 (18.86)	56.69 (19.40)
	OWNER	53.93 (14.03)	49.84 (13.36)	56.49 (13.40)	50.05 (14.22)
	FOREIGN	2.89 (4.95)	3.85 (5.67)	1.33 (3.02)	5.39 (8.44)
	FINST	22.12 (14.38)	28.79 (15.17)	16.46 (10.25)	31.04 (15.63)
	CORP	43.74 (17.58)	37.21 (15.27)	49.41 (17.47)	30.79 (18.10)
	PERSON	29.35 (14.36)	28.14 (13.02)	30.68 (11.80)	31.37 (15.82)

Table 6: Growth in per capita RVAD and factors of corporate governance : The case of financial distress (absolute values of t-statistics in parentheses)

	Period 1	Period 2 (1)	(2)	Period 3 (1)	(2)	(3)
SALE	-0.241 (1.053)	0.030 (0.107)	0.094 (0.347)	-0.072 (0.461)	-0.054 (0.343)	-0.060 (0.381)
MAIN	0.211 (0.812)	0.006 (0.010)	-0.048 (0.076)	0.316 (1.235)	0.312 (1.216)	0.320 (1.235)
PROFIT	2.114 (1.678) *	3.680(1.987) **	3.765 (2.060) **	0.844 (0.631)	0.749 (0.560)	0.814 (0.607)
MAIN	-0.675 (0.489)	4.781 (1.646) *	5.122 (1.757) *	1.360 (0.744)	1.547 (0.850)	1.497 (0.820)
EXIM		0.542 (1.086)	0.496 (1.020)	0.166 (0.833)	0.151 (0.752)	0.169 (0.822)
MAIN		-0.869 (0.900)	-0.916 (0958)	-0.073 (0.228)	-0.093 (0.295)	-0.110 (0.342)
DEBT	- 0.166 (0.636)	-0.282 (1.474)	-0.266 (1.375)	-0.524 (3.158)***	-0.496(3.133)***	-0.487 (3.024)***
MAIN	0.462 (1.579)	0.556 (1.219)	-0.627 (1.373)	0.250 (0.970)	0.224 (0.889)	0.222 (0.850)
OWNER		0.107 (0.281)		0.189 (0.754)		
MAIN		0.156 (0.237)		-0.081 (0.230)		
FOREIGN			3.257 (0.980)		1.081 (1.381)	
MAIN			-7.716 (1.347)		-0.817 (0.900)	
FINST						0.014 (0.045)
MAIN						0.008 (0.021)
CORP						
MAIN						
PERSON						
MAIN						
Const.	0.560 (1.092)	0.097 (0.143)	0.091 (0.158)	0.940 (1.254)	1.179 (1.771) *	1.193 (1.652) *
MAIN	-1.355 (1.893)*	0.647 (0.696)	0.855 (1.077)	-0.973 (1.002)	-1.078 (1.270)	-1.123 (1.177)
Adjusted R2	0.0486	0.1031	0.1074	0.0330	0.0348	0.0296
F Value	1.3568	1.2048	1.5167	0.3897	0.4100	0.3175

Table 6: Continued

(4)	(5)	Period 4 (1)	(2)	(3)	(4)	(5)
-0.064 (0.401)	-0.070 (0.444)	-0.143 (1.229)	-0.125 (1.035)	-0.187 (1.524)	-0.148 (1.267)	0.123 (0.998)
0.320 (1.241)	0.350 (1.358)	-0.013 (0.067)	0.004 (0.021)	0.061 (0.319)	-0.011 (0.059)	0.042 (0.218)
0.804 (0.600)	0.764 (0.569)	2.617 (2.780)***	2.581 (2.737)***	2.768 (2.921)***	2.780(2.937)***	2.668 (2.817)***
1.378 (0.754)	1.335 (0.730)	-1.378 (0.917)	-1.427 (0.959)	-1.413 (0.938)	-1.317 (0.880)	-1.549 (1.044)
0.169 (0.838)	0.183 (0.905)	0.007 (0.051)	0.030 (0.230)	0.005 (0.037)	-0.011 (0.080)	0.009 (0.065)
-0.096 (0.303)	-0.074 (0.231)	-0.024 (0.101)	0.067 (0.252)	-0.022 (0.093)	-0.041 (0.171)	0.006 (0.024)
-0.493 (2.994)***	-0.508 (3.115)***	0.142 (1.070)	0.070 (0.603)	0.103 (0.881)	0.148 (1.133)	0.110 (0.831)
0.201 (0.774)	0.263 (1.029)	0.447 (2.034) **	0.491 (2.300) **	0.507 (2.393) **	0.475 (2.165) **	0.458(2.071) **
		-0.177 (0.953)				
		0.056 (0.196)				
			-0.364 (0.484)			
			-0.068 (0.077)			
				0.247 (1.108)		
				-0.058 (0.196)		
0.021 (0.113)					-0.154 (1.087)	
0.102 (0.374)					-0.110 (0.464)	
	-0.128 (0.525)					0.107 (0.479)
	-0.183 (0.484)					0.078 (0.245)
1.188 (1.727) *	1.418 (1.862)*	0.333 (0.470)	-0.040 (0.066)	-0.166 (0.264)	0.218 (0.337)	-0.376 (0.387)
-1.168 (1.331)	-1.178 (1.278)	-1.400 (1.369)	-1.336 (1.611)	-1.496 (1.647) *	-1.194 (1.334)	-1.080 (0.953)
0.0312	0.0324	0.0500	0.0517	0.0550	0.0580	0.0509
0.3891	0.5057	1.3626	2.0970	1.9168	1.4290	2.0637

Table 7: Structural changes in the RVAD function between truncated sample period (Absolute value of t-statistics in parentheses)

	Between period 1 and 2		Between period 1 and 3	
	(1)	(2)	(1)	(2)
SALE	-0.017 (0.606)	-0.019 (0.674)	-0.023 (0.843)	-0.025 (0.896)
DUMT	-0.009 (0.278)	-0.003 (0.097)	0.044 (1.385)	0.046 (1.434)
RETURN	1.792 (9.122)**	1.797 (9.130)**	1.746 (8.941)**	1.735 (8.882)**
DUMT	-0.826 (3.490)**	-0.874 (3.689)**	-0.493 (1.969)*	-0.510 (2.037)*
EXIM	0.102 (1.387)	0.106 (1.430)	0.131 (1.794)*	0.138 (1.895)*
DUMT	-0.004 (0.057)	-0.017 (0.220)	-0.042 (0.539)	-0.049 (0.627)
DEBT	0.034 (1.150)	0.036 (1.220)	0.031 (1.045)	0.032 (1.091)
DUMT	-0.011 (0.326)	-0.003 (0.088)	-0.048 (1.413)	-0.044 (1.295)
OWNER	0.069 (2.169)*		0.072 (2.283)*	
DUMT	-0.045 (1.162)		-0.021 (0.516)	
FOREIGN		0.006 (0.096)		-0.013 (0.199)
DUMT		0.130 (1.792)*		0.027 (0.354)
MAIN	0.000 (0.011)	-0.015 (0.368)	-0.001 (0.015)	-0.016 (0.400)
DUMT	-0.035 (0.669)	-0.034 (0.657)	-0.012 (0.245)	-0.010 (0.212)
Const.	-0.132 (0.969)	0.005 (0.041)	-0.193 (1.428)	-0.053 (0.437)
DUMT	-0.058 (0.349)	-0.205 (1.390	-0.137 (0.870)	-0.183 (1.328)
Adjusted R2	0.0645	0.0659	0.0619	0.0608
F-Value	8.202	8.960	16.544	15.696

(Notes) DUMT presents a cross term between each explanatory variable and the dummy for a specific sample period. Period 1, 2, and 3 are the early 1970s (1971-1974), the early 1980s (1981-1985), and the late 1980s (1985-1989) respectively.

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