Differentials in firm-level productivity and corporate governance:

Evidence from Japanese firm data in 1998-2001

Naoki Shinada[*]

Submitted in partial fulfillment of the requirements for

the degree of Master of Arts in Quantitative Methods in the Social Sciences

in the Graduate School of Arts and Sciences

COLUMBIA UNIVERSITY

2004

[*] I would like to express my appreciation for the invaluable assistance and comments provided by my advisor, Professor Frank R. Lichtenberg, Courtney C. Brown Professor of Business, Columbia University Graduate School of Business.

ABSTRACT

Differentials in firm-level productivity and corporate governance:

Evidence from Japanese firm data in 1998-2001

Naoki Shinada

This thesis analyzes the differentials in productivity of Japanese firms in the late 1990s and the beginning of the 2000s. The results of the firm-level TFP estimation suggest that the differentials broadened in 1998-2001, and it suppressed the overall productivity growth. This thesis also demonstrates the relationship between firm-level productivity and corporate governance. The results suggest that managerial ownership did not have positive effects on productivity levels, while the ratios of financial and foreign shareholding and the ratio of top five large shareholders significantly increased the level of productivity.

Contents

1 Introduction

Since the bubble economy from the end of the 1980s to the beginning of the 1990s was over, Japanese economy has experienced the lower level of growth compared to the high-performing growth in the later 1980s. Many previous studies from macroeconomic-level viewpoints regarded Total Factor Productivity (TFP) as one of the largest factors of declining of Japanese economy from the 1990s, but the arguments on what kind of factors mainly caused TFP declining have been controversial.[1]

While it has been widely recognized that Japan's TFP has been sluggish in the 1990s, there is a growing awareness that the differentials in corporate performance between "winners and losers" have been broadening recently, that is, Japanese firm-level differentials in profitability, efficiency or productivity have widened since the late 1990s. It is considered that this problem has restrained Japanese economic growth from the late 1990s, because productivity growth overall would be restrained when decreasing productivity in low-performance firms offset increasing in high-performance firms.

[1]Hayashi (2003) pointed out that structural problem on the supply side caused the decline of TFP, but Yoshikawa (2003) emphasized that the productivity has been declined by weak demand and weakened capability of investigation of financial sector. Jorgenson and Motohashi (2003) proved that real Japan's productivity growth has rather been maintained since the bubble collapse by considering the adjustment of dramatically declining prices of information technology (IT)-related capital and services.

Rather than macro-level analyses, firm-level analyses are more useful for demonstrating whether such differentials occurred in Japan or not. Although more firm-level analyses on Japanese productivity growth has been recently conducted to demonstrate other factors that macro-level analyses do not cover[2], there are a fewer studies emphasizing on the differentials in Japanese firm productivity than those in other countries' firm productivity.[3]

This study is begun by demonstrating whether the differentials in Japanese firm productivity have broadened from the end of the 1990s to the beginning of the 2000s. Compared to the previous literatures on Japanese firm-level productivity, this study extends the coverage[4] and the method of estimating data: First, the sample firms are selected in all industry including non-manufacturing. Second, the sample period covers the data from the fiscal year of 1998 to that of 2001. Third, the method of estimating firm-level productivity is developed so that firm-level changes in prices of multiple capital

[2]For example, Fukao and Chuan (2003) proved that R&D and import ratio have a positive effect on TFP growth. Nishimura, Nakajima, and Kiyota (2003) compared TFPs of firms entering markets and withdrawing from markets. Economic Plannig Agency (2000) examined the relationship between IT equipment and productivity.

[3]Aw, Chen, and Roberts (2001) revealed that there occurred significant differentials in firm-level productivity of Taiwanese manufacturing in the 1980s. Dhawan (2001) used panel data of U.S. 935 firms to explain the difference in productivity and risk between large and small firms.

[4]Kitamura and Tsutsui (1996) measured firm-level productivity with estimating its differentials by the method of Data Envelopment Analysis but their sample was limited to Japanese major electric companies.

goods are reflected on real capital input of each firm.

The next step in this study is aimed to determine what factors have significant effects on firm-level productivity. In terms of other factors determining firm-level productivity than R&D, import ratio, IT-related capital stock, and so forth, it has been widely argued that Japanese firm productivity has been closely related to corporate governance, and that the recent inefficiency in corporate governance might have an negative effect on corporate performance such as productivity.

Especially, monitoring and motivating managers is an important function of corporate governance. Externally, managers are monitored by large shareholders, shareholders meetings, stock market, main banks and external managers and auditors. In Japan, the effect of main banks on corporate governance have been particularly emphasized (Hoshi, Kashyap, and Scharfstein (1990), Aoki and Patrick (1994)), but whether this effect has actually influenced corporate governance or not is controversial in the recent studies (Morck and Nakamura (1999), Hanasaki and Horiuchi (2000)). [5]

[5]In terms of other external monitoring to management, it is often argued that it might be ineffective in Japan. Large shareholders sometimes give a carte blanche to management and shareholders meetings are controlled in favor of managers (Matsumoto (1991)). Stock markets also have not disciplined managerial behaviors because adversarial mergers and acquisitions did not occur so often and managers escaped to pay much attention to reaction to their firm performance in stock market (Odagiri (1994)).

On the other hand, internally, managers are motivated by their salary, bonus, capital gains from holding shares, etc. It is considered that, if managers are given effective incentives to monitor their management, they could improve their corporate performance through strengthening corporate governance internally. One of the most effective internal incentives to managers is monetary reward. Manager salary is a typical incentive of monetary reward to motivate corporate governance, because managers will be motivated higher if their salary depends on corporate performance. The previous literatures on the case of Japanese firms such as Kaplan (1994) and Kato (1997) examined the relationship between manager salary and corporate performance.

Another typical incentive regarding monetary reward is stock-ownership by managers. Even if a firm does not have the system that manager salary completely depends on corporate performance, capital gains from the stocks owned by managers would become another incentive to motivation for corporate governance. However, due to the existence of shareholding by main bank and keiretsu networks in Japan, the incentive by managerial ownership has been not viewed as importance so far, and there were limited number of studies such as Lichtenberg and Pushner (1994) and Ferris, Kim, and Kitsabunnarat (2001) on the incentive by managerial ownership in Japanese

firms. Thus, this study pays attention to an effect of managerial ownership on corporate performance through demonstrating the relationship between firm-level productivity and corporate governance.

The rest of this paper is organized as follows. Section 2 describes the concepts on corporate governance and performance based on previous literatures. Section 3 specifies the models for estimating firm-level productivity and demonstrating its relationship with corporate governance. Section 4 presents the data used in estimations. Section 5 and 6 report the descriptive statistics of the data and the results of the estimations. Section 7 gives a summary and conclusions.

2 Concepts and previous literatures on corporate governance and performance

In the case that corporate governance does not function well, there exists a basic problem on the balance between external monitoring and internal motivation on managers, especially, on the balance of conflicting interests between shareholders and managers, called an agency problem. While shareholders request managers to manage their companies in order to maximize corporate performance, managers tend to manage their companies to maxi-

mize their own profits. Since individual, small shareholders generally do not have enough information and incentives to monitor management, they would possibly result in failing in monitoring management and giving contributions to improving companies' performance.

Under the situation with such an agency problem, when incentives by monetary reward such as salary and capital gains from shareholding are properly given to managers, those could balance the interests of shareholders and managers. The incentive given by manager salary could take effect for motivating managers, because, if a company holds a payment system that manager salary completely depends on its performance such as profitability or productivity, managers would be motivated to make efforts to maximize the company's performance. Abowd (1990) used U.S. company data to demonstrate that the companies where the manager salary is more elastic to corporate performance have better performance. Kubo (2001) also drew the same conclusion by using U.K. corporate data. On the contrary, Vafeas (2000) examined the case of the salary of external managers and corporate performance and concluded that there is no significant difference in corporate performance between the companies that provide incentives to external managers and those that do not provide. Regarding the cases of Japanese

firms, Kaplan (1994) and Kato (1997) demonstrated the relationship between manager salary and corporate performance, but their conclusions were not consistent. While Kaplan (1994) presented a positive relationship between them, Kato (1997) concluded that they did not find any significant relationship between them.

Also, the incentive given by capital gains from holding shares could encourage managers to maximize their corporate performance. Rather than managerial salary, capital gains from owning stocks directly depend on corporate performance in stock market, and it is considered that the incentive through owning stocks to managers also play an important role in corporate governance. Jensen and Meckling (1976) suggested that managers owning large equity positions can align managerial interests with those of shareholders. Since this reduces agency costs, operating performance of a firm increases as management ownership rises. Leland and Pyle (1977) and Stulz (1988) presented another effects of managerial ownership on corporate performance. The former literature, using a signaling model, showed that managers' willingness to invest in their own project can serve a signal of project quality, in other words, owning shareholders by managers would be used as a signal to markets that they have a plan for highly qualified projects. The latter, using

a takeover model with managers and bidders, argued that managers' control of voting rights of shareholders may increase firm value because it ensures a higher bid premium in a hostile takeover contest. According to those literatures, it is theoretically considered that managerial ownership would have a positive effect on corporate performance.

Previous empirical firm-level studies presented the positive relationship between managerial ownership and corporate performance. Mehran (1985) found this relationship in 153 U.S. manufacturing firms in 1979-1980, and Palia and Lichtenberg (1999) also demonstrated that managerial ownership changes are positively related to TFP changes by using the data of 255 U.S. manufacturing firms in 1982-1993. Short and Keasey (1999) and Kim, Kitsabunnarat, and Nofsinger (2004) found the similar relationship in U.K. and Thai manufacturing firms, respectively.

There were, on the other hand, limited number of studies on such relationship in Japanese firms. Because previous literatures on the relationship between stock ownership and corporate performance in Japanese firms were mainly conducted from viewpoints of Japan's inherent ownership structure based on main bank system or keiretsu networks (Hoshi et al. (1990), Hoshi, Kashyap, and Scharfstein (1991), Aoki and Patrick (1994)), the importance

of effects of managerial ownership on corporate performance has been understated.[6]

However, there occurred the changes in stock-ownership structure in Japanese firms after the collapse of the bubble economy in the early 1990s, because long-term depression in financial sector and deregulation in financial market helped controlling power of banks on firms weakened, while other stockowners such as foreign shareholders might increase their presence in corporate governance. The recent studies such as Morck and Nakamura (1999) and Hanasaki and Horiuchi (2000) suggested that bank monitoring might be ineffective in Japan.

Accordingly, we will have contradict views about an effect of managerial ownership on corporate performance in the recent situation Japanese firms are facing. Managerial ownership has had a positive effect on corporate performance as the presence of banks or keiretsu network have been weakened, or it has had no significant effect because the presence of bank ownership or other factors such as increasing foreign shareholding is more explanatory for demonstrating the relationship with corporate performance. Lichtenberg and Pushner (1994) found the positive relationship between director

[6]Lichtenberg and Pushner (1994) demonstrated the effect of director ownership as well as that of financial equity ownership.

ownership and profitability in the 1980s using the data of 1,024 Japanese manufacturing firms. On the other hand, Ferris et al. (2001), using the data of Japanese firms in 1993-1996, showed that firms with significant managerial stock-ownership do not typically depend on keiretsu networks and banks debt, but also showed that managerial ownership does not enhance firm performance because managerial ownership is endogenously determined.

Therefore, this study aims to determine whether managerial stock ownership and other ownership structure in corporate governance have had a positive effect on firm productivity, followed by presenting the firm-level differentials in productivity in 1998-2001. It develops Ferris et al. (2001) with extending sample period to 1998-2001, and, in the similar way as Lichtenberg and Pushner (1994) and Palia and Lichtenberg (1999), employs TFP as an indicator for corporate performance, rather than stock market returns or operating profit ratio. It also develops the method of estimating production function by considering firm-level real capital input that reflects capacity utilization rate and price changes of multiple capital goods in each firm.

3 Model specification

In this section, models for estimating firm-level productivity and demonstrating its relationship with corporate governance are specified. A general expression of productivity in a firm is described as follows:

$$p = \frac{Y}{I} \tag{1}$$

where p denotes productivity, Y denotes output, and I denotes input. Since a firm usually employs multiple kinds of I such as labor and capital, p varies depending on a kind of I. TFP is considered as a productivity of total output towards total inputs. We assume that a firm produces a single output by using two inputs, labor and capital. A production function of a firm is expressed as the following Cobb-Douglas function form:

$$Y = AL^{\alpha}K^{\beta} \tag{2}$$

where L denotes labor input, K denotes capital input, and A presents TFP which can be recognized as a multiplicative technology parameter. TFP indicates how efficiently a firm uses input to produce output, and is an appropriate indicator for corporate performance based on a production function.

Taking logarithms, we obtain

$$\ln Y = \ln A + \alpha \ln L + \beta \ln K \tag{3}$$

where $\ln A$ indicates TFP factor. In a practical manner, TFP factor in a firm i $(i = 1, 2, \ldots, N)$ in year t can be obtained from

$$\ln A_{i,t} = \ln Y_{i,t} - \alpha_t \ln L_{i,t} - \beta_t \ln K_{i,t}. \tag{4}$$

$\ln A$ is observed by calculating real values of Y, L and K to consider price changes and obtaining α and β from cross-sectional or panel data estimation for year t. Particularly, changes in variance of $\ln A$ among N firms in year t is mentioned to see whether the differentials in firm-level productivity has recently broadened.

Next, to demonstrate the relationship between firm-level productivity and corporate governance, we assume a model that corporate governance such as managerial ownership would affect productivity of firms. Referring to the models used in Palia and Lichtenberg (1999), Ferris et al. (2001) and Kim et al. (2004), the relationship between productivity and corporate governance can be expressed in the following model for estimation:

$$\ln A_{i,t} = \gamma_{j,t} \ln M_{i,j,t-1} + dummy_t + residual_{i,t} \tag{5}$$

where M_j denotes an index for a factor j indicating corporate governance, and four factors of M (j = managerial ownership ratio, financial shareholding ratio, foreign shareholding ratio, and the concentration ratio of large shareholders) described in Section 4.3 are introduced into this model. The equation presents that the level of productivity in a firm would increase if its corporate governance functions well, and it is assumed that there are multiple Ms to indicate corporate governance M in year $t-1$ affects $\ln A$ in year t. The sign of γ depends on what kind of corporate governance index M is introduced. Additionally, the industrial dummy variable is added to the model for cross-sectional estimation.

4 Data

4.1 Sample firms and estimation period

The main source from which the data necessary to estimate equation (3) and (5) are obtained is the Corporate Financial Database maintained by Development Bank of Japan. This database covers the financial dataset of

Japanese companies listed in all stock markets from 1956. Number of sample firms for the estimation is 604, including 496 manufacturing firms and 108 non-manufacturing ones. Because several financial data need to be obtained from 1970 for calculating real capital stock as described later, sample firms are limited to those having complete dataset consecutively from 1970 to the latest year 2001, excluding firms established after 1971. Number of sample firms are tradeoff between employing TFP estimated according to production function and a more simplified index for corporate performance such as stock market returns and operating profit ratio.

The period for estimation is from the fiscal year of 1998 to that of 2001. It is also limited due to data availability, for the data indicating corporate governance can be obtained from 1998. However, compared to the sample periods of 1976-1989 in Lichtenberg and Pushner (1994) and 1993 and 1996 in Ferris et al. (2001), this sample can be extended to cover the more recent period when the financial situation in Japan significantly changed.

4.2 Real output and inputs

For estimating equation (3), Y, L, and K are calculated in real values. In Japan, the price changes in material goods, durable and non-durable con-

sumption goods, and capital goods in deflation from the late 1990s have varied, and would have an idiosyncratic effect on firm-level real values of output and inputs. Thus, using the similar methods by Hayashi and Inoue (1991), Y, L and K are calculated considering price changes.

4.2.1 Real output

Nominal value of value added in each firm is calculated based on the definition in Financial Data Handbook by Development Bank of Japan as follows:

$$\begin{aligned} Nominal\,value\,added &= Operating\,profit + Labor\,expenses \\ &\quad + Rental\,expenses + Taxes\,and\,public\,charges \\ &\quad + Patent\,license\,fees + Depreciation. \end{aligned} \tag{6}$$

Real output is obtained from nominal value deflated by commodity price index of the industry to which each firm belongs.[7]

[7] All price index used in this paper are adjusted on the basis of year 1990.

4.2.2 Labor input

The amount of labor input is calculated as number of workers multiplied by number of working hours. Number of workers is the aggregate total of the number of employees of a firm at the end of a fiscal year, temporary and contract employees not included in the number of employees, and employees on temporary transfer. The index of actual total working hours of the Monthly Labor Survey by Ministry of Health, Labor and Welfare is used for working hours. The intermediate classification of industries in the Corporate Financial Database is matched to the industry classification of the Monthly Labor Survey.[8]

4.2.3 Capital input

Capital input consists of three kinds of assets: inventory assets, land, and depreciable assets. First, the amount of inventory assets are aggregated by five kinds of assets deflated by each price index.[9]

[8]The industries are classified into mining, construction, manufacturing, electricity and gas, transportation and communications, wholesale and retail, real estate, and service.

[9]Inventory assets are divided into (a) products and manufactured goods, (b) sales-use land, (c) intermediate and partially-finished goods, (d) disbursements for work in progress and (e) raw materials. (a) is deflated by the commodity prices in each industry, (b) is deflated by the urban land price index, (d) is deflated by the construction deflator, (e) is deflated by the domestic wholesale price index, and the average price of (a) and (e) is used for (c).

Second, the real value of land is estimated by the following method:

$$RV_t = LI_t + (RV_{t-1} - LD_{t-1})\dot{(}RV_{t-1}/NV_{t-1})\dot{(}P_t/P_{t-1}) \tag{7}$$

where RV and NV respectively denote the real and nominal values of land at the end of a fiscal year, LI and LD respectively denote the increase and decrease of land during a year, and P denotes the market price of land. The market price of land is taken from the Land Price Index by Japan Real Estate Institute. The benchmark of RV is the value in 1970, calculated from the real land value owned by non-financial companies in the National Accounts by Cabinet Office and the book land value in the Annual Report of Corporate Statistics by Ministry of Economy, Trade and Industry.

Third, the input of depreciable assets is specified as follows:

$$\begin{aligned} Input\,of\,depreciable\,assets \;\; &= \;\; real\,capital\,stock\,of\,depreciable\,assets \\ &\quad \times capacity\,utilization\,rate \end{aligned} \tag{8}$$

where the adjustment by capacity utilization rate is reflected on the actual amount of capital used for production. Real capital stock of depreciable

assets in each year is obtained by the benchmark-year method as follows:

$$K_t = (1 - \delta)K_{t-1} + I_t \tag{9}$$

where K_t denotes real capital stock at the end of year t, I_t denotes real capital investment in year t, and δ denotes depreciation rate.

The benchmark of real capital stock is taken from the National Wealth Survey 1970 by Economic Planning Agency. Real capital stock and investment are calculated by dividing depreciable assets into five and deflating them with each price index.[10] The depreciation rate for each asset used in Hayashi and Inoue (1991) is applied to δ. In terms of capacity utilization rates, the industry-base data in the Industrial Production Index published by Ministry of Economy, Trade and Industry are applied to manufacturing firms, and the utilization rates in non-manufacturing industries are estimated by the method used in Kamada and Masuda (2000).[11]

[10]Depreciable assets are divided into (a) non-residential construction, (b) structures, (c) machinery and equipment, (d) motor vehicles and transportation equipment, and (e) tools, furniture and fixtures. The construction price index published by Ministry of Land, Infrastructure and Transportation is used for (a) and (b). The domestic wholesale price of transportation equipment published by Bank of Japan is used for (d). For (c) and (e), weight-averaged domestic wholesale prices are calculated with the weights for equipment and other investment goods in each industry, which can be taken from the Input-Output Tables by Ministry of Public Management, Home Affairs, Posts and Telecommunications.

[11]The utilization rates in non-manufacturing industries are estimated from the business-use electrical power consumption rate and the capacity judgment index in the Business

4.3 Managerial ownership and other indices for corporate governance

In order to demonstrate whether managerial ownership has an positive effect on productivity, the ratio of stocks owned by managers is taken from the Corporate Financial Database and applied to M in equation (5). As the database has the managerial ownership ratio from the fiscal year of 1998, the estimation period is limited to 1998-2001.

Besides, other three indices than managerial ownership, indicating corporate governance, are added as explanatory variables M in equation (5): bank shareholding ratio, foreign shareholding ratio, and the concentration ratio of large shareholding. Adding those variables into the model will help us compare the effect of managerial ownership on productivity with that of the other factors. The reasons those variables will have effects on corporate performance are described below.

While managerial ownership is recognized as internal motivation to managers, those three factors play a role as external monitoring to management. Especially, bank loans in Japan have had much importance on corporate finance, and main banks have intervened in the management of their client

Outlook Survey by Ministry of Finance.

firms in various ways such as shareholding, dispatching external managers, and so on. Thus, there exists a hypothesis that the ratio of stocks owned by banks and other financial institutions would affect corporate performance of their client firms. Lichtenberg and Pushner (1994) empirically supported this hypothesis.

In addition, Yonezawa and Miyazaki (1996) suggested that foreign shareholders have played a more important role in recent Japanese corporate governance under the long-term sluggish stock market and deregulation. Instead of internal incentives to self-improvement in management, external pressure on improving corporate governance and performance from foreign shareholders as well as financial shareholders could possibly take effect, and the shareholding ratio of foreigners could have a positive correlation to firm productivity.

Moreover, there is the possibility that the degree of concentration of shareholding has an effect on corporate governance. It should be noted that whether that degree of concentration would be positive or negative cannot be determined, because relatively large, stable shareholders could have considerable monitoring power to intervene in management at shareholders meetings(Yonezawa and Miyazaki (1996)). On the contrary, as Hanasaki and Horiuchi (2000) pointed out, it has been considered that Japanese shareholders

have not often monitored and intervened management, partly because cross-shareholding has been popular for a long time in Japanese capital market.[12]

5 Descriptive statistics

Table 1 presents basic descriptive statistics in the sample firms. For the data of all sample firms from 1998 to 2001, the average value of Y is 45.3 billion yen and the average K is 142.84 billion yen. However, the median values of Y and K are much smaller than the mean values, and this indicates that the sample has a large proportion of relatively smaller firms in terms of real output and capital input.

The mean value of managerial ownership measured by the ratio of shares owned by managers is 1.43%, well below the level of U.S. firms in Palia and Lichtenberg (1999), 13.73%. The mean of financial shareholding ratio is 33.56%.[13] This figure is much larger than the mean of foreign shareholding ratio, 6.87%, and it characterizes the shareholding structure in Japanese listed firms. While the mean of financial shareholding ratio is slightly lower than the median of that, the mean of foreign shareholding ratio is higher

[12]Lichtenberg and Pushner (1994) demonstrated that high levels of intercorporate shareholding have a negative influence on firm profitability.

[13]The mean of that ratio in 1,241 firms in 1976-1989 by Lichtenberg and Pushner (1994) is about 25%.

than the median value. This suggests that the sample has a large proportion of firms with smaller foreign shareholding and higher financial shareholding.

Compared to non-manufacturing firms, manufacturing firms with the proportion of 82.1% in the number of the sample firms have a little more variant statistics in real output, real capital stock, managerial ownership, and the ratio of financial shareholding, but as a whole there is not large difference in the descriptive values between two industries.

Table 2 presents annual statistics from 1998 to 2001. Comparing 1999 and 2000, the standard deviation of real output increases, while that of real capital input decreases and that of real labor input is almost maintained. This implies the possibility that the variance of firm efficiency in production could increase in this period, and we discuss about it later.

Managerial ownership, the ratio of managers' shareholding, does not show large fluctuation during the period. On the other hand, the ratio of financial shareholding decreases between 1998 and 1999, while the ratio of foreign shareholding increases. We can find that the structural change in shareholding of Japanese firms from the end of the 1990s to the beginning of the 2000s was characterized by financial institutions' and foreigners' ownership, rather than by managerial ownership.

6 Estimation results

The production function presented in equation (3) is estimated and the results are presented in Table 3. The coefficients in four cross-sectional estimations by each year are all significant at 1% level. We find the coefficients for $\ln K$ from .428 to .443, and those for $\ln \ln L$ from .593 to 622. Those capital and labor shares is considered to be reasonable, compared to the macro level estimation.[14] The results of the panel data estimation with random effects[15] by using the same data as the cross-sectional estimations are also presented in Table 3, and the coefficients are also significant.

Based on those results, $\ln A$ is computed by equation (4), and the standard deviation of $\ln A$ in each year are also presented in Table 3. According to the results of the cross-sectional estimations, the standard deviation increases from .294 in 1999 to .350 in 2001, and this indicates that the variance of the firm-level productivity increased from 1999 to 2001. The similar results are seen in the results of the panel data estimation.

More precisely considering the distributions of the firm-level productivity, Table 4 reports the 25th, 50th and 75th percentiles for each distribution

[14] According to the National Accounts by Cabinet Office, the share of real capital stock in real income is computed as .42-.42 in 1998-2001.

[15] The random effects model is selected by the Hausman test.

of $\ln A$ in the cross-sectional models. Whereas the 25th percentile decreases from -.153 in 1998 to -.182 in 2001, the 75th percentile increases from .148 to .176. This represents that the differentials in productivity broadened. In other words, worsening in low productivity firms offset improving in high productivity firm, and it constrained the improvement of the median productivity that resulted in being continuously low during the years.

Thus, the results of estimating TFP suggest that the firm-level productivity growth in 1998-2001 was overall suppressed, and the differentials in productivity broadened at the same time.

Table 5 presents the results of the cross-sectional estimation by equation (5). The dependent variable is TFP factor, lnA, and independent variables are managerial ownership, financial shareholding ratio, foreign shareholding ratio, and the concentration ratio of top five shareholders. All of those are 1-year lagged variables because we assume that the level of a proxy for corporate governance in year t would determine the level of productivity in year $t+1$. Industry dummies are also added to the estimation model to consider industry-specific effects.

The first column suggests that the signs for the coefficient for managerial ownership is negative in years of 1999 and 2001, contrary to our expectation,

and that managerial ownership does not have a significant relationship with productivity in all years.[16] The hypothesis that increasing managerial ownership would contribute to strengthening corporate governance and would lead to enhancing productivity is not supported in these results.

On the contrary, the second and third columns in Table 5 present that the variables are all significant at 1% or 5% level and the signs are shown as expected. It is found that both of the financial and foreign shareholding ratios have positive effects on the level of productivity.[17]

Table 5 also indicates that there is not much difference in the sizes of the coefficients for financial and foreign shareholding ratios, whereas Table 2 presents that the mean of financial shareholding ratio is much larger than that of foreign shareholding ratio. This presents that the effect of increase or decrease of foreign shareholding ratio is larger than that of financial shareholding ratio, and suggests the possibility that the external monitoring to management from foreign shareholders would contribute to increasing productivity.

[16] Although the different types of models by replacing the level of the managerial ownership ratio with the year-on-year difference of the ratio, or with the squared ratio to assume the nonlinear relationship, the coefficient was not found significant.

[17] The similar results are obtained from the panel data estimation. The coefficient for managerial ownership is not significant, while the financial and foreign shareholding ratios are positively significant at 5% or 10% level.

The forth column represents that the concentration ratio of top five shareholders significantly has a positive effect on the level of productivity. As explained in Section 4.3, the effect could be reasonably expected positive and negative, but, according to the result of this estimation, it is found that relatively large shareholders help corporate governance strengthened as stable stakeholders, and lead to enhancing productivity.

7 Summary and conclusions

There have been a lot of interests on productivity of Japanese firms in the late 1990s and the beginning of the 2000s, and its relationship with corporate governance. Although many previous literatures from macroeconomic viewpoints mentioned the stagnation of productivity growth, there were few studies on the recent differentials in firm-level productivity. The first aim of this study is to show that the differentials of Japanese firm-level productivity have broadened recently, extending the sample industries and the methods of estimating TFP by considering price changes and capacity utilization.

The results of the firm-level TFP by cross-sectional estimation in 1998-2001 suggest that the differentials in TFPs in that period have broadened, and that it suppressed the overall productivity growth as worsening in low

productivity firms offset the improvement in high productivity firms.

There are also the earlier theoretical and empirical studies presenting that there would be a relationship between the level of productivity and corporate governance, especially managerial ownership would have a positive effect on productivity. The second aim of this study is to demonstrate such a relationship, by using the TFPs estimated above and extending the sample period to the recent years 1998-2001.

By introducing several indices of stock ownership structures that include managerial ownership, which are proxies for corporate governance, the model of the relationship between corporate governance and TFPs is estimated by cross-sectional estimation in 1998-2001. The results suggest that managerial ownership did not have a positive effect on productivity, and that the financial shareholding ratio, the foreign shareholding ratio and the concentration ratio of top five shareholders significantly had positive effects on productivity, instead. It is found that, in the recent situation of Japanese firms, high managerial ownership did not significantly motivate managers to increase productivity levels, while financial and foreign shareholders play a role to externally monitor managers and thereby increased the level of productivity.

References

Abowd, J. M. (1990): "Does Performance-Based Managerial Compensation Affect Corporate Performance?" *Industrial & Labor Relations Review*, 43, 52–73.

Aoki, M. and H. Patrick, eds. (1994): *The Japanese Main Bank System: Its Relevance for Developing and Transforming Economies*, New York: Oxford University Press.

Aw, B. Y., X. Chen, and M. J. Roberts (2001): "Firm-level Evidence on Productivity Differentials and Turnover in Taiwanese Manufacturing," *Journal of Development Economics*, 66, 51–86.

Dhawan, R. (2001): "Firm Size and Productivity Differential: Theory and Evidence from a Panel of US Firms," *Journal of Economic Behavior & Organization*, 44, 269–293.

Economic Plannig Agency (2000): "The Effect of IT (Information Technology) on Productivity: In search of Japan's "New Economy" (in Japanese)," *Policy Analysis Report*, No. 4.

Ferris, S. P., K. A. Kim, and P. Kitsabunnarat (2001): "Is Manage-

rial Equity Ownership an Alternative Governance Mechanism for Japanese Firms?" *Advance in Financial Economics*, 6, 39–63.

Fukao, K. and H. Chuan (2003): "Japan's Productivity and Economic Growth (in Japanese)," Revised version of the paper submitted to the Japanese Economic Association Meeting in April 2003.

Hanasaki, M. and A. Horiuchi (2000): "Did Main Bank Relationship Contribute to Improvement of Corporate Management Efficiency? (in Japanese)," *Economic and Business Research, Development Bank of Japan*, Vol. 21-1.

Hayashi, F. (2003): "No Structural Reform, No Growth (in Japanese)," in *Empirical Analysis on Deflation*, ed. by Y. Harada and K. Iwata, Tokyo: Toyo Keizai.

Hayashi, F. and T. Inoue (1991): "The Relationship of Firm Growth and Q with Multiple Capital Goods: Theory and Evidence from Panel Data on Japanese Firms," *Econometrica*, 59, 731–754.

Hoshi, T., A. Kashyap, and D. Scharfstein (1990): "The Role of Banks in Reducing the Costs of Financial Distress in Japan," *Journal of Financial Economics*, 27, 67–88.

——— (1991): "Corporate Structure, Liquidity, and Investment: Evidence from Japanese Industrial Groups," *Quarterly Journal of Economics*, 106, 33–60.

Jensen, M. C. and W. H. Meckling (1976): "Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure," *Journal of Financial Economics*, 3, 305–360.

Jorgenson, D. W. and K. Motohashi (2003): "Economic Growth of Japan and the United States in the Information Age," *RIETI Discussion Paper Series*, 03-E-015.

Kamada, K. and K. Masuda (2000): "Effects of Measurement Error on the Output Gap in Japan," Working Paper 00-15, Research and Statistics Department, Bank of Japan.

Kaplan, S. N. (1994): "Top Executive Rewards and Firm Performance: A Comparison of Japan and the United States," *Journal of Political Economy*, 102, 510–546.

Kato, T. (1997): "Chief Executive Compensation and Corporate Groups in Japan: New Evidence From Micro Data," *International Journal of Industrial Organization*, 15, 455–467.

Kim, K. A., P. Kitsabunnarat, and J. R. Nofsinger (2004): "Ownership and Operating Performance in an Emerging Market: Evidence from Thai IPO Firms," *Journal of Corporate Finance*, forthcoming.

Kitamura, M. and M. Tsutsui (1996): "Measurement and Comparative Analysis of the Managerial Efficiency of U.S.-Japan Electric Industry by DEA Method (in Japanese)," *Electric Power Economic Research*, No. 37.

Kubo, K. (2001): "Changes in Directors' Incentive Plans and the Performance of Firms in the UK," Working Paper 2001-3, Centre for Economic Institutions, Hitotsubashi University.

Leland, H. E. and D. H. Pyle (1977): "Information Asymmetry, Financial Structure and Financial Intermediation," *Journal of Finance*, 32, 371–387.

Lichtenberg, F. R. and G. M. Pushner (1994): "Ownership Structure and Corporate Performance in Japan," *Japan and the World Economy*, 6, 239–261.

Matsumoto, K. (1991): *The Rise of the Japanese Corporate System*, New York: Kegan Paul International.

Mehran, H. (1985): "Executive Compensation Structure, Ownership, and Firm Performance," *Journal of Financial Economics*, 38, 163–184.

Morck, R. and M. Nakamura (1999): "Banks and Corporate Control in Japan," *Journal of Finance*, 54, 319–339.

Nishimura, K., T. Nakajima, and K. Kiyota (2003): "What Happened in Japanese Industries in the Lost Decade 1990s? (in Japanese)," *RIETI Discussion Paper Series*, 03-J-002.

Odagiri, H. (1994): *Growth through Competition, Competition through Growth: Strategic Management and the Economy in Japan*, New York: Oxford University Press.

Palia, D. and F. R. Lichtenberg (1999): "Managerial Ownership and Firm Performance: A Re-examination Using Productivity Measurement," *Journal of Corporate Finance*, 5, 323–339.

Short, H. and K. Keasey (1999): "Managerial Ownership and the Performance of Firms: Evidence from the UK," *Journal of Corporate Finance*, 5, 79–101.

Stulz, R. M. (1988): "Managerial Control of Voting Rights: Financing

Policies and the Market for Corporate Control," *Journal of Financial Economics*, 20, 25–54.

Vafeas, N. (2000): "Operating Performance around the Adoption of Director Incentive Plans," *Economics Letters*, 68, 185–190.

Yonezawa, Y. and S. Miyazaki (1996): "Corporate Governance and Productivity of Japanese Firms," in *Japan's Capital Market*, ed. by T. Tachibanaki and Y. Tsutsui, Tokyo: Nippon Hyoron Sha.

Yoshikawa, H. (2003): "Comments on Hayashi's Paper: Less is More? (in Japanese)," in *The Root Causes of the Lost Decade*, ed. by K. Iwata and T. Miyagawa, Tokyo: Toyo Keizai.

Table 1. **Descriptive statistics**

Industry	All Industry			Manufacturing			Non-manufacturing		
Number of firms	604			496			108		
	Mean	Median	S.D.	Mean	Median	S.D.	Mean	Median	S.D.
Y	45.32	14.20	106.13	42.86	12.99	108.71	56.61	20.82	92.66
K	142.84	41.29	323.96	135.86	37.93	332.07	174.88	59.93	281.86
L	3.54	1.28	7.76	3.33	1.19	7.12	4.50	1.69	10.15
Managerial shareholding ratio	1.43	0.38	3.04	1.48	0.39	3.11	1.19	0.38	2.69
Financial shareholding ratio	33.56	34.18	15.51	33.75	34.07	15.54	32.70	34.54	15.40
Foreign shareholding ratio	6.87	2.17	10.11	7.32	2.28	10.61	4.77	1.89	6.99
Top 5 shareholders ratio	33.48	27.89	14.22	33.43	27.74	14.14	33.71	29.44	14.60

Notes: 1. The sample period is 1998-2001.

2. The unit of Y and K is billion yen on the basis of year 1990. The unit of the ratios is percentage.

Table 2. **Descriptive statistics (annual)**

	Mean				Standard deviation			
Year	1998	1999	2000	2001	1998	1999	2000	2001
Y	45.04	45.40	47.15	43.67	102.52	103.59	110.41	108.04
K	144.97	142.15	142.42	141.83	335.02	323.91	319.33	318.10
L	3.80	3.55	3.47	3.33	7.99	7.70	7.74	7.62
Managerial shareholding ratio	1.46	1.49	1.42	1.35	3.01	3.29	3.10	2.75
Financial shareholding ratio	35.49	33.00	32.91	32.85	15.88	14.83	15.42	15.78
Foreign shareholding ratio	6.16	7.13	7.13	7.05	8.77	10.20	10.37	10.94
Top 5 shareholders ratio	33.09	33.03	33.56	34.23	13.93	14.03	14.13	14.78

Notes: 1. The sample period is 1998-2001.

2. The unit of Y and K is billion yen on the basis of year 1990. The unit of ratios is percentage.

Table 3. Estimation results by equation (3)

	Cross-sectional Estimation				Panel Data Est.(Random Effects)
Year	1998	1999	2000	2001	1998-2001
ln K	0.440**	0.428**	0.442**	0.443**	0.471**
	(0.019)	(0.019)	(0.019)	(0.021)	(0.015)
ln L	0.593**	0.622**	0.611**	0.611**	0.558**
	(0.022)	(0.021)	(0.022)	(0.024)	(0.017)
Constant	0.821**	0.901**	0.890**	0.825**	0.753**
	(0.067)	(0.066)	(0.069)	(0.077)	(0.056)
F-statistics[1]	5692.5**	5980.1**	5277.5**	4247.2**	12657.9**
Adj. R-squared	0.950	0.952	0.946	0.934	0.945

Notes: 1. Wald chi-squared statistic is reported in the random effects model.
2. Standard deviations are reported in parentheses.
3. ** denotes statistical significance at 1% level.

Table 4. Distribution of the estimated ln *A*

Year	1998	1999	2000	2001
Standard deviation	0.299	0.294	0.313	0.350
Max	2.203	1.827	1.651	1.746
Min	-1.037	-1.577	-2.075	-1.887
25th percentile	-0.153	-0.159	-0.153	-0.182
Median	-0.012	-0.013	-0.011	-0.004
75th percentile	0.148	0.138	0.152	0.176

Notes: ln *A* is estimated in the cross-sectional models.

Table 5. **Estimation results by equation (5)**

Year	1998	1999	2000	2001
Managerial ownership	0.0036	-0.0007	0.0003	-0.0072
	(0.004)	(0.004)	(0.004)	(0.004)
Financial shareholding	0.0026**	0.0030**	0.0035**	0.0029*
	(0.001)	(0.001)	(0.001)	(0.001)
Foreign shareholding	0.0055**	0.0040**	0.0043**	0.0037**
	(0.001)	(0.001)	(0.001)	(0.001)
Top 5 shareholding	0.0042**	0.0042**	0.0042**	0.0037**
	(0.001)	(0.001)	(0.001)	(0.001)
Constant	-0.160	-0.204	-0.677	-0.676
	(0.269)	(0.265)	(0.284)	(0.317)
F-statistics	6.12**	5.91**	5.46**	7.08**
Adj. R-squared	0.239	0.232	0.215	0.214

Note: 1. The estimated coefficients for industrial dummies are not reported.
2. Standard deviations are reported in parentheses.
3. ** and * denote statistical significance at 1% and 5% levels, respectively.