“The Efficiency and Productivity of Life Insurance Industry in Japan”

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1. Introduction

The Japanese financial system has performed well for a long time and the financial institutions have rarely experienced destabilization or bankruptcy until mid 1990s. The system was often referred to as “Bank-Centered Economy” (Kaplan and Minton; 1994) and was supported by heavy government regulations, which protected the Japanese banking sector from competition from outside the industry. However, Weinstein and Yafeh (1998) point out that keiretsu firm had a higher cost of funds at the same time. In sum, this government regulation policy caused the stability of financial system but caused inefficiency of Japanese financial systems. Japanese banking sector gradually began to be deregulated after late 1970s. Weinstein and Yafeh (1998) find that bank’s bargaining power on keiretsu firms likely has declined as the financial system has become more deregulated.

Japanese life insurance industry has also been heavily regulated. As of 2007, only 38 life insurance companies conduct their business in Japan. According to Cummins, Tennyson and Weiss (1999), more than 300 insurance companies are conducting their business in the United States. Also, Fecher, Kessler, Perelman and Prestieau (1993) say that 243 life insurance companies conduct their business in France. Cummins, Terchetti and Weiss (1996) report the fact that there are more than 200 life insurance companies in Italy. Therefore, there is a possibility that the life insurance industry in Japan has suffered from inefficiency because of its oligopoly structure. Policy makers also recognize this inherent problem in Japanese life insurance industry, and the critical shift in policy toward deregulation started around mid 1990s.

In general, the deregulation was aimed at improving the availability of services provided by financial institutions and the operational efficiency of such institutions; these changes were expected to be effected by introducing competition. There is no doubt that we enjoy the fruits of deregulation, such as lower costs and availability of a wide variety of products, even in the Japanese life insurance industry.

However, Cummins and Santomero (1999) point out that the deregulation could deteriorate the efficiency and productivity of financial institutions. In fact, Japanese life insurance companies have started developing a variety of products beyond their management ability. That is, Japanese life insurance companies have failed to pay insurance benefit that should actually have been paid to policyholders and it becomes serious issue in present-day Japan. Therefore, it
apparently seems that the deregulation is confusing Japanese life insurance industry and could deteriorate its efficiency and productivity in this surrounding. In other words, while deregulation, in general, was expected to enhance the efficiency of financial institutions, its effect is actually unclear. Moreover, the results of studies conducted on this subject could vary depending on the countries and time periods. Hence, we need to clarify what happened to the efficiency and productivity of life insurance industry in Japan after mid 1990s.

Fortunately, Japanese life insurance companies are supposed to use almost the same production techniques relatively to other countries’ life insurance companies, though only 38 companies are conducting their business in Japan. In fact, Fukuyama (1997), examining the efficiency and productivity in Japanese life insurance industry during 1988-1991, confirms that mutual and stock companies possess identical technologies despite differences in the incentives of managers and in legal form. To put it another way, Japanese life insurance industry is in the best condition to examine the efficiency and productivity changes concerning the critical policy scheme change.

Fukuyama (1997) has already examined the efficiency and productivity in Japanese life insurance industry and concludes that efficiency and productivity performance differ from time to time across the two ownership types under different economic conditions. Therefore, there was not clear efficiency and productivity difference between mutual insurance companies and stock companies in former years in Japan. However, Fukuyama uses the data period (1988-1991) and it is before the critical deregulation in mid 1990s. That is to say, this scheme changes could change the structure of life insurance industry in Japan and the efficiency and productivity might dramatically be improved after the deregulation.

In this paper, we find that the efficiency of life insurance companies in Japan have not changed during sample period but that productivity of insurance companies in Japan increased during sample period. It should be noted that productivity of stock companies dramatically increased during the sample period, while productivity of mutual companies deceased during the sample period.

The remainder of this paper is divided into five sections. Section 2 introduces the aspects of the mid 1990’s deregulation about Japanese life insurance industry. Section 3 explains the data and technical tools employed to measure the efficiency and productivity in Japan’s life insurance industry. Section 4 examines the empirical evidence concerning the efficiency and productivity in the life insurance industry. Section 5 provides the conclusions.

2. Description of Japanese life insurance industry after 1990s

Japanese life insurance industry can be characterized as by far the largest amount of life
insurance contracts in the world. For example, Japanese life insurance industry has 2000 trillion yen of life insurance contracts as of 2004, while the second largest U.S. life insurance industry has 1000 trillion yen (dollar-yen conversion rates as of the end of 1994) in 1994. There were 44 insurance companies at the end of 20 century, but it started with only 20 companies immediately after World War II in Japan. The concern was that the operation of life insurance companies became inefficient because of oligopoly. Therefore, the first drastic changes were introduced in life insurance business law in last 56 years. The law, which was put into effect on April 1, 1996, has three elements, i.e. the promotion of deregulation and liberalization, the maintenance of sound management and the carrying-out of fair business operations. The new law has achieved its primary object by allowing life and non-life insurance companies to enter each other’s sector through subsidiaries. In August, 1996, six affiliates of life insurance companies and 11 subsidiaries of non-life insurance companies were established and commenced operations from October on a national wide basis.

In addition, a broker system has been for the first time introduced to both life and non-life industries where examination and training systems were initiated by life and non-life associations for the qualification of brokers. In December 1996, the Japan-U.S. insurance talks, which started in 1993, finally reached the conclusion following lengthy negotiations centering on mutual entry into the third sector. By this agreement, non-life subsidiaries were permitted to sell personal accident insurance effective January 1, 1997.

Recently, the ban on banks’ insurance sales is expected to be completely lifted toward the end of 2007 December. Insurance sales at banks made by foreign-owned have been at brisk and, on the other hand, domestic life insurance companies are making fresh efforts for insurance sales at banks. In addition, because of the nonpayment of claims and payments made in error, life insurance companies’ trust was eroded and the Financial Service Agency announced correct claims payment system and examination of claims nonpayment problems on October 28, 2005. With regard to insurance measures were implemented with users’ priority coming first.

In sum, the amount of life insurance contract fairly large relatively to other developed countries but less than 40 life insurance companies are operating at the market. The policy scheme in Japanese life insurance industry has changed from pre-authorization to ex post facto around mid 1990s. As a result, 13 companies entered into the market and the market is assumed to become more competitive, efficient and productive than used to be. At the same time, however, insurance companies have started dealing with a broad range of insurance goods with a variety of channels such as banks’ counter. These changes make inherently difficult life insurance business more difficult and result in

1 Mizushima (2002) point out that policy target in life insurance industry had mainly given the priority to stability of financial system but to efficiency.

2 The first insurance business law in Japan became effective in 1900, was changed in 1940 and full-fledged revised in 1996.
the intervention of Financial Services Agency regarding nonpayment of claims problems. That is, the
effect of policy scheme change after mid 1990s on the efficiency and productivity of Japanese life
insurance companies defies easy description. Therefore, theoretical and empirical analysis will be
needed.

![Herfindahl index for Japanese life insurance industry](image1)

**Figure 1.** Herfindahl index

![Number of life insurance companies in Japan](image2)

**Figure 2.** Number of life insurance companies in Japan

### 3. Data and Methodology

#### 3.1 Outputs and Inputs

Cummins, Tennyson and Weiss (1999), which examine the impact of M&A on the efficiency of life insurance companies in the United States, use incurred benefits plus additions to reserve as output variables for the five major lines of business offered by life insurers – individual life
insurance, individual annuities, group life insurance, group annuities, and accidents and health insurance. Cummins and Zi (1998) also use incurred benefits plus addition to reserves as output variables for the five major lines of business offered by life insurers. Incurred benefits are proxy for the risk bearing/risk pooling services and addition to reserves is the proxy for the intermediation services.

Cummins, Tennyson and Weiss (1999) and Cummins and Zi (1998) use home office labor, agent labor, business services (including physical capital), and financial capital as output variables. Therefore, there seems to be a prevailing view that incurred benefits plus additions to reserves for major lines of business will be appropriate as outputs and home office labor, agent labor business services and financial capital for inputs in examining the efficiency and productivity analysis with using the U.S. data.

Outside the United States, there are several studies on the efficiency and productivity of life insurance industry. For instance, Cummins, Rubio-Misas and Zi (2004) use additions to reserves plus incurred benefits to examine the effect of different organizational structures on efficiency in Spain. Cummins, Turchetti and Weiss (1996) also use change in reserves plus incurred benefits to examine the productivity and technical efficiency. Hardwick, Adams and Zou(2004) use additions to reserves plus incurred benefits to examine the effect of governance structure on the efficiency of life insurance industry in the United Kingdom. Ennsfellner, Lewis and Anderson (2004) studying Austrian life insurance industry also try to define output and inputs of insurance companies in accordance with Cummin, Weiss and Zi (1999), Cummins, Weiss and Zi (1993).

It seems to be approaching to agreement about input and output variables in life insurance industry. However, Mahlberg and Url (2003) examine Austrian insurance industry and classify into three lines of business and this classification, such as health insurance, life insurance and property-liability insurance and this classification is different from that of the U.S.\(^3\). Cummins, Rubio-Misas and Zi (2004) and Hardwick, Adams and Zou (2004), examining Italian and U.K. life insurance industry, do not divide labor into home office labor and agent labor\(^4\). Even though basic concept of inputs and outputs is approaching to agreement, there are slight differences about inputs and outputs across the countries. That is, researchers consider different characteristics across the countries to reflect their distinctions or they merely cannot get the disclosed data because of the lack of disclosure system. Anyway, the recent study of life insurance industry literature uses almost the same output variables and input variables even from the international perspectives but it is not perfect consistency regarding input and output

\(^3\) Fecher, Kessler Perelman and Pestieau (1993) examine French insurance industry but they use premiums as output as Grace and Timme(1992) and Gardner and Grace(1993). Recent studies do not use premiums as output variables.

\(^4\) The labor information of life insurance industry might not be disclosed in Italy.
data.

Even though the structure of life insurance industry in Japan is more similar than the other countries, it is still criticized as some of life insurance companies in are conducting their business only through internet services and then it is difficult to examine the productivity and efficiency of life insurance industry in Japan. We response to this kind of criticizes by excluding the life insurance companies conducting mainly their business through internet but using insurance sales. By making this modification, we can examine the productivity and efficiency of life insurance industry in more preferable environment.

To summarize the points, they consider labor, business services and equity capital as inputs of life insurance business and incurred benefits plus additions to reserves for major lines of business as output in previous studies. We basically follow the recent literature in defining inputs, labor, business services (including materials and physical capital), and equity capital to make the international comparison easier. We use labor, business services and financial capital as input and use number of contracts for individual and group insurance as outputs. We make some modification about inputs and outputs by considering the level of disclosure in Japan. In the concrete, we proxy business services by average of movable during period. We also put the value on following the concept that Cummins, Tennyson and Weiss (1999) and Cummins and Zi (1998) divide life insurance business into major lines of business. In Japan, we divide life insurance business into individual and group insurance.

3.2 Methodology

3.2.1 Data Envelopment Analysis (DEA)

Berger and Humphrey (1997) survey previous studies on the efficiency of financial institutions and indicate that previous studies employ at least five different efficiency techniques. At present, there is no agreement on a preferred frontier model; however, Berger and Humphrey suggest that most researchers employ data envelopment analysis (DEA) and stochastic frontier analysis (SFA).

The DEA, developed by Charnes, Cooper, and Rhodes (1978), is the most frequently used method. It measures the efficient frontier based on the best practice firms and calculates the other firms’ relative efficiency value that ranges from 0 to 1. This calculation is done by using

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5 Examples of nonparametric approaches are data envelopment analysis (DEA) and free disposal hull (FDH), while those of parametric frontiers are the stochastic frontier analysis (SFA), the distribution-free approach (DFA), and the thick frontier approach (TFA).

6 Overall, nonparametric techniques were employed in 69 cases, and parametric approaches, in 60 cases.
the best practice firms as a benchmark. Intuitively, the method involves searching for a convex combination of firms in an industry that is dominated by a given firm. This method can also be used to estimate production, cost, revenue, and profit frontiers and provides a particularly convenient means to categorize efficiency as purely technical, scale, or allocative. It is nonparametric, and unlike the parametric approach, neither the functional form nor the error term assumptions are required; in addition, both multiple inputs and outputs can be simultaneously examined. The rationale behind the use of this approach is that a firm’s outputs could be produced more cheaply (i.e., with better cost efficiency) by adhering to the “best practice” in the industry (Cummins and Weiss; 2001).

Consider a set of \( n \) DMUs (Decision Making Unit), and let input data be \( x_i (i = 1, \cdots, m) \), output data be \( y_r (r = 1, \cdots, s) \), and \( v_i \) and \( u_r \) be input and output weights, respectively. The efficiency of the \( o \)-th DMU is measured by solving the following maximization problem, where the \( o \)-th DMU is allowed to choose the combination of weights that maximizes its objective function, given by a ratio of weighted inputs and outputs.

\[
\begin{align*}
\text{max} & \quad \frac{u_1 y_{io} + u_2 y_{2o} + \cdots + u_s y_{so}}{v_1 x_{1o} + v_2 x_{2o} + \cdots + v_m x_{mo}} \\
\text{s.t.} & \quad \frac{u_1 y_{ij} + u_2 y_{2j} + \cdots + u_s y_{sj}}{v_1 x_{1j} + v_2 x_{2j} + \cdots + v_m x_{mj}} \leq 1 \quad (j = 1, \cdots, n) \\
& \quad v_1, v_2, \cdots, v_m \geq 0 \\
& \quad u_1, u_2, \cdots, u_s \geq 0
\end{align*}
\]

The following reduced form of the above maximization problem is employed for the computation of the DEA efficiency of each DMU.

\[
\begin{align*}
\min \theta \\
\text{s.t.} & \quad \theta x_o - X \lambda \geq 0 \\
& \quad y_o - Y \lambda \leq 0 \\
& \quad \lambda \geq 0
\end{align*}
\]

For the \( o \)-th DMU, these are represented by the column vectors \( x_o \) and \( y_o \), respectively. The \( m \times n \) input matrix \( X \) and the \( s \times n \) output matrix \( Y \) represent the data for all \( n \) DMUs. Here, \( \theta \) is a scalar and \( \lambda \) is an \( n \times 1 \) vector of constants. The optimal \( \theta \) is an input radical measure of technical efficiency for the \( o \)-th DMU. \( \theta \) takes a value between 0 and 1, with 1 indicating a point on the frontier, and hence, a technically efficient DMU.
The solution of this linear programming, i.e., $\theta$, indicates the “input-oriented” efficiency for each DMU. Input-oriented efficiency measurement captures the extent to which inputs are efficiently used for a given output level. We focus on this input-oriented DEA efficiency in the following analysis. Note that this model assumes constant returns to scale (CRS) for the operational activity of each DMU. The CRS-DEA model discussed above can be readily extended to the variable returns to scale (VRS)-DEA model and the non-increasing returns to scale (NIRS)-DEA model. The $e'\lambda = 1$ restriction is added to the input-oriented VRS-DEA model in (2). $e$ is an $n \times 1$ vector of ones. Similarly, the $e'\lambda \leq 1$ restriction is added to the input-oriented NIRS DEA model in (2).

3.2.2 Malmquist Index

Malmquist index measures the change in efficiency and productivity during two periods. The productivity change can be divided into efficiency change and frontier shift. The distance which is equivalent to the distance from $x_t$ to $y_t$ is defined as Shephard distance. It make possible that the distance from all points within production possibility set can be defined.

We define $t = 1, \ldots, T$ $x_t \in \mathbb{R}^N_y$, $y_t \in \mathbb{R}^M_x$ and production possibility set $S_t$ is assumed as the following closed set.

$$S_t = \{(x_t, y_t): x_t \text{ can produce } y_t\} \quad (1)$$

Here, frontier $B_t$ is described as follows.

$$B_t = (x_t, y_t)$$

$$(x_t, y_t) \in S_t, \quad (\lambda x_t, y_t) \notin S_t \quad \forall 0 < \lambda < 1, \quad (x_t, \sigma y_t) \notin S_t \quad \forall \sigma > 1 \quad (2)$$

Based on the condition above, distance function is defined as follows.

$$D^\alpha(x_y, y_y) = \sup\{(\sigma: (x_y/\sigma, y_y) \in S_t\} \quad (3)$$

In the range that the value of distance is more than one, the more value become smaller and the more efficient the value is. The productivity should be measured by the same technology and we assume the frontier will be different at the different point. The change in productivity based on point t is described as follows, when we define t and t+1 point.
By the same token, the productivity change based on t+1 point is described as follow.

$$M_{t+1}(x_t, y_t, x_{t+1}, y_{t+1}) = \left[ \frac{D'(x_t, y_t)}{D'(x_{t+1}, y_{t+1})} \right]$$  

(5)

We take geometric mean of (4) and (5), and define Malmquist index because (4) disagree with (5)

$$M_{t,t+1}(x_t, y_t, x_{t+1}, y_{t+1}) = \left[ \frac{D'(x_t, y_t)}{D'(x_{t+1}, y_{t+1})} \cdot \frac{D'^{t+1}(x_t, y_t)}{D'^{t+1}(x_{t+1}, y_{t+1})} \right]^{\frac{1}{2}}$$  

(6)

From (6), the change in productivity can be decomposed into the change in efficiency and frontier shift.

$$M_{t,t+1}(x_t, y_t, x_{t+1}, y_{t+1}) = EFFCH \cdot TECHCH$$  

(7)

$EFFCH$ describes the change of efficiency between two periods and described bellow.

$$EFFCH = \frac{D'(x_t, y_t)}{D'^{t+1}(x_{t+1}, y_{t+1})}$$  

(8)

$TECHCH$ describes the frontier shift between two periods.

$$TECHCH = \left[ \frac{D'^{t+1}(x_{t+1}, y_{t+1})}{D'(x_{t+1}, y_{t+1})} \cdot \frac{D'^{t+1}(x_t, y_t)}{D'(x_t, y_t)} \right]^{\frac{1}{2}}$$  

(9)

In (9), the first component part of right-hand side within case arc is frontier shift based on $t+1$ period, the second component of right-hand side within case arc is frontier shit based on t period. In FGNZ model, we calculate Malmquist index based on the Constant Return to Scale assumption. For decomposition of Malmquist index, we rewrite (7) and use the following equation.
\[ M_{t,t+1}(x_t, y_t, x_{t+1}, y_{t+1}) \]

\[ = \left( \frac{D_C(x_{t+1}, y_{t+1})}{D_C(x_t, y_t)} \right)^{\frac{1}{2}} \cdot \frac{D_C(x_t, y_t)}{D_C^{eff}(x_{t+1}, y_{t+1})} \]

\[ = \left( \frac{D_C(x_{t+1}, y_{t+1})}{D_C(x_t, y_t)} \right)^{\frac{1}{2}} \cdot \frac{D_C(x_t, y_t)}{D_C^{eff}(x_{t+1}, y_{t+1})} \cdot \frac{D_V(x_t, y_t)}{D_V^{eff}(x_{t+1}, y_{t+1})} \cdot \frac{D_V^{eff}(x_{t+1}, y_{t+1})}{D_V(x_t, y_t)} \]

\[ = \left( \frac{D_C(x_{t+1}, y_{t+1})}{D_C(x_t, y_t)} \right)^{\frac{1}{2}} \cdot \frac{D_C(x_t, y_t)}{D_C^{eff}(x_{t+1}, y_{t+1})} \cdot \frac{D_V(x_t, y_t)}{D_V^{eff}(x_{t+1}, y_{t+1})} \cdot \frac{D_V^{eff}(x_{t+1}, y_{t+1})}{D_V(x_t, y_t)} \]

Malmquist index is decomposed into the following equation.

\[ M_{t,t+1}(x_t, y_t, x_{t+1}, y_{t+1}) = \text{TECHCH} \cdot \text{PEFFCH} \cdot \text{SCH} \]  

(10)

In RD Model, Malmquist index is decomposed into the following equation.

\[ M_{t,t+1}(x_t, y_t, x_{t+1}, y_{t+1}) \]

\[ = \left( \frac{D_V^{eff}(x_{t+1}, y_{t+1})}{D_V(x_t, y_t)} \right)^{\frac{1}{2}} \cdot \frac{D_V(x_t, y_t)}{D_V^{eff}(x_{t+1}, y_{t+1})} \cdot \frac{D_V^{eff}(x_{t+1}, y_{t+1})}{D_V(x_t, y_t)} \]

When we compare this equation with (9), there are three components \( \text{TECHCH} \), \( \text{PEFFCH} \), \( \text{SCH} \) but definition of \( \text{TECHCH} \) and \( \text{SCH} \) is different from that of (9). Distant function becomes equivalent with technical efficiency (input oriented) of Farrell and then distant function is solved with DEA. In this study, we use distant function (input oriented) because of the production
activity characteristics of life insurance companies.

4. Result

4.1 DEA efficiency

The efficiency of life insurance companies in Japan is as follows. Efficiency scores are constant through the sample period and this is interpreted as the evidence that the relative efficiency does not change through the sample period. In other words, the structure of life insurance companies is stable in terms of efficiency.

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<tr>
<td>Average</td>
<td>0.843</td>
<td>0.852</td>
<td>0.868</td>
<td>0.843</td>
<td>0.867</td>
<td>0.887</td>
<td>0.849</td>
<td>0.874</td>
<td>0.821</td>
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<tr>
<td>Variance</td>
<td>0.0406</td>
<td>0.0523</td>
<td>0.0423</td>
<td>0.0682</td>
<td>0.0483</td>
<td>0.0391</td>
<td>0.045</td>
<td>0.0344</td>
<td>0.0544</td>
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<tr>
<td>S.D.</td>
<td>0.0203</td>
<td>0.0261</td>
<td>0.0212</td>
<td>0.0341</td>
<td>0.0242</td>
<td>0.0195</td>
<td>0.0225</td>
<td>0.0172</td>
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4.2 Statistical analysis
The results of productivity change analysis are as follows. On average, the productivity of Japanese life insurance companies is increasing through the sample period. Amazingly, the productivity of mutual companies decreases through the sample period while the productivity of stock companies steadily keeps increasing through the sample period. Table shows that the productivity difference between mutual life insurance companies and stock mutual life insurance companies is statistically significant. That is, productivity of mutual forms of organization in Japanese life insurance industry is lower than that of stock companies. The forms of organization seems important to the productivity and this result is consistent with the evidence that Fecher, Kessler, Perelman and Pestieau (1993): French case, Hardwick, Adams and Zou (2004): U.K. case, Cummins, Rubio-Misas and Zi (2004): Spanish case suggest.

In addition, the result suggests that the productivity of life insurance industry in Japan, on average, is improved after the political scheme change. Fukuyama (1997) examined the productivity of life insurance companies in Japan and find that there are not clear productivity differences between mutual forms of organization and stock forms of organization. Though the effect of regulation on the efficiency of Japanese life insurance companies was ambiguous, this result suggests that the deregulation in Japan improve the efficiency of life insurance industry on average. In other words, the original purpose of deregulation in Japanese life insurance companies can be achieved.

Figure 3 Productivity of life insurance companies (Mutual, Stock and All)
Table 1: Productivity Difference

<table>
<thead>
<tr>
<th>Stock Companies</th>
<th>Mutual Companies</th>
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<tr>
<td>56.833</td>
<td>90.643</td>
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<tr>
<td>5.120</td>
<td>0.000</td>
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</table>

5. Conclusion

The Japanese financial system is currently undergoing a period of deregulation. The life insurance sector, which has been heavily regulated like the banking sector, has been moving toward a more open and a less regulated market system. In this study, we have measured the efficiency and productivity of Japanese life insurance companies after the introduction of government deregulation. In order to accomplish this task, we have employed DEA and Malmquist Index to calculate the efficiency and productivity of life insurance companies in Japan over a period of 9 years. We believe that this study would be helpful in discussing the efficiency of the life insurance industry across countries and time periods.

We find that efficiency in the life insurance industry has been constant. The efficiency did not vary across life insurance companies in Japan and the structure of life insurance industry in Japan has not changed after the political paradigm change around 1990s. That is, disperse of efficiency among life insurance companies except the default companies have not changed.

The productivity of life insurance companies in Japan has improved during the sample period, especially the stock forms of life insurance companies has dramatically improved their efficiency. In this regard, our study implies that the government succeeded in accomplishing its purpose. Fukuyama (1997) finds that there is not this kind of clear difference between mutual and stock companies before mid 1990s. Therefore, the political scheme changes affect the productivity of life insurance companies in Japan.

Several studies attempt to clarify the effect of deregulation on the efficiency in the banking industry, but the results are not consistent. In this study, we try to ascertain the change in mean efficiency and productivity before and after the onset of deregulation by studying the data pertaining to Japan’s life insurance industry. The results indicate that the mean efficiency in Japan’s life insurance industry is constant and productivity has improved though there are different effects coming from the different forms of organization.

Finally, although many researchers are trying to delineate the effects of deregulation, it has not been examined in an adequately lucid and direct manner. Therefore, studies that approach deregulation from different perspectives should be accumulated across industries, countries, and time periods. Moreover, it is important to explain the dispersion of insurance efficiency. We will employ a multiple regression analysis to explain the dispersion of efficiency in the Japanese life
insurance industry. Firm size, governance index (outside directors), and profit could be considered as explaining variables. In addition, the relationship between efficiency and the governance index, which is unique to Japanese financial systems such as banks and keiretsu groups, should be clarified in future studies.

References
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Cummins, Weiss and Zi (1999), Management Science, 45, pp.1254-1269.
of Productivity Analysis 4, pp.5–34.


