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on Productivity, Wages, and Corporate Performance

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The Effects of Japanese Employee Stock Ownership Plans on Productivity, Wages, and Corporate Performance[*]

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Abstract

Using data from the Survey of Current Status of Employee Stock Ownership conducted by the Japanese Stock Exchanges Conference (FY 1989 – FY1998) and Tokyo Stock Exchange (FY 1999 – FY 2013), we estimated the influence that employee participation in stock ownership plans had on value added productivity, wages, and corporate performance. In our estimation using firm fixed effects and instrumental variables, we confirmed that on average there were positive effects on productivity, wages, ROA, and Tobin's q. Furthermore, we found that these effects were manifested mainly through increases in the value of ESO shares per person, but did not find a significant relationship between increases in participation rates and ESO share in ownership and productivity. The higher the institutional or overseas investor share in ownership for the firm, the larger the effects of the ESO plan on productivity, suggesting the possibility that employee financial participation and monitoring by shareholders play a complementary role in raising firm performance. These results indicate the importance of understanding ESO plans as a means of bestowing incentives, and a need to reconsider whether the current level at which matching contributions are set by many listed companies – 5-10% – is appropriate.

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1. Introduction: Why are Employee Stock Ownership Plans Important Today?

Reflecting the dissolution of cross-shareholding and the increase in the holding ratio by overseas investors, shareholders have acquired more sway over corporate management than in the past. That the majority of domestic institutional investors have decided to adopt Stewardship Code that was compiled in 2014 will probably accelerate this trend. While the increase in involvement by shareholders will on the one hand strengthen discipline of management, there is also the possibility that it will transform the corporate posture of stressing employment security, which until now had been considered a characteristic of Japanese-style management. Furthermore, it is expected that corporate globalization will make it more difficult in the future to treat domestic employees and overseas employees differently, and in particular to adopt discriminatory policies toward employment guarantees, which could increasingly hinder harmonization of shareholder interests and employee interests.

In the event that the conflicting interests of employees and shareholders were to be manifested, there would be an impact on employee participation in management, which had been premised on the long-term employment that has been seen as a source of competitiveness of Japanese corporations. Against the backdrop of these changes in the environment, in order to maintain the long-term commitment of both labor and management, there will probably be a need for policies that increase employee desire to cooperate with management, and improve the alignment between their interests and those of shareholders. The employee stock ownership (ESO) plan should be considered one method for management to achieve these ends.[1]

The objective of this research project is to examine what kind of effect ESO plans have on productivity, corporate earnings, stock prices, etc., and to identify the mechanisms through which employee stock ownership affects the efficiency. In the event that the ESO plan is acknowledged to have an effect on boosting productivity, a policy to expand usage of this plan

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[1] The abbreviation ESO is used to indicate a broader range of employee stock ownership schemes including ESOPs in the US and employee stock ownership plans in Japan.

as a means to return benefits to employees in sectors where improvements in productivity can be expected will probably be put on the agenda for discussion.

Of course, measures to enhance the alignment of the interests of employees with those of shareholders need not be limited to stock-based programs. There are various collective incentive schemes that aim to share profits or share gains, and bonus payments linked to profits adopted by many Japanese corporations are one type of profit sharing program. However, it has been pointed out that incentives tied to stock holding, through the bestowal of ownership, are helpful in instilling a value and culture that employees are considered to be active partners. In fact, there has been growing interest in the U.S. and Europe in recent years in the ESO plan as a method of encouraging employees to think like a business owner and fomenting a partnership culture. In the U.S., there have been initiatives that seek to disseminate and provide information on ESOPs such as the National Center for Employee Ownership, the Employee Ownership Foundation, and the Beyster Institute (affiliated with the University of California – San Diego), and as of 2013, approximately 6,800 firms had adopted ESOPs with a total of about 14 million participants[2].

In Europe, since the release of the 1991 PEPPER (Promotion of Employee Participation in Profit and Enterprise Results) Report there has been strong interest in employee financial participation measures, and in 2014 the European Parliament adopted a resolution to promote employee financial participation. In France in particular, ESOP participants, as a result of policy support, have increased from 700,000 in 1998 to 3.7 million in 2015 (FAS = French Federation of Employee Shareholder Associations, 2015). As a backdrop to the heightened interest in ESOPs in the U.S. and Europe we can cite the increase in the number of firms that have adopted high performance work systems, centered around a nucleus of team organization and delegation of authority, that had stemmed from research on Japanese-style management in the 1980s, and

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[2] According to a survey by the National Center for Employee Ownership.

https://www.nceo.org/articles/statistical-profile-employee-ownership

the increased interest in ESOPs, which are incentive schemes that complement these management approaches.

On the other hand, interest increased in Japan, centered on the financial sector, after the Ministry of Economy, Trade and Industry released its "Report on Company Stock Holding Schemes" in 2008, but the interest did not go beyond the design and sale of new employee stock ownership schemes developed in the securities and trust banking industries, the so-called Japanese-style ESOP that are responsive to particular client needs, and it is hard to say that these measures have led to the more active utilization of the employee stock ownership system. First, given that the ESO plan adoption ratio for listed firms has reached 95%, it is hard to expect that efforts to increase the utilization ratio even further will be meaningful. However, matching contributions are quite low in the vast majority of firms – only 5% of total contributions, and it is necessary to pay heed to the fact that the ESO plan holding ratio averages only 1 – 2%, which is quite low compared to France's 4% (FAS 2012). Second, given the timeline of the establishment of the employee stock ownership plan as a system, the fact that the Japanese ESO plan was not originally meant to benefit from the incentive effect may have had some influence on the low level of interest. Furthermore, there has been much less research on the productivity effect of ESO plans in Japan than in the U.S. and Europe, so the difficulty of having an evidence-based discussion on whether policy incentives should be provided may also have been a factor.

ESO plans first began to be widely disseminated in Japan from the late 1960s to 1970s, and the main motivation was the formation of a class of stable shareholders. Against a background of growing capital liberalization, the adoption of ESO plans was promoted in tandem with cross-shareholding as a means of avoiding takeovers by foreign capital. Of course, on the surface encouraging a spirit of dedication to one's company and employee asset formation were the aspects that were emphasized, but it was not desirable to increase income risk when wage income and asset formation are dependent on the same source. On the other hand, as for the desire to form a class of stable shareholders, as will be noted later, as management has subsequently sustained ESO plans over these many years, and as more than

90% of listed firms have adopted ESO plans, this aspect of these plans is believed to be the most prized, even though their weight in overall stock holding has declined. As cross-shareholding has declined in recent years, the importance of ESO plans, which can be expected to be long-term shareholders, to corporations should not be underestimated.

On the other hand, even though, as noted below, many academic research studies abroad have taken up the issue of conferring incentives to employees to hold shares in their own companies, it appears that the accumulation of such knowledge has not been sufficiently imparted in Japan. ESO plan systems can change the behavior of participating employees through various pathways. First, adopting the perspective of shareholders encourages employees to engage in behavior that shows concern for corporate value. This diminishes conflicts with shareholders, and makes it easier to coordinate between divisions and functions. It also provides a motive to actively participate in activities to improve productivity. Second, by becoming shareholders, the scope of the relational contract that is formed between the firm and employees is expanded, and one effect that can be expected is a stronger commitment by both employees and management. Business school case studies and other materials frequently promote ESOPs as a complementary practice to create a corporate culture that views employees, management, and shareholders as partners. Third, there is a possibility that employees who have become shareholders will, acting as internal monitors, monitor each other, and via the employees' union, etc., exert influence to discipline management.

This study utilizes the data from the Survey of Current Status of Employee Stock Ownership (SCSESO) conducted over 25 years by Tokyo Stock Exchange, measuring primarily the effects of bestowing incentives in the firms listed on Tokyo Stock Exchange. While most previous studies have conducted comparisons between corporations that have introduced, or have not introduced ESO plans (used here as a generic term for the various systems that have been introduced domestically and overseas), or between the pre- and post-introduction firm performance (what economics refers to as the extensive margin effect), this study will assess the influence of the scope and intensity of the employees' ESO participation in firms that have already introduced such plans (the intensive margin effect). By attempting to measure the

degree of participation on three axes – the scope of participation (participation rate), stake (value of ESO shares per person), and holding ratio (percentage of total shares issued held by the ESOP), it is possible to capture the implications of the pathways. One could say that using the detailed information on ESO plans' attributes on participation from the SCSESO makes such an approach possible for the first time.

More specifically, we conducted analysis on the following three issues. First, we evaluated what kind of influence corporate characteristics had on the matching contributions that have substantially impacted employee participation in ESOPs, and to what degree the participatory behavior of employees is influenced. This preliminary analysis is required before we can assess the influence of ESO plans on productivity.

Next, we estimated the influence that participation in ESO plans had on average on productivity, wages, profitability, and stock price. We captured the influence through the three ESO plan participation indices that use different measures – value of ESO shares per person, participation rate, and ESO plan holding ratio. In particular, as will be noted later, since ESO plans are expected to have both positive and negative effects that offset each other, the use of multiple measures makes it possible to isolate the two effects.

Finally, we attempted to measure how the influence of ESO plan participation conditions on corporate performance indices varied due to pressure from the stock market (mainly determined by holding ratios by ownership structure/investors) and corporate characteristics, and the heterogeneity of effects. For example, since the increase in institutional investors and overseas investors who wield influence over management via resolutions at general shareholders' meetings (voice) and trading in the market (exit) influences bargaining power when labor and management seek to divide the economic value that arises from productivity gains, it also influences employee desire to contribute to the company, and the relational contracts that are formed between labor and management. Furthermore, on the one hand, in young firms and small firms, there is a possibility that the incentive effect will be more strongly manifested in proportion to more effective mutual monitoring of employees, but on the other hand, in old firms and large firms, the management may have a stronger commitment to

employees. These differences are expected to give rise to multiplicity in the effects of ESO plans.

The contributions of this study, which relies on the analysis described above, can be summarized in the three points noted below. First, using panel data from a representative sample of large corporations (capturing time-series changes from measurements at multiple points in time), we confirmed that participation in ESO plans had on average a positive effect on productivity. Most previous research, including studies in the U.S. and Europe, used cross-sectional data (using measurements from only a single point in time), or small-scale samples. Thus, most of these studies were plagued by problems such as endogeneity bias and sectional bias. We believe that by using detailed time-series data from the Survey of Current Status of Employee Stock Ownership, the analysis in our study has less bias and more accurately captures causal relationships.

Second, we were able to obtain results that offer a wealth of important suggestions with regard to the paths through which ESO plans influence productivity. Namely, the effects on productivity are mainly exercised through increases in the value of ESO shares per person, and the correlation to rises in participation rates and ESO plan holding ratios is tenuous. We were able to obtain these results by not focusing on the presence/absence of the system (extensive margin), as most previous studies have, but rather by focusing on the degree of participation (intensive margin).

Third, we were able to conduct a novel analysis of the effects of ESO plans on ownership structure (holding ratios by investor type) and corporate traits, etc. Surprisingly, the higher a corporation's institutional investor and overseas investor holding ratios, the greater the influence of ESO plans on productivity. This suggests the possibility that employee commitment to participation and monitoring by shareholders play a complementary role in improving discipline of management.

2. Previous Research

There is not much evidence of the causal impact of ESO plans on productivity. The results of research centering on the U.S. and Europe largely indicate a positive influence on corporate performance, but mixed in are some results that indicate a negative influence. Studies that discovered a positive correlation include Estrin, Grout, and Wadhawani (1987), Quarrey and Rosen (1987), Jones and Kato (1993, 1995), Park and Song (1995), and Blair, Kruse, and Blasi (2000). On the other hand, studies that discovered a negative correlation include Livingston and Henry (1980), Heinfelt and Curcio (1997), Faleye, Mehrotra and Morck (2006). Moreover, most of these studies used cross-sectional data to compare corporations that had introduced, or had not introduced ESO plans, and since the adoption of ESO plans was endogenous, it is very likely that endogeneity bias has occurred. For example, if it is the case that the higher the growth opportunities of a corporation, the stronger the tendency to introduce ESO plans, then there is a high likelihood of obtaining a result indicating that corporations that have introduced the ESO plans have higher productivity. Furthermore, quite a few analyses have used samples lacking in representativeness, and in such cases this means that they are measuring the effects of ESO plans related to a specific sample source or specific corporate characteristic, so there is a need to correct the selection bias. Only a few studies – including Jones and Kato (1995), which relied on Japanese data, and Kim and Ouimet (2014) – have used panel data from a representative sample, and then took steps to eliminate endogeneity bias.

Even as the adoption of an ESO plan can involve tradeoffs between positive effects and negative effects, it is possible that either the positive or negative effects could dominate the other depending on differences in the proportion of the total shares owned by the ESO plan. In fact, Guedri and Hollandts (2008) have put forth the hypothesis that the relationship between the employee holding ratio and corporate performance can be depicted as an inverted U curve, and using cross-section data from 230 of the 250 representative firms that comprise France's stock index, they have obtained results that are consistent with their hypothesis. Kim and Ouimet (2012) used panel data for U.S. firms to show that the ESOP adoption effect had on average a significantly positive influence on wages and corporate value when the ESO share in

stock holding was below 5%, but the positive effects were offset by the negative effects when the ESO share was above 5%, and the influence on wages and corporate value turned neutral. When the influence turns either positive or negative in association with the ESO share in stock holding, it is not sufficient simply to evaluate the presence or absence of ESO plans (extensive margin). Rather, it is necessary to measure the influence in correlation to the targets of the plans, participants, actual value of ESO shares, shares, and other participating conditions (intensive margin), but up to this point in time there have been few detailed research studies on the latter.

The only conceivable consensus that has emerged is that employee stock holding has on average a positive effect on the sense of belonging, desire to work, degree of satisfaction, cooperation, and information sharing (Long 1978, Pierce, Rubenfeld and Morgan 1991, Klein 1987, Mitchell, Lewin and Lawler 1990, Frohlich, Godard, Oppenheimer and Starker 1998).

Furthermore, many studies have implied that ESO plans should not be used as a policy to form a class of stable shareholders. For example, Litchtenberg and Pushner (1994), Hiraki, Inoue, Ito, Kuroki, and Masuda (2003), and Miyajima and Kuroki (2007) show that for Japanese corporations, there is a negative correlation between the scale of stable shareholders and corporate value. Moreover, Gordon and Pound (1990), Dillon and Ramirez (1994), and other studies have found, using U.S. data, that there is a negative correlation between excessive adoption of ESO plans and corporate value.

3. Theoretical Background

In this section, we will lay out the theoretical background that is indispensable to an interpretation of our empirical analysis. As introduced by the above-mentioned Guedri and Hollandts (2008), employee financial participation can have both positive and negative effects on productivity. We would like to summarize the various pathways through which these effects are exerted.

The positive effects cited first are that the offering of company-wide incentives encourages decision-making that seeks to enhance corporate value, and participation in activities that boost productivity, and facilitates wider cooperation and the alignment of goals between divisions

(the alignment effect, team incentive effect). Such effects make it optimal for the firms to have more information sharing and delegation of authority. Second, when employees become shareholders, the scope of the sustainable relational contract between the firm and employees expands, and employee commitment and dedication increase, leading to fewer job-leavers and absences. Decreases in the job-leaving rate increases returns from training (human capital investment), and promotes the accumulation of firm-specific human capital.

Finally, previous research has often pointed to the peer monitoring effect that arises from employee financial participation. Normally when team incentives are provided freeriding can easily occur, but if peer monitoring works and peer pressure imposes discipline, productivity may also increase (Knes and Simester 2001). This mechanism works when a team is organized at a size that makes peer monitoring possible, and when there are expectations of a long-term relationship with colleagues (Che and Yoo 2001).

On the other hand, there are two explanations for the negative effect. First, when employees become shareholders, their voice increases, and the relational contract between labor and management is strengthened, the tendency for management to make decisions that show more concern for the interests of employees is heightened. This gives rise to excessive employment security, the maintenance of high compensation for employees, and the aversion to risk- in selecting investment opportunities, and fosters the tendency to delay workforce reductions or business and organizational restructuring. The second explanation has to do with the entrenchment effect. An ESOP means that employees will join a class of investors that supports management as stable shareholders, so pressure from the stock market will diminish, giving rise to the possibility that discipline will no longer be exerted on management.

Of the above effects, there is a strong likelihood that the positive effect increases in proportion to the amount of holdings per person and the participation ratio, and the negative effect strengthens in proportion to the percentage of issued shares held by the ESOP. Therefore, using multiple indices makes it possible to disaggregate the positive and negative effects.

4. Data

The ESOP data that we used is from the Survey of Current Status of Employee Stock Ownership (SCSESO) over FY1989-2013 conducted initially by National Conference of Stock Exchanges (FY1989-1998) and later by Tokyo Stock Exchange (FY1999-2013). For FY1989 – 1998, the survey targeted all listed firms, but we are given access to only those firms listed on Tokyo Stock Exchange (TSE). Thus, the dataset contains firms on the First and Second Sections of the TSE, and TSE Mothers over FY1989-2013.

This survey relies on the data provided by major securities firms and we were given full access to roughly 80 percent of all firms with ESO plans that are listed on Tokyo Stock Exchange over 1989-2013. [3]

It is estimated that this data encompasses approximately 80% of firms with ESO plans listed on Tokyo Stock Exchange.[4] Since well over 90 percent of firms listed on Tokyo Stock Exchange have ESO plans, our data cover more than 75 percent of all firms listed on Tokyo Stock Exchange.

The statistics obtained from the surveys of the conditions of ESO plans are provided in **Table 1**. We conducted our analysis by merging this data with Nikkei NEEDS corporate financial data, stock data, corporate governance evaluation system, and the corporate financial databank of the Development Bank of Japan. After excluding firms for whom important data is missing, and holding companies, we constructed a sample of 1,613 firms (20,207 observations).

First, we will explain how we formulated the major variables based on the information from the surveys of conditions of ESOPs that we used in our analysis. The surveys on ESO plans include data on the number of participants in ESO plans, number of employees, number of shares held by ESO plan, total number of shares issued, total market value of shares held by

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[3] We were allowed access only to data provided by four securities companies – Daiwa Securities, Nomura Securities, Mizuho Securities, and Mitsubishi UFJ Morgan Stanley—which agreed that the objectives of our research matched the survey objectives of Tokyo Stock Exchange sharing the view that it would contribute to the development of securities markets.

[4] This is based on estimates by Tokyo Stock Exchange and securities industry professionals that about 20% of firms have management contracts with other securities firms, trust banks, etc.

Table 1, Employee Stock Ownership Data (as of March 31)

Fiscal Year	Number of firms	Market Cap (¥mil.)	Employee Stock Ownership（¥mil.）	Total Number of Employees	Total Number of Participants	ESO Share （%）	Ave. Stake Per Participant (¥)	Participation Rate
1989	1610	491,454,697	3,824,013	4,896,322	2,346,846	0.85%	1,629,426	43.7%
1990	1632	443,699,290	3,514,292	5,090,493	2,435,514	0.86%	1,442,936	43.9%
1991	1641	320,567,013	2,716,921	5,171,224	2,458,285	0.91%	1,105,210	43.6%
1992	1654	326,377,202	3,024,259	5,296,234	2,522,847	1.02%	1,198,748	43.7%
1993	1674	363,299,411	3,469,752	5,389,008	2,561,426	1.05%	1,354,618	43.5%
1994	1691	309,652,186	3,033,109	5,323,106	2,545,971	1.07%	1,191,337	43.6%
1995	1723	386,096,273	3,863,786	5,232,264	2,507,113	1.14%	1,541,130	43.9%
1996	1774	335,216,817	3,387,173	5,148,180	2,535,186	1.19%	1,336,065	45.2%
1997	1808	313,980,311	3,150,328	5,085,402	2,516,884	1.31%	1,251,678	45.0%
1998	1848	339,553,792	3,442,277	5,007,586	2,473,051	1.46%	1,391,915	45.1%
1999	1564	265,692,276	2,364,133	2,876,039	1,454,146	2.01%	1,625,788	52.1%
2000	1493	199,197,878	2,020,294	2,617,124	1,437,322	2.08%	1,405,596	54.4%
2001	1455	180,913,648	1,874,447	2,602,741	1,417,856	2.04%	1,322,029	53.6%
2002	1465	140,413,443	1,529,042	2,613,817	1,421,096	2.06%	1,075,960	56.5%
2003	1317	227,569,713	2,306,998	2,669,641	1,382,003	1.81%	1,669,315	60.3%
2004	1303	230,871,935	2,331,182	2,642,577	1,349,771	1.66%	1,727,095	69.7%
2005	1409	363,177,937	3,250,850	2,810,041	1,421,425	1.56%	2,287,036	56.1%
2006	1458	370,911,690	3,130,384	2,831,812	1,461,577	1.50%	2,141,785	67.4%
2007	1412	276,104,444	2,328,961	3,176,989	1,550,285	1.47%	1,502,280	64.4%
2008	1655	191,862,025	1,795,294	3,290,138	1,729,167	1.62%	1,038,242	84.0%
2009	1688	259,740,185	2,394,546	3,690,504	1,770,472	1.71%	1,352,490	64.2%
2010	1670	237,627,820	2,361,294	3,977,930	1,797,208	1.83%	1,313,868	58.6%
2011	1620	232,806,996	2,572,036	3,919,667	1,840,247	1.83%	1,397,658	56.3%
2012	1805	298,901,044	3,225,542	4,388,523	1,903,999	1.91%	1,694,088	51.6%
2013	2536	364,665,669	3,589,945	4,910,300	2,002,191	2.09%	1,793,008	48.0%

ESO plan, total market capitalization, matching contributions, etc. for each firm as of the end of March. Although collection of data on matching contributions began with FY1994, this data was not available for FY1998.

The number of employees is the number of employees of the firm that implements the ESO plan, and does not include the number of employees at subsidiaries. But since ESO Plans frequently allow employees of subsidiaries and sub-subsidiaries to participate, the actual number of workers who are eligible for the plan frequently exceeds the figure for the number of employees. Unfortunately, the surveys did not have an item for total number of workers who are eligible for participating in the plan, so while the participation rate should have been calculated by dividing the number of participants by the total number of those with eligible status, we instead defined the participation rate as the number of participants divided by the number of employees at the firm implementing the plan. Therefore, we obtained overstated participation rates, and we need to bear in mind that the larger the gap between the size of the standalone firm and its consolidated group, the more inflated the participation rate. To mitigate the potential bias caused by this gap, we include the ratio of the size of the standalone firm to that of its consolidated group as control where the size is measured by the number of employees.

As indices for measuring the degree of employee participation in the ESO plan, we also used the value of shares held per employee, and the value of ESO shares per participant. There is the following relationship among the three variables.

$$\text{Value of ESO shares per employee (¥)} = \frac{\text{Value of shares helde by ESO plan}}{\text{Number of employees}}$$

$$= \frac{\text{Value of shares helde by ESO plan}}{\text{Number of participants}} \times \frac{\text{Number of participants}}{\text{Number of employees}}$$

$$= \text{Value of ESO shares per participant (¥)} \times \text{Participation rate}$$

Moreover, the ESO share is calculated as follows.

$$\text{ESO share} = \frac{\text{Number of shares held by ESO plan}}{\text{Total number of shares issued}}$$

Figure 1 shows the time-series changes in these various indices. Since there was a considerable level of turnover during the observation period (*i.e.* the dataset is not so-called balanced panel data), **Figure 2** provides a graph of only those firms without missing values during the observation period. There are a large number of firms that were included in **Figure 1** but not **Figure 2**, including newly listed firms, firms that experienced mergers, dissolution, or bankruptcy, and firms that established ESOPs after 1989, etc. However, if you compare the two figures, there is almost no qualitative difference between the two. What is interesting is that the ESO share rises when stock prices are low, and falls when stock prices are high, exhibiting a so-called "contrarian" investment pattern. From 1989 to 2002, a period during which stock prices were on the decline, the ESO share was almost consistently on an upward trend. Subsequently, stock prices began on an upward trajectory that ended with the stock price crash

Figure 1. Changes in Key Attributes of ESO Plans over 1989-2013: Whole Sample (Unbalanced Panel of 1613 firms

Employee Stake (yen) — ESO Ownership Share --- Participation Rate
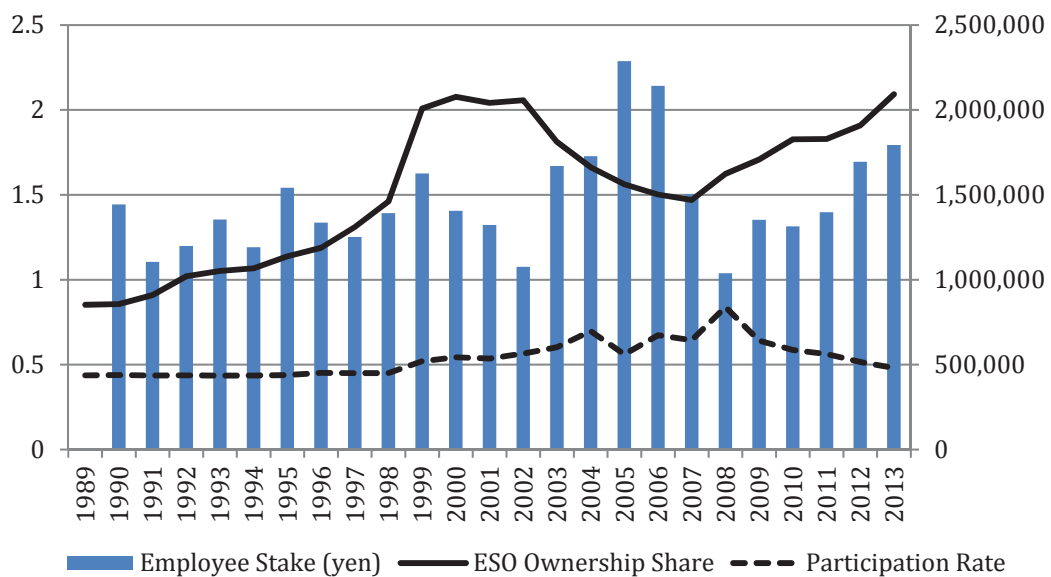
after the 2007 global financial crisis, and the ESO share was on a downward trend. In an ESO plan, each participating employee designates a certain amount of money to be withdrawn from her monthly pay to invest in the ESO fund, which cannot be sold until the trading unit for the stock is reached. Therefore, investment in ESO is perceived as long-term investment. Stock is accumulated when the stock price is low, and when the stock price rises, it is rational to make the choice to sell the stock, or reduce the value of one's total holdings, and this is confirmed by the data.

On the other hand, looking at the participation rate, we find that it has followed an opposite trajectory. While the stock market was sluggish between 1990 and 2002, the participation rate, according to the graph in **Figure 2**, rose no higher than 45 – 50%, but when the stock market began to turn up, participation rates gradually increased, exceeding 60% in 2006. However, after the crash that occurred in the global financial crisis, we entered a period of slumping stock prices, and participation rates began to decline again, reverted to the 50% level by 2010. This suggests that there are core participants who aim to hold stock for the long term, and whose

Figure 2. Changes in Key Attributes of ESO Plans over 1989-2013: Balanced Panel of 572 firms
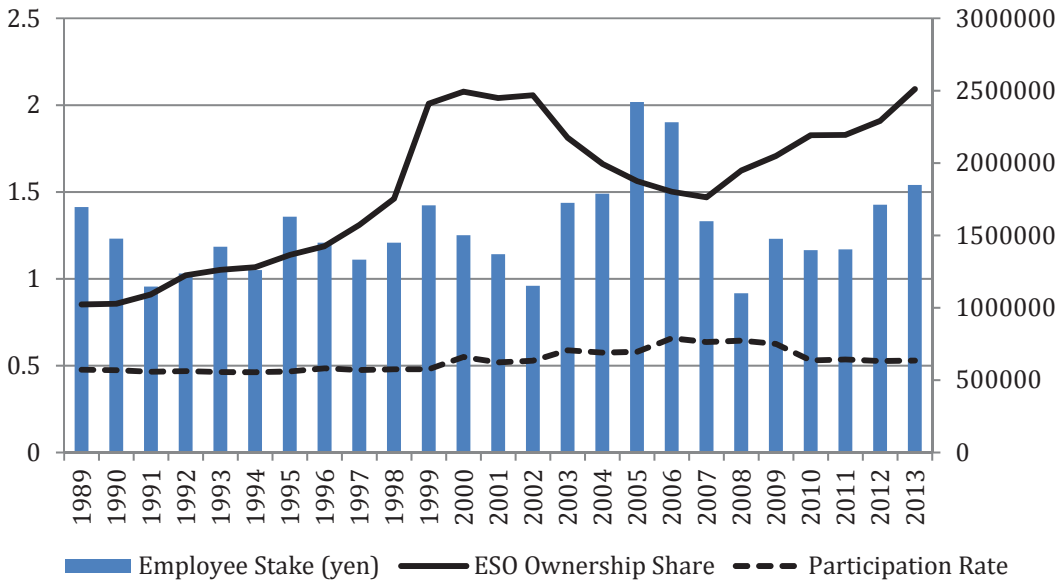
participation is not influenced by the price of the stock, and marginal participants who join or leave the ESO Plan in response to the stock price, and react to short-term gains from rising prices.

Figure 3 shows how participation rates are distributed by industry. The utilities sector (e.g. electric power, water services, and gas companies) have the highest participation rates, followed by finance, real estate and mining companies. It is believed that the comparatively stable revenues and low investment risk of electric power, water services, and gas companies contribute to their high participation rates. There are no differences between manufacturing industries that are worthy of special mention.

The ESO share on average largely fluctuated between 1 to 2% (Figure 1). However, as shown in **Figure 4**, if we look at the overall distribution, we find that there is a substantial bunching toward the left, with nearly half of all firms never reached 1%. The average ESO share

Figure 3. Participation Rate Distribution by Industry
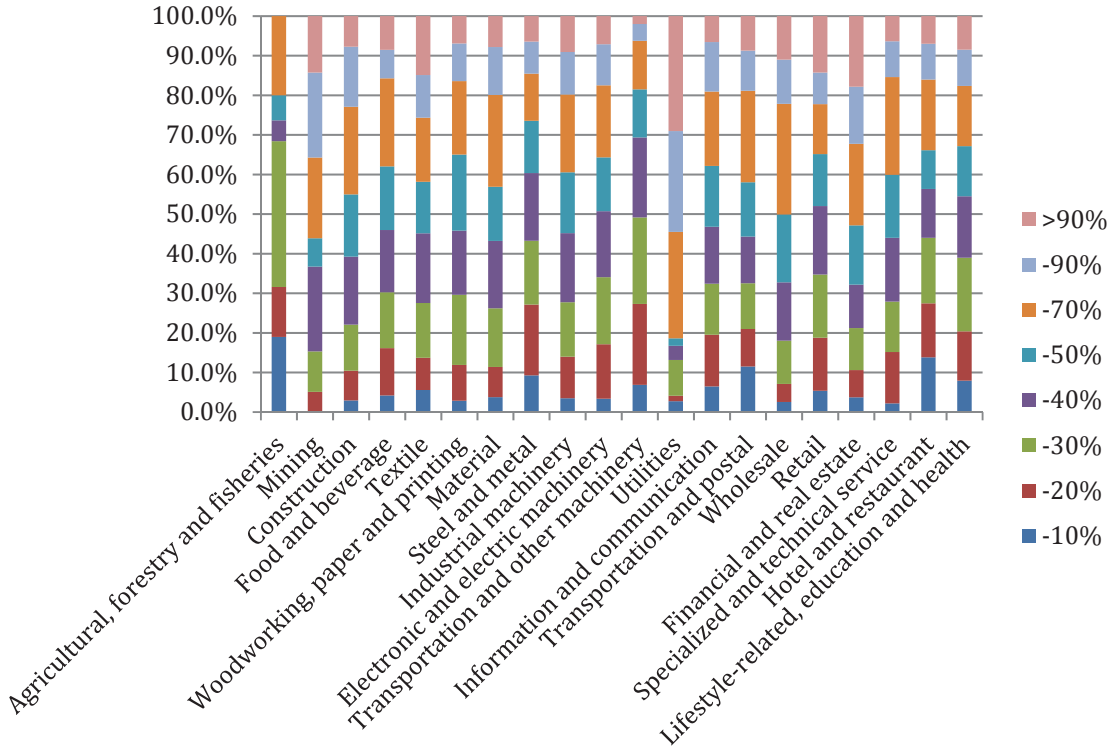
Figure 4. ESO Share Distribution
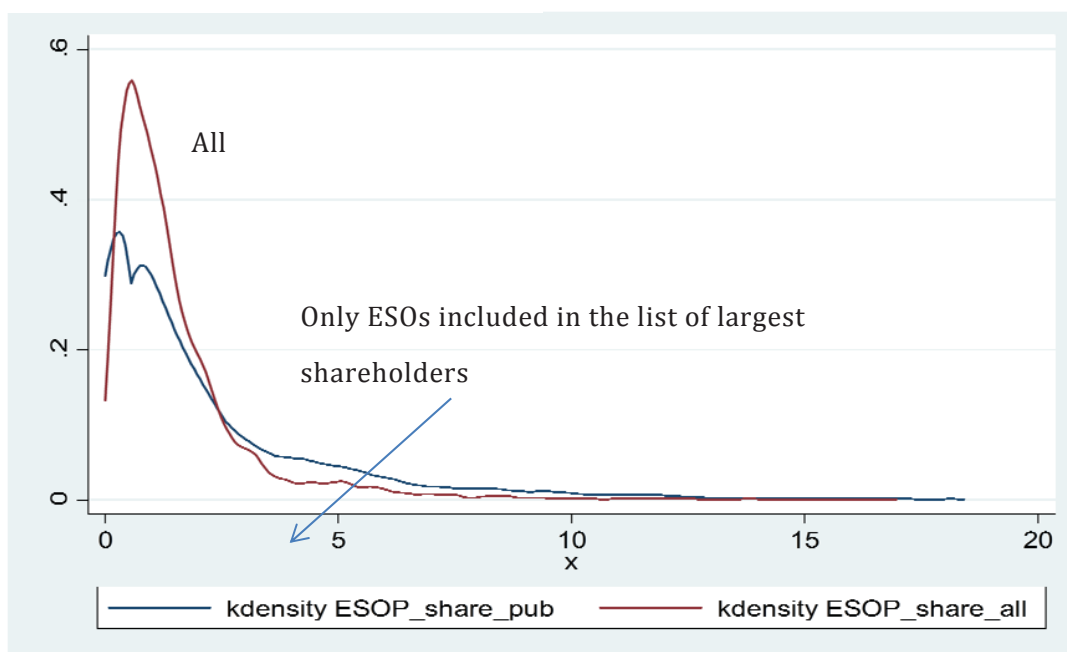
over the entire period was 1.53%, and the median was 1.02%, and only 12.4% of all firms exceeded the block holder ratio of 3% (and only 4.5% meet the 5% threshold). It is probably acceptable to conclude that for most firms the ESO plans' role as stable shareholders is very limited. The basic statistical data for the major variables are compiled in **Table 6**.

5. The Determining Factors for Matching Contributions

We have not come across any previous scholarly research on matching contributions, so we would like to discuss this practice here. Matching contributions are paid to participants by the ESO plan-implementing firm, and as shown in **Table 2**, most commonly at a rate of 5% of the contribution. [5]

In other words, if an ESO Plan participant deposits a contribution of ¥10,000 per month, the employer, or implementing firm, would pay ¥500 monthly into the participant's account, so that a total of ¥10,500 would be invested in the company's stock. This ¥500 is treated under the

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[5] This figure does not include auxiliary payments for purchase fees and management fees.

Table 2. Trend and distribution of employer matching contributions

Rate	1994	1995	1996	1997	1999	2000	2001	2002	2003	2004
0%	203	202	192	179	125	106	101	107	92	81
	12.0%	11.7%	10.8%	9.9%	8.0%	7.1%	6.9%	7.3%	7.0%	6.2%
-3%	70	70	79	83	85	92	88	85	67	68
	4.1%	4.1%	4.5%	4.6%	5.4%	6.2%	6.0%	5.8%	5.1%	5.2%
-5%	816	844	887	914	889	820	782	782	672	653
	48.3%	49.0%	50.1%	50.6%	56.8%	54.9%	53.7%	53.4%	51.0%	50.1%
-10%	579	586	596	610	444	446	454	460	453	467
	34.2%	34.0%	33.7%	33.8%	28.4%	29.9%	31.2%	31.4%	34.4%	35.8%
-20%	22	18	16	18	21	28	29	31	33	34
	1.3%	1.0%	0.9%	1.0%	1.3%	1.9%	2.0%	2.1%	2.5%	2.6%
-50%	1	1	1	1	0	1	1	0	0	0
	0.1%	0.1%	0.1%	0.1%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%
-100%	0	0	0	0	0	0	0	0	0	0
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Total	1,691	1,721	1,771	1,805	1,564	1,493	1,455	1,465	1,317	1,303

Rate	2005	2006	2007	2008	2009	2010	2011	2012	2013
0%	84	97	90	109	124	81	78	85	96
	6.0%	6.7%	6.4%	6.6%	7.3%	4.9%	4.8%	4.7%	3.8%
-3%	73	63	55	68	66	71	69	82	141
	5.2%	4.3%	3.9%	4.1%	3.9%	4.3%	4.3%	4.5%	5.6%
-5%	702	696	613	711	720	713	662	753	1141
	49.8%	47.7%	43.4%	43.0%	42.7%	42.7%	40.9%	41.7%	45.0%
-10%	493	534	575	671	688	710	709	775	990
	35.0%	36.6%	40.7%	40.5%	40.8%	42.5%	43.8%	42.9%	39.0%
-20%	54	66	75	90	84	88	93	100	148
	3.8%	4.5%	5.3%	5.4%	5.0%	5.3%	5.7%	5.5%	5.8%
-50%	2	1	2	4	3	5	7	7	15
	0.1%	0.1%	0.1%	0.2%	0.2%	0.3%	0.4%	0.4%	0.6%
-100%	1	1	2	2	3	2	2	3	5
	0.1%	0.1%	0.1%	0.1%	0.2%	0.1%	0.1%	0.2%	0.2%
Total	1,409	1,458	1,412	1,655	1,688	1,670	1,620	1,805	2,536

tax code as salary income, and not given preferential treatment. Furthermore, in recent years, though still a minority, more firms are raising the matching contribution. In 1994, 1.4% of firms paid out a matching contribution that exceeded 10% of the contribution, but in 2013, 6.6% of firms were paying out matching contributions in excess of 10%. While no firms paid out a matching contribution above 50% in 1994, in 2013 there were five firms that paid a matching contribution in this range, and four out of those five firms paid a matching contribution of 100% (see **Table 2**). These changes may have been influenced by the conclusion of the debate over

Table 3. The number of firms that changed their employer contribution matching rates

Fiscal Year	Number of firms with matching rate			Total
	Reduced	Unchanged	Raised	
1995	28	1,631	24	1,683
1996	23	1,654	35	1,712
1997	21	1,688	48	1,757
1999	52	869	42	963
2000	43	1,332	70	1,445
2001	25	1,382	51	1,458
2002	30	1,502	48	1,580
2003	18	1,529	36	1,583
2004	12	1,401	54	1,467
2005	10	1,384	82	1,476
2006	41	1,676	91	1,808
2007	9	1,360	80	1,449
2008	24	1,402	56	1,482
2009	35	1,626	30	1,691
2010	30	1,651	90	1,771
2011	16	1,593	48	1,657
2012	15	1,617	28	1,660
2013	17	1,706	49	1,772
Throughout	181	2,990	793	3,964

the legal aspects of paying matching contributions. [6]

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[6] In the past, there was concern that paying out matching contributions at a high percentage rate would be in violation of the principle of shareholder equality, or would constitute a payment of financial benefit with respect to the shareholder's exercise of rights (Clause 2 of Article 294 of the Commercial Code), but at present, the view that there is no problem as long as the ESO plan

It is of great interest to determine what strategy and motivation moved firms to adopt policies to actively encourage employee financial participation. Some 3 to 7% of firms change their level of matching contribution payments every year (**Table 3**), but these changes are not necessarily permanent, and quite a few firms whose funds for matching contributions have shrunk in tandem with a decline in internal reserves have implemented temporary reductions in matching contributions. On the other hand, 2,990 of 3,964 firms, roughly three out of four firms, never changed their level of matching contributions during the period they were observed. What factors cause changes in matching contributions? The results of our simple analysis of this question are presented in **Table 4**. The first column presents results from the ordinary least squares (OLS) model, and the second column the results of the fixed effects (FE) model. The

Table 4. Determinants of Employee Matching Contributions

VARIABLES	(1) OLS	(2) FE 1	(3) FE 2
ln(number of employees)	-0.269***	0.217***	0.222***
	(0.0816)	(0.0588)	(0.0588)
ln(firm age)	0.0558	0.163	0.151
	(0.153)	(0.219)	(0.219)
Ave. employee matching rate of	0.120**	0.0179	0.0187
other firms in the same industry	(0.0489)	(0.0188)	(0.0188)
Abnormal shareholder return	-0.0368	-0.111***	
	(0.0739)	(0.0420)	
Ave. abnormal return of other			-0.169**
firms in the same industry			(0.0791)
Net debt ratio	-0.486	-0.597***	-0.579***
	(0.346)	(0.167)	(0.167)
Stock option	0.287	-0.0991	-0.0951
	(0.177)	(0.0621)	(0.0621)
Stable ownership share	-0.0183***	-0.00784***	-0.00787***
	(0.00577)	(0.00179)	(0.00179)
Observations	15,768	15,768	15,766
R-squared	0.038	0.079	0.079
Number of nkcode		1,612	1,612

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

participant's exercise of voting rights based on his own volition is guaranteed has become commonly accepted. For details, see Motomura (2004).

OLS results strongly reflect cross-sectional relationship in the comparisons of corporations, but the fixed effects model can capture the correlation between variables for time-series changes within firm. While the former shows a negative correlation between number of employees and matching contributions, the comparison of time-series changes shows a positive correlation. This suggests that growth firms actively raise matching contributions, while large corporations with declining growth potential have a tendency to maintain matching contributions at low levels.

Furthermore, expecting that the herd mentality of trying to set matching contributions at the same level as other companies in the same industry comes into play, we added the matching contributions of other companies in the same industry to the explanatory variable. However, although the OLS model provided significantly positive results, the FE model did not find a significant correlation. These results mean that since there is a tendency for a firm to face the same technology and business environment as other firms within the same industry, although when firms are compared with each other we will find significant correlations, when we examine time-series changes, we are not able to show that firms align their matching contributions with other firms in the same industry. When the abnormal shareholder return of the focal firm is included in the explanatory variable, or when the abnormal shareholder return of other firms in the same industry is included, we find a negative correlation with matching contributions. This result suggests that in a firm with growing investment opportunities, employees maintain a strong desire to invest in that firm's stock from expectations that its stock price will rise, leading to the management's decision to reduce the matching contributions.

Furthermore, there is a negative correlation between the net debt ratio and matching contributions that was significant at the 1% level in the FE model. Thus, it appears that an increase in the net debt ratio may, by reducing cash flow, which is a source of funds for the matching contributions, exert downward pressure on matching contributions.

Finally, the stable shareholder ratio had a negative correlation with matching contributions in both the OLS and FE models. Here we calculate this ratio by summing the shares owned by city banks, regional banks, life and casualty insurers, and other financial institutions, and

Figure 5. Trends in the Ownership Structure of Public Companies
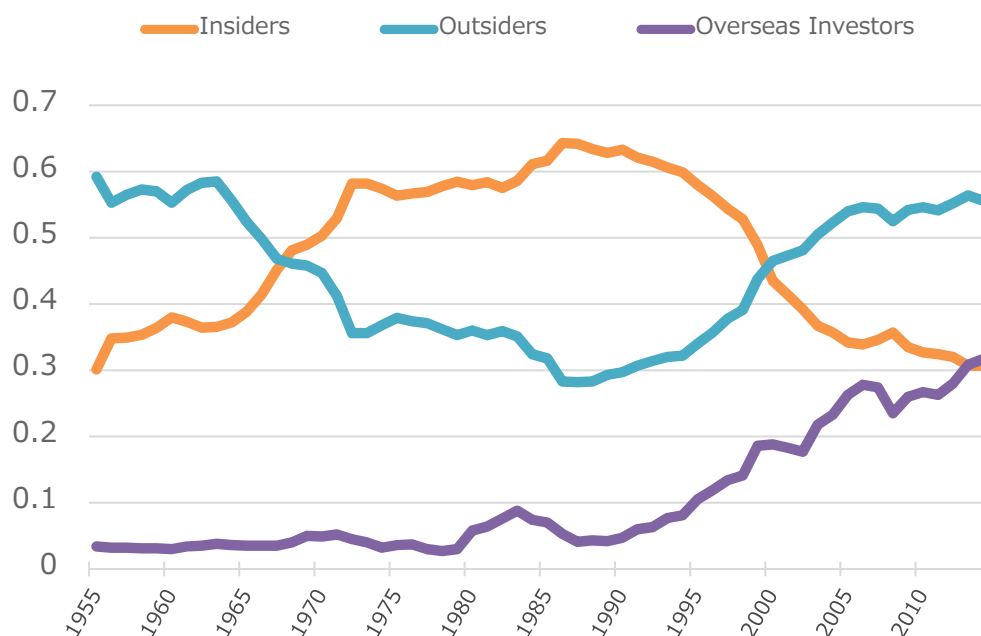
Source: Tokyo Stock Exchange, Survey of Current Status of Stock Distribution
Note; Survey targets all firms listed at the stock exchanges nationwide including Mothers, JASDAC, Hercules. An ownership share is computed based on the market value of shares held by each type of investors except for years before FY1970 when the share is calculated based on the number of shares but adjusted to keep continuity in FY1970. Insiders include banks, insurance companies, other financial institutions, and nonfinancial corporations. Outsiders include overseas investors, individuals, mutual funds, and pension trusts. Between FY1970 and FY1985, the share of banks cannot be distinguished from than of trust banks, and thus estimates are made under the assumption that the relative ratios of banks to trust banks are all equal to the figure for FY1986. Before FY1965, financial institutions were not broken down by subgroups, thus the estimates are projected based on the breakdown in FY1966.

business enterprises. Note that the stable shareholder ratio has declined from a peak of just under 65% to around 30% most recently (see **Figure 5**).[7] The decline in the stable shareholding ratio that has accompanied the dissolution of cross-shareholding and main-bank relationships has been a matter of concern for the managements of a substantial number of firms, and it is apparent that they increased ESO Plan matching contributions as a way to preserve their stable shareholders. The coefficient of -0.00784 ~ -0.00786 for the stable shareholder ratio that is

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[7] See Miyajima and Hoda (2015), and Miyajima and Ogawa (2016) for changes in the stock ownership structure during this period, and the consequences of these changes.

produced by the fixed effects (FE) model in **Table 4** means that when the stable shareholder ratio declines by 10%, matching contributions are lowered by around 0.8% (or alternatively, 1 in 6 firms lowers its matching contribution by 5%).

Next, we used the variables introduced in the previous section to measure the impact that matching contributions have on ESO plan participation. **Table 5** summarizes the estimation results for five fixed effects models that include matching contributions as explanatory variable. The dependent variables are value of ESO shares per employee, value of ESO shares per participant, participation rate, ESO share, and average annual contribution. The average annual contribution was calculated as follows.

$$\text{Annual contribution} = \frac{\text{Increase in the number of ESO shares held during period} \times \text{Stock price at end of fiscal year}}{\text{Number of participants}}$$

As evident from the analysis in Table 4, the matching contribution is an endogenous variable, so it is almost certainly some kind of endogeneity bias. However, if we take into consideration the fact that the increase in the abnormal shareholder return is significantly driving the matching contribution lower, it is expected that there will be a negative bias. And if this is the case, the estimation result showing that a rise in the matching contribution has a positive influence on ESO participation is probably an underestimation, and the actual effect is probably even larger.

The expected signs of the coefficients are all significant at the 1% level. If the matching contribution is increased by 5%, the value of ESO shares per employee rises by 11%, and the value of ESO shares per participant decreases by 4%. Similarly, a 5% increase in the matching contribution leads to a 15% rise in the participation rate (It should be noted that the 15% rise is not a 15 percentage point rise in the participation rate. In other words, if the original participation rate was 30%, a 15% increase leads to an increase of 4.5 percentage points, i.e. $30\% \times 15\% = 4.5\%$), an 0.041% rise in the ESOP holding rate, and a ¥26,000 increase in the annual contribution. These figures are within the scope of rational prediction, but for the reasons

Table 5. Impact of Employer Matching Contribution: Fixed effects models

VARIABLES	ESO per employee	ESO per participant	Participation Rate	ESO Share	Annual Employee Contribution
ln(number of employees)	-0.229***	0.0867***	-0.315***	0.242***	45,920***
	(0.0176)	(0.0149)	(0.0114)	(0.0218)	(16,269)
ln(firm age)	-0.922***	-0.678***	-0.245***	-0.201**	-155,250**
	(0.0797)	(0.0674)	(0.0515)	(0.0984)	(73,593)
Capital Labor Ratio	0.000247***	0.000016	0.000232***	-0.000116*	-11.55
	(0.000052)	(0.000044)	(0.000033)	(0.000064)	(47.62)
Consolidated/non-consolidated	0.0310***	0.0109***	0.0200***	-0.0158***	2,653
employee ratio	(0.00272)	(0.00230)	(0.00176)	(0.00336)	(2,511)
Net debt ratio	-0.488***	-0.513***	0.0252	0.432***	12,426
	(0.0368)	(0.0311)	(0.0238)	(0.0454)	(33,924)
TOPIX return	0.0820***	0.0526**	0.0294	0.0949***	-181,998***
	(0.0279)	(0.0236)	(0.0180)	(0.0344)	(25,742)
Employer matching contribution	0.0217***	-0.00809***	0.0297***	0.00810***	5,189***
	(0.00188)	(0.00159)	(0.00122)	(0.00233)	(1,739)
Observations	16,176	16,176	16,176	16,176	16,176
R-squared	0.282	0.313	0.122	0.092	0.021
Number of nkcode	1,627	1,627	1,627	1,627	1,627

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

mentioned earlier, may have an even larger impact. It is not surprising that the value of shares held per participant declines because the increase in the matching contribution boosts the number of new participants, who start with zero holdings, so the average value of shared help per participant falls.

6. Estimation Method

The ESO plan influence on productivity and corporate performance is quite complicated. ESO plan participation is determined by multiple factors including the size of the matching contribution selected by management, the employee's predictions on the future performance of the employer-firm, trends in the stock market as a whole, etc. If ESOP participation is an endogenous variable, it will not satisfy the assumption assumed by the OLS method that the explanatory variable and error term are independent.

As the initial standard response, we can turn to the fixed effects (FE) model, which can eliminate the bias caused by time-invariant unobservable firm characteristics such as potential growth opportunities and management policies. But the model will not correct for spurious correlation between ESO participation and corporate performance that arises in response to changes in time-varying factors such as business environment, stock market outlook, etc. Therefore, in addition to fixed effects, we employ instrumental variables to identify the causal impact of ESO participation using the two-stage least squares method.

The model is formulated as follows.

$$y_{it} = X_{it}\beta + ESOP_{it}\gamma + \delta_t + c_i + \varepsilon_{it}$$
$$E[X_{it}{}'\varepsilon_{it}] = 0$$

Here, y_{it} includes four dependent variables: added value, average wages, ROA, and Tobin's q. These are representative indices for productivity, rents distributed to employees, annual corporate profit, and corporate value. $ESOP_{it}\gamma$ includes the above-mentioned indices such as

Table 6. Basic Statistics

Variable		Mean	Std. Dev.	Min	Max	Observations
ln(ESO per employee)	overall	12.8472	1.0656	3.2453	17.2601	21591
	between		1.0252	6.5953	16.2699	1647
	within		0.5551	4.4654	15.8294	13.1093
ln(ESO per participant)	overall	13.7618	0.7842	4.9619	19.1868	21591
(stake)	between		0.7228	8.9807	16.9432	1647
	within		0.4778	5.2168	17.4650	13.1093
ln(participation rate)	overall	-0.9146	0.6632	-7.5063	2.4456	21591
	between		0.6299	-4.8862	1.6161	1647
	within		0.3278	-7.1883	1.4390	13.1093
ESO share (%)	overall	1.4897	1.5381	0.0001	24.5104	21591
	between		1.8865	0.0026	23.9458	1647
	within		0.5971	-4.6158	9.3649	13.1093
ln(value added)	overall	9.6808	1.3153	2.2012	15.0226	21591
	between		1.3132	5.2353	14.9627	1647
	within		0.3539	3.8918	11.7806	13.1093
ln(average wage)	overall	15.4452	0.2823	8.2908	16.6812	21576
	between		0.2164	14.1627	16.4512	1643
	within		0.2006	8.9305	16.4843	13.1321
ROA	overall	0.0471	0.0425	-0.6138	0.4877	21591
	between		0.0428	-0.2314	0.4094	1647
	within		0.0302	-0.3902	0.4034	13.1093
Tobin's q	overall	1.0050	0.6659	0.1170	13.3954	21591
	between		0.6320	0.1447	7.8118	1647
	within		0.4834	-2.7570	10.9421	13.1093
lnL	overall	7.1068	1.1809	4.6052	12.4913	21591
=ln(number of employees)	between		1.1648	4.6052	12.2164	1647
	within		0.2525	5.0709	10.0832	13.1093
lnK	overall	10.3597	1.5375	5.5866	16.4059	21591
=ln(tangible fixed assets)	between		1.4991	5.6668	16.1853	1647
	within		0.3672	7.7403	12.0969	13.1093
ln(firm age)	overall	3.9537	0.4124	0	4.8520	21591
	between		0.4998	0.6931	4.7517	1647
	within		0.1241	2.3473	4.7848	13.1093
Average employee age	overall	38.5721	3.7185	24.4000	57.4000	21586
	between		3.6750	25.8600	55.1591	1646
	within		1.9497	27.3352	49.4312	13.1142
Average employee tenure	overall	14.7845	4.4574	1.0000	29.1000	21587
	between		4.7566	1.2000	24.5700	1646
	within		1.8266	2.3845	25.9702	13.1148
ln(total asset)	overall	11.3632	1.3964	7.1732	16.5335	21591
	between		1.3949	7.2403	16.4385	1647
	within		0.2319	9.3378	13.5677	13.1093
ln(equity debt ratio)	overall	-0.8218	1.6649	-13.8448	6.5481	21567
(Leverage)	between		1.6244	-9.8505	3.0981	1646
	within		0.8591	-10.0882	4.8988	13.1027
Capital labor ratio	overall	45.9013	102.578	0.4247	4966.637	21591
	between		130.395	1.0606	4408.206	1647
	within		56.580	-941.3434	3765.159	13.1093
ln(share of institutional	overall	2.4505	0.9553	0	4.3292	19015
investors)	between		0.9306	0.0100	4.2553	1551
	within		0.5056	-0.2909	4.8156	12.2598
ln(share of foreign	overall	1.8334	1.0007	0	4.3935	19052
investors)	between		0.9070	0	4.2789	1552
	within		0.5521	-0.6822	4.3702	12.2758
Employer matching	overall	6.7949	3.6817	0	100	15929
contribution	between		3.8641	0	100	1626
	within		1.9408	-20.3480	48.1074	9.79643
Average matchin	overall	6.7107	1.5511	0	21.3333	15870
contribution of other firms	between		1.3536	0.8333	16.6111	1624
in the same industry	within		1.0285	0.2638	14.8597	9.77217
Average shareholder	overall	0.0538	0.2907	-0.9574	5.2420	19859
return of other firms in the	between		0.1228	-0.5382	1.2486	1530
same industry	within		0.2824	-1.1249	4.7605	12.9797

value of shares held per employee, value of ESO shares per participant, participation rate, ESO share, etc., and one or two were included in each model in order to capture differences in the degree of participation in ESOPs. X_{it} is a control variable, but the choice of variable changes in accordance with the dependent variable. In the case of added value, we assume a translog production function using the number of employees as labor input and tangible asset as capital input, and added additional variables such as firm age, share of institutional investors in ownership, and industry trends (quadratic). When indices for corporate performance such as ROA and Tobin's q are placed on the left, total assets, net debt ratio, firm age, capital labor ratio, share of institutional investors in ownership, and industry trends (quadratic) are included in X_{it}, and in the case of average wages, average age and tenure were also added. δ_t is the year effect, and c_i is the firm fixed effects. The basic statistical results for all variables are shown in **Table 6**.

If $E[ESOP_{it}\varepsilon_{it}] = 0$, the fixed effects (FE) model yields an unbiased estimate, but if $E[ESOP_{it}\varepsilon_{it}] \neq 0$, then the fixed effects two-stage least square (FE-2SLS) model is preferable. However, in the latter case, it is difficult to find an appropriate instrumental variable. Here, of the various candidates for instrumental variables, we will use the average matching contribution of other firms in the same industry, the average abnormal shareholder return of other firms in the same industry, and the interaction term for these two variables, which persistently passed the Anderson canonical correlations test, a test for of under-identification, and the Sargan test, a test for over-identification.

7. Estimation Results

In **Table 7**, we summarize the estimation results for the impact on added value. If we look at the results for the fixed effects models for columns 1 to 3, the ESO participation variables are significant for all models. For Model 1, the coefficient for the value of ESO shares per employee is 0.076, which means that a 10% rise in the value of ESO shares per employee will produce a 0.76% increase in added value. For Model 2, the coefficients for value of ESO shares per participant, and participation rate are both at the 5% significance level, although the

Table 7. The Fixed Effect Estimates of the Effect on Productivity of ESO plans

VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	Fixed Effect Model (1989-2013)			FE 2SLS Model (1995-2013 excl. 1999)		
lnL	0.724***	0.704***	0.726***	1.097***	0.985***	1.099***
	(0.177)	(0.176)	(0.178)	(0.101)	(0.121)	(0.234)
lnK	0.167*	0.169*	0.178*	0.142**	0.141**	0.135
	(0.0986)	(0.0989)	(0.0985)	(0.0657)	(0.0639)	(0.565)
lnL^2	0.0177	0.0181	0.0166	0.00700	0.0125	0.00720
	(0.0158)	(0.0156)	(0.0157)	(0.00850)	(0.00897)	(0.0181)
lnK^2	0.0131	0.0133	0.0118	0.0152***	0.0175***	0.0159
	(0.00966)	(0.00965)	(0.00971)	(0.00464)	(0.00474)	(0.0489)
lnK´lnL	-0.0394*	-0.0396*	-0.0376	-0.0528***	-0.0556***	-0.0536
	(0.0233)	(0.0230)	(0.0234)	(0.0109)	(0.0108)	(0.0668)
ln(firm age)	0.424***	0.417***	0.428***	0.659***	0.594***	0.658***
	(0.114)	(0.114)	(0.115)	(0.0827)	(0.0902)	(0.0862)
ln(share of institutional investoirs)	0.0887***	0.0836***	0.0822***	0.0195	0.0123	0.0220
	(0.00840)	(0.00841)	(0.00847)	(0.0141)	(0.0145)	(0.197)
Lagged endogenous explanatory variables						
ln(ESO per employee)$_{t-1}$	0.0760***		0.0869***	0.394***		0.393***
	(0.00778)		(0.00858)	(0.0646)		(0.0760)
ln(ESO per participant)$_{t-1}$		0.101***			0.430***	
		(0.00948)			(0.0667)	
ln(participation rate)$_{t-1}$		0.0269**			0.184	
		(0.0117)			(0.147)	
ln(ESO share)$_{t-1}$			-0.0269***			0.0150
			(0.00693)			(1.213)
Observations	20,207	20,207	20,207	15,216	15,216	15,216
R-squared	0.507	0.509	0.508	0.355	0.391	0.349
Number of firms	1,613	1,613	1,613	1,484	1,484	1,484

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

coefficient for the former is larger. If we bear in mind that the value of ESO shares per employee is the value of ESO shares per participant multiplied by the participation rate, even when the value of ESO shares per employee rises by 10%, a 10% rise in the value of ESO shares per participant has a greater impact than a 10% increase in the participation rate. In other words, one may conclude that instead of increasing the participation rate, which also includes employees who have little involvement with decision-making, it is better to provide core employees who are involved with decision-making, or in the support of decision-making, with more shares.[8]

The results of Model 3 are quite interesting. If, as discussed in Section 3, the ESO plan is expected to have both positive and negative effects, there is a high likelihood that the positive effect can be captured with the value of ESO shares per employee, and the negative effect with the ESO share. In fact, the coefficient of the former is 0.0869, and the latter -0.0269, so part of the positive effect is offset by the negative effect. As in Guedri and Hollandts (2008), we estimated a model which included a quadratic equation for the holding ratio, but could not obtain significant results, and the sign of the coefficient was unstable—not robust to changes in the model specifications (for this reason, the results are not reported here).[9]

As for the results obtained to this point, since we did not take into consideration the endogeneity of ESO participation, there is a possibility that bias has occurred, and could be either positive or negative. In short, when unobservable time-variant firm characteristics have a positive correlation with both ESO participation and productivity, they cause a positive bias.

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[8] As noted earlier, to calculate the participation rate, we used the number of employees at the ESOP-implementing firm (parent company) as the denominator, and not the total of number of persons eligible to participate in the ESOP, a figure which includes the number of employees at subsidiaries, etc., so the greater the difference between the number of employees at the standalone firm and the consolidated group, the more excessive the participation rate. In order to examine whether such definitional problems influenced the estimation results, we conducted robustness checks by adding the ratio of the number of employees at the standalone firm and the consolidated group for all of our major analyses, but there were no noticeable differences in our results, and the coefficient for the consolidated and standalone employee ratio was not significant.

[9] Since Guedri and Hollandts (2008) conducted a cross-sectional analysis, a simple comparison is not approproate.

On the other hand, when firm characteristics have a negative correlation with ESO participation, and a positive correlation with productivity, they will impart a negative bias to the estimation results. As an example of positive bias, employees have private information related to the firm's future productivity, and when productivity is expected to increase, it is possible that, anticipating a rise in stock prices, employees increase their contributions to the ESO plan. Or management may possess private information related to the firm's future productivity, and when future productivity is expected to increase, there is a possibility that management will increase matching contributions, expecting returns in the form of employee effort and cooperation. On the other hand, a negative bias could occur if the firm adopts a performance-based system, or implements layoffs and restructuring. If performance-based approaches and ESO plans are substitutes, as a result of the adoption of performance-based compensation, management could reduce matching contributions whereas productivity could increase due to the effect of performance-based compensation. Similarly, if layoffs or business restructurings are conducted, devotion to the firm will diminish, and ESOP participation will decline, but one could predict that productivity will increase as a result of the restructurings.

When we actually examine the estimation results, we find that those from the FE-2SLS models show a productivity boosting effect that is more than five times that found in the fixed effects model. In other words, when the value of ESO shares per employee rises by 10%, productivity is pushed up 3.94%. If this estimation is correct, then if the value of ESO shares per employee is ¥1.8 million, a 10% increase is ¥180,000, or more than 2% of the average wage at a listed firm. If this amount were to be paid in the stock of one's company, an increase of more than 2% in personnel costs yields an increase of 3.94% in productivity, so intuitively, it seems too large. The Sargan test could not reject the null hypothesis that exclusion constraints hold, but the conditions may not have been fully satisfied. Or there is a likelihood that the local average treatment effect (LATE) for the group for which changes in instrumental variables can easily occur is higher than the average treatment effect. However, instrumental variable estimations at least seems to show that there is little likelihood that the fixed effects model

Table 8. The Fixed Effect Estimates of the Effect on Wages of ESO plans

VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	Fixed Effect Model (1989-2013)			FE 2SLS Model (1995-2013 excl. 1999)		
Average employee age	0.00235	0.00233	0.00237	0.00102	0.00115	0.00165
	(0.00424)	(0.00425)	(0.00422)	(0.00151)	(0.00155)	(0.00336)
Average employee tenure	0.0124***	0.0125***	0.0126***	0.0124***	0.0130***	0.0128***
	(0.00346)	(0.00346)	(0.00345)	(0.00127)	(0.00135)	(0.00233)
ln(total assets)	0.0889***	0.0885***	0.0874***	0.0826***	0.0830***	0.0889***
	(0.00663)	(0.00663)	(0.00675)	(0.0128)	(0.0131)	(0.0327)
ln(leverage)	-0.00991***	-0.00984***	-0.00910***	-0.00955***	-0.00955***	-0.00740
	(0.00155)	(0.00156)	(0.00153)	(0.00210)	(0.00216)	(0.0104)
ln(firm age)	0.00216	0.000570	0.00697	0.0193	-0.0424	0.0208
	(0.0368)	(0.0368)	(0.0367)	(0.0463)	(0.0585)	(0.0472)
Capital Labor Ratio	-0.000055**	-0.000057**	-0.00005**	-0.000054**	0.000104***	0.000031**
	(0.000024)	(0.000024)	(0.000023)	(0.000026)	(0.000039)	(0.000113)
ln(share of institutional investoirs)	0.00336	0.00299	0.000776	-0.00384	-0.00736	-0.0107
	(0.00371)	(0.00374)	(0.00373)	(0.00512)	(0.00560)	(0.0329)
Lagged endogeneous explanatory variables						
ln(ESO per employee)$_{t-1}$	0.0195***		0.0246***	0.0351		0.0363
	(0.00281)		(0.00292)	(0.0263)		(0.0271)
ln(ESO per participant)$_{t-1}$		0.0217***			0.0561*	
		(0.00300)			(0.0294)	
ln(participation rate)$_{t-1}$		0.0158***			-0.0687	
		(0.00442)			(0.0636)	
ln(ESO share)$_{t-1}$			-0.0134***			-0.0519
			(0.00233)			(0.247)
Constant	13.78***	13.76***	13.74***			
	(0.189)	(0.195)	(0.191)			
Observations	18,928	18,928	18,928	14,030	14,030	14,030
R-squared	0.667	0.667	0.668	0.530	0.505	0.524
Number of nkcode	1,533	1,533	1,533	1,389	1,389	1,389

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

estimates are upward biased. In interpreting the estimation results hereafter, we will assume that the results of the fixed effects model are understated.

Next, we will first examine the influence on wages with a fixed effects model. According to Model 1 in **Table 8**, the coefficient for the value of ESO shares per employee is 0.0195, and a 10% increase in the value of ESO shares leads to a 0.195%, or nearly 0.2% rise in wages. Since the labor distribution ratio is around 68%, which means that around 20% of the incremental increase in added value is distributed to employees. In other words, a large portion of the fruits of increased productivity – around 80% – goes to the shareholders. Of course, while employees may also accrue other gains such as higher matching contributions and investment return from holding the firm's stock, this does not change the fact that the return to shareholders is much larger. What is interesting in Model 2 is that unlike the case of added value, the coefficient for the value of ESO shares per participant and the coefficient for the participation rate are 0.0217 and 0.0158, so the gap has almost disappeared. This could mean that the distribution of the incremental increase in added value that arises from increased participation in ESO plans to employees is larger the higher the participation rate. However, in Model 5, which uses instrumental variables, the coefficient for the participation rate turns negative, and again is no longer significant.

Comparing the fixed effects model and fixed effects 2SLS model, we find that the latter has coefficients that are approximately twice as large as the former, so the difference is not quite as large as with the effect on added value. Furthermore, in the fixed effects 2SLS model, many of the coefficients were no longer statistically significant.

Next, in order to confirm whether the growth in productivity is linked to increases in corporate profits, we used ROA as a dependent variable, to conduct a similar estimation. As shown in **Table 9**, the effect of ESO plans is largely consistent with that on productivity. Model 1 has a coefficient of 0.00833, so if the value of ESO shares per employee increases 10%, then the ROA should increase by 0.08 percentage points. Since the average ROA in our sample is 4.71% (Table 6), this means a profit increase of around 1.7%, which is consistent with an 0.76%

Table 9. The Fixed Effect Estimates of the Effect on ROA of ESO plans

VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	Fixed Effect Model (1989-2013)			FE 2SLS Model (1995-2013 excl. 1999)		
ln(total assets)	0.000516	-0.000287	-0.000095	-0.0165***	-0.0165***	-0.0197**
	(0.00267)	(0.00267)	(0.00270)	(0.00353)	(0.00354)	(0.00983)
ln(leverage)	-0.00609***	-0.00597***	-0.00581***	-0.00412***	-0.00412***	-0.00535
	(0.000829)	(0.000828)	(0.000821)	(0.000591)	(0.000592)	(0.00353)
ln(firm age)	-0.0142	-0.0164	-0.0126	0.0384***	0.0388**	0.0406**
	(0.00999)	(0.0101)	(0.0103)	(0.0131)	(0.0158)	(0.0165)
Capital Labor Ratio	-0.000013	-0.00001	-0.000015*	-0.000027***	-0.000027**	-0.000013
	(0.000008)	(0.000008)	(0.000008)	(0.000007)	(0.000011)	(0.000039)
ln(share of institutional	0.0102***	0.00959***	0.00930***	0.00222	0.00226	0.00628
investoirs)	(0.00110)	(0.00109)	(0.00111)	(0.00143)	(0.00154)	(0.0116)
Lagged endogenous explanatory variables						
ln(ESO per employee)$_{t-1}$	0.00833***		0.0101***	0.0570***		0.0563***
	(0.000874)		(0.000970)	(0.00735)		(0.00877)
ln(ESO per participant)$_{t-1}$		0.0120***			0.0568***	
		(0.00114)			(0.00811)	
ln(participation rate)$_{t-1}$		0.00204**			0.0578***	
		(0.00100)			(0.0176)	
ln(ESO share)$_{t-1}$			-0.00475***			0.0302
			(0.000840)			(0.0852)
Observations	18,948	18,948	18,948	14,045	14,045	14,045
R-squared	0.225	0.231	0.229	-0.198	-0.204	-0.629
Number of nkcode	1,534	1,534	1,534	1,389	1,389	1,389

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

increase in added value.[10] Models 2 and 3 depict essentially the same pattern as Table 7. Estimations using instrumental variables have an even larger incremental increase, and compared to Models 1 and 4, the latter has an impact that is nearly seven times larger. In other words, if the value of ESO shares per employee increases 10%, ROA increases 0.57%. If this figure is then divided by the average ROA of 4.71% for the sample, there is a profit increase of around 12%, and as was the case with the earlier discussion of added value, bestowing company stock to employees worth approximately 2% in wages leads to a 12% increase in profits, which should be considered a rather unrealistic estimation.

When the effect on ROA is examined with the fixed effects 2SLS model, there is some difference with that of added value on productivity, especially in Model 5 which analyzes the effect of the participation rate. In our analysis of the productivity effect of added value, we find that the influence of the participation rate is small and not statistically significant, but as for its influence on ROA, coefficients for the value of ESO shares per participant and the participation rate were almost equal and significant at the 1% level. The increase in the participation rate, possibly reflecting the employees' expectations of greater future corporate value and the growth of the firm, might lead to wages that are set proportionately lower under more harmonious labor management relationship thus boost corporate profits. This is consistent with our finding in our earlier analysis of the effect on wages that the coefficient for the participation rate in Model 5 was negative.

Finally, we will examine the influence on Tobin's q, or on long-term corporate value. This is useful for judging whether the market views the rise in productivity arising from ESOP participation as temporary (in other words, when it does not view this as a case of improved incentives through ESO participation), or as a permanent change. The coefficient for the value of ESO shares per employee under Model 1 in **Table 10** is 0.157, so an increase of 10% in the value of ESO shares would increase the corporate value by 1.57%. This scale of increase (the

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[10] Japan's labor share of income is around 68%, so if the distribution of the added value created by the ESO plan to labor is, as discussed above, around 20%, then the year-on-year distribution to capital is 0.76% x (1-0.2)÷ (1-0.68) = 1.9%.

Table 10. The Fixed Effect Estimates of the Effect on Tobin'q of ESO plans

VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	Fixed Effect Model (1989-2013)			FE 2SLS Model (1995-2013 excl. 1999)		
ln(total assets)	-0.304***	-0.317***	-0.316***	-0.403***	-0.402***	-0.355***
	(0.115)	(0.114)	(0.115)	(0.0379)	(0.0376)	(0.0807)
ln(leverage)	-0.00528	-0.00329	0.000192	0.00450	0.00441	0.0240
	(0.00950)	(0.00939)	(0.00921)	(0.00670)	(0.00664)	(0.0293)
ln(firm age)	-0.203	-0.245	-0.179	-0.127	-0.197	-0.195
	(0.173)	(0.171)	(0.170)	(0.146)	(0.184)	(0.185)
Capital Labor Ratio	1.56e-05	5.13e-05	-5.94e-06	-3.61e-05	-1.79e-06	-0.000141
	(9.43e-05)	(9.13e-05)	(9.77e-05)	(6.31e-05)	(8.34e-05)	(0.000166)
ln(share of institutional	0.124***	0.114***	0.106***	0.0618***	0.0580***	-0.00417
investoirs)	(0.0124)	(0.0122)	(0.0124)	(0.0156)	(0.0166)	(0.0972)
Lagged endogenous explanatory variables						
ln(ESO per employee)$_{t-1}$	0.157***		0.192***	0.322***		0.321***
	(0.0199)		(0.0224)	(0.0802)		(0.0862)
ln(ESO per participant)$_{t-1}$		0.216***			0.343***	
		(0.0236)			(0.0866)	
ln(participation rate)$_{t-1}$		0.0512**			0.204	
		(0.0216)			(0.206)	
ln(ESO share)$_{t-1}$			-0.0934***			-0.510
			(0.0124)			(0.741)
Observations	19,344	19,344	19,344	14,332	14,332	14,332
R-squared	0.259	0.267	0.267	0.176	0.193	0.050
Number of nkcode	1,608	1,608	1,608	1,439	1,439	1,439

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

rate of increase in Tobin's q) is almost the same as the scale of the rate of increase in the ROA (1.7%), suggesting the possibility that the market views the improvement in corporate performance to be a permanent improvement. However, this could be a case of spurious correlation arising from time-variant factors – for example, expectations of increasing productivity by employees and management could increase ESO plan participation, and then as productivity actually rises, a permanent increase in productivity is at the same time reflected in the market price. In fact, if we examine the fixed effects 2SLS model that eliminates the endogeneity bias, the coefficient indicates an increase that is twice as large, so it is smaller than the almost seven-fold increase for ROA. This may suggest that there is little market recognition of the true influence of ESOP participation.

Summarizing the above results, we can say that a rising degree of participation in ESO plans has on average a positive effect on productivity, corporate profit, and corporate value. A positive but limited correlation with wages is also found. The size of the value of ESO shares per person primarily has a positive effect on productivity, and a rise in the participation rate as such only has a limited influence on productivity, but there is a possibility that the participation rate influences the distribution ratio of added value to labor and capital. Furthermore, there is a strong tendency for the ESO share to have a negative effect, which is consistent with the view that ESO plans have positive and negative effects that offset each other. It is believed that the fact that the fixed effects 2SLS model, which uses instrumental variables, shows a stronger positive effect for ESOP participation than the fixed effects model can be attributed in part to the fact that during the observation period there was extensive implementation of performance-based systems, layoffs, and restructurings. As we discussed earlier, the introduction of performance-based systems became a substitute for ESO plan participation, which was no longer encouraged as much as it had been previously, and if greater numbers of older employees retired due to restructuring, then our indices for ESO plan participation will decline across the board. On the other hand, if these efforts to improve profitability actually improve productivity and profitability, then the ESO effect measured by the fixed effects model would have a

downward bias. Therefore, the results of the fixed effects model can be seen as the true lower bound of the ESO effect.

8. Additional Analyses: Pressure from Shareholders and Corporate Characteristics and ESO Effects

Complementarity with External Monitoring

Does the ESO effect change depending on the existence of powerful shareholders? Since shareholder pressure is highly dependent on the ownership structure, we attempted to analyze how the ESO plan participation effect varies in response to differences in ownership structure. In general, if the ratio of institutional investors and overseas investors, whose objective for holding shares is to maximize financial performance, increases, then there is a higher underlying risk of takeover and a higher risk of sale (exit). While pressure from "vocal shareholders" who advocate for acquisitions and takeover, and make shareholder proposals remains relatively low, the threat that a firm could be sold off is believed to have grown immensely over the past 20 years.[11]

Of course, it is not obvious what kind of effect ESO plans have during times when shareholders wield strong influence. One hypothesis asserts that there is a possibility that as shareholders grow stronger, it becomes difficult to maintain employment guarantees and good compensation packages for employees, and no longer possible to sustain employee participation in management, and therefore the effect of ESO plans, which are seen as complementary to these efforts, diminishes. Another hypothesis contends that shareholder pressure constrains the negative effect of ESOPs that arises when excessive concern is shown for employee interests and from the entrenchment effect that occurs when there is a rise in the stable shareholder ratio, so that the positive effects of ESOPs are strengthened overall. In fact, Park and Song (1995), using U.S. data from 1979 to 1989, showed that the introduction of ESOPs and expansion of

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[11] See Hamao et al. (2010), Becht et al. (2015) for trends in and outcomes of shareholder activism in Japan. The latter study is an Asia-wide analysis, but the sample is based largely on Japan.

eligibility have a positive influence on performance indices such as ROA and Tobin's q and in particular, that the positive effect of ESOPs is substantial for firms with large shareholders (primarily institutional investors) who do not get involved in management.

In order to confirm which of these hypotheses is more convincing, we estimated an equation that incorporated into the Model 1, the fixed effects model in **Tables 7** to **10**, an interaction term between the value of ESO shares per employee and a dummy variable indicating high institutional or overseas investors' share in ownership. We defined the firms with high institutional or overseas investors' share as those with the share being in the top quintile. In order to examine whether the effect changes monotonically as the pressure from stock markets and shareholders grow, we also estimated with models using the top tertiles and top quartiles, but since we could not find conspicuous differences, we omitted these results. [1,2] **Table 11** presents only the coefficients of the value of ESO shares per employee and interaction term. Coefficients for other variables were largely similar to those for Model 1 in **Table 7** to 10, and were therefore omitted.

The coefficients for all of the interaction terms were positive and statistically significant. The effect of ESO plans in increasing added value is 1.5 times stronger for the group of firms that felt stronger pressure from the stock market. Increases in the institutional investor share in ownership and that of overseas investors had similar effects of increasing the ESO influence. The fact that no differences were found between the top tertile and top quintile as noted above, however, may suggest that when there is a moderate level of holding by institutional or overseas investors, further strengthening of external monitoring will not make a noticeable difference.

[1,2] As shown in **Figure 5**, the institutional investors and overseas investors' shares in ownership have changed substantially since 1990. For this reason, we used the following procedure to specify the groups. First, we took the average share in ownership for institutional investors (overseas investors) for each year, and then divided the ratio for each firm by the average ratio to compile a standardized series. Next, we calculated the within-firm average for the new variables over the observation period for each firm. Finally, we constructed dummy variables for the high holding ratio group which is comprised of firms that fall into the top quintile of the distribution of these average values.

Table 11 Interplays between ESO per employee and Ownership Structure in the productivity effects

	Fixed Effect Estimates（1989-2013）							
Dependent Variables	Value Added		Wages		ROA		Tobin's Q	
Lagged Explanatory Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ln(ESO per employee)$_{t-1}$	0.0680***	0.0680***	0.0204***	0.0204***	0.00870***	0.00870***	0.151***	0.151***
	(0.00787)	(0.00787)	(0.00279)	(0.00279)	(0.000902)	(0.000902)	(0.0206)	(0.0206)
ln(ESO per employee)$_{t-1}$ × high ownership share of institutional investors (5th quintile)	0.0374**		0.00321**		0.00291***		0.0314**	
	(0.0146)		(0.00146)		(0.00103)		(0.0135)	
ln(ESO per employee)$_{t-1}$ × high ownership share of foreign investors (5th quintile)		0.0375**		0.00321**		0.00291***		0.0314**
		(0.0146)		(0.00146)		(0.00103)		(0.0135)
Observations	20,207	20,207	18,928	18,928	18,948	18,948	19,344	19,344
R-squared	0.509	0.509	0.666	0.666	0.206	0.206	0.260	0.260
Number of firms	1,613	1,613	1,533	1,533	1,534	1,534	1,608	1,608

Notes: Other control variables have similar coefficients to those in Table 7-10 and thus are omitted.

Cluster-Robust standard errors in parentheses.

This discovery is consistent with the contention that when participation in ESO plans rises for the group of firms that feel strong pressure from shareholders, it offsets the entrenchment effect that arises from increases in the stable shareholding ratio, the excessive concern shown for employee interests, and other negative effects, strengthening the overall positive effect of ESO plans.

Similarly, the enhancing effect of ESO plans on wages, ROA, and Tobin's q was significantly higher for the group of firms that felt stronger pressure from the stock market. However, this effect was only 1.16 times, 1.33 times, and 1.21 times, or lower than the enhancing effect of 1.55 times on added value, so the results are somewhat inconsistent (Columns 3 – 8). But it is quite interesting that regardless of the strengthening of pressure from shareholders, the rents that accrue from the enhancing effect of ESO plan participation are also distributed to employees.

Complementarity with Stock Options

Next, we investigated whether the effect of ESO plan participation varied in relation to firm characteristics aside from ownership structure (see **Table 12**).

First, in our earlier analysis, based on the result that the increase in the value of ESO shares per participant was more effective than the rise in the participation rate in inducing the rise in productivity, we put forth the view that what is desirable is not necessarily an increase in participation by all employees, but rather the participation of core employees. One may make a logical inference from this view that if what is desirable is stock holding by a segment of employees, then stock options that are extended to all managers may suffice—ESO plans would not be needed. To investigate this point, we ran an estimation that added information on the presence or absence of stock options. The first column in **Table 12** shows our results from analyzing whether the effect of the value of ESO shares per employee varied in relation to the availability of stock options for directors and managers.[13] These results show that the stock

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[13] Data on stock options was obtained from publicly available information in Nikkei NEEDS-cges (Corporate governance evaluation system), and while it is not clear what the scope of the stock

Table 12. ESO Effects and Firm Characteritics

VARIABLES	(1) Stock Option	(2) Small Firms	(3) Young Firms
lnL	0.690***	0.714***	0.716***
	(0.182)	(0.178)	(0.177)
lnK	0.156	0.179*	0.165*
	(0.101)	(0.0990)	(0.0983)
lnL^2	0.0186	0.0193	0.0183
	(0.0159)	(0.0158)	(0.0158)
lnK^2	0.0128	0.0129	0.0132
	(0.00977)	(0.00970)	(0.00965)
lnK´lnL	-0.0379	-0.0406*	-0.0395*
	(0.0236)	(0.0234)	(0.0233)
ln(firm age)	0.421***	0.402***	0.420***
	(0.116)	(0.120)	(0.114)
ln(share of institutional investoirs)	0.0934***	0.0888***	0.0888***
	(0.00874)	(0.00842)	(0.00842)
ln(ESO per employee)$_{t-1}$	0.0762***	0.0847***	0.0799***
	(0.00796)	(0.00887)	(0.00800)
ln(ESO per employee)$_{t-1}$	0.000063		
× stock option dummy	(0.00106)		
ln(ESO per employee)$_{t-1}$		-0.0255***	
× med-to-small firm dummy		(0.00919)	
ln(ESO per employee)$_{t-1}$			-0.0110**
× young firm dummy			(0.00524)
Observations	19,615	20,207	20,207
R-squared	0.504	0.508	0.507
Number of nkcode	1,597	1,613	1,613

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

option dummy was not statistically significant, and that the coefficient of the interaction term was near zero. Therefore, the ESOP and stock options do not have a substitutive relationship, suggesting that shareholding in the firm not just by directors and managers but also more broadly by employees is effective in raising productivity.

The Heterogeneity of Effects due to Differences in Scale and Firm Age

It is generally believed that the smaller the firm, the greater the positive effect of any group incentive pay including ESO practices. The main reasons are: (1) mitigation of the free-rider problem; and (2) the team incentive effect is greater because employees have wider job responsibilities, and authority is delegated. Similarly, it would intuitively seem that new firms have stronger incentives to utilize the ESO plan than mature firms for the following reasons: (1) since growth firms have a strong desire to invest, they have a tendency to prefer compensation systems that make use of stock due to cash constraints; and (2) since new firms tend to attract personnel who are not risk avoiders, there is little resistance to participation in ESO plans. As for the actual effects, if efforts to develop new businesses are even more important for new firms, then ESO plan may be an effective practice for new firms in order to promote behavior that adopts a perspective for the long run using long-term incentives as well as encouraging cooperation at the same time.

In our analysis, we constructed a small firm dummy for the group of firms comprising the bottom tertile in terms of number of employees, and a new firm dummy for the group of firms comprising the bottom tertile in terms of firm age, and for Model 1 in **Table 7**, we ran an estimation while adding an interaction term for these dummy variables and the value of ESO shares per employee. Similar to the variable indicating high ownership share for institutional investors (overseas investors), we defined the standardized measure of size and firm age for each year then took the average over the observation period in order to compile a small firm

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option system is, and whether it is made available only to directors, or to all managers, and thus this data does not completely match our objectives, we believe that it is effective in allowing us to capture the overall effect of stock options.

dummy, and new firm dummy. While it is difficult to delineate a clear threshold, roughly speaking, the dummy designates firms with fewer than 800 to 900 employees, and firms that have been in existence for less than 45 years.[14]

The results presented in columns 2 and 3 of **Table 12** do not support the above hypothesis. The effect of participation in ESO plans is significantly lower the smaller and younger the firm. One possible interpretation is that there is a substitution effect. Comparatively smaller and younger firms offer more opportunities for promotion and have a comparatively easier time in evaluating individual performance, so promotions and other long-term incentives, and performance-based wages may work more effectively than in extremely large corporations. It is possible that since substitute incentive arrangements function well, the additional incentive effect brought by ESO plans is smaller. Another interpretation is that managements that allow employee participation through small group activities such as *Kaizen* is quite prevalent at traditional large corporations, and since ESO plans are seen complementary to such activities, the positive effect for traditional large corporations is more pronounced in the data. However, as seen from the comparison of coefficients, the effect of the value of ESO shares per employee is only one-third, one-fourth, and one-seventh less respectively than the reference group, so the difference is not that large.

To confirm the robustness of these results, we also ran estimations using not just the tertiles for small firms and new firms, but also using dummies for the quartiles and quintiles, but did not find large variations in the coefficients.

9. Conclusion

In this study, we have shown that the effect of ESO plan participation on productivity and corporate performance is on average positive, and that employees benefit from this effect

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[14] Therefore, the firms that fit into the group of small and new firms as defined here are much larger than the small and medium-sized firms, and much older than the new firms that we normally envision. Since we used a fixed effects model for our estimation, we needed to have sufficient observations for the observation period, which did not allow us to define a group with smaller and younger firms.

through higher wages. Furthermore, we have also shown that defining who is targeted by the ESO plan, how much and to whom matching contributions are paid are important factors influencing the effect, and that instead of increasing the participation rate, it is more important to raise the value of ESO shares held by core personnel. However, even in firms that offer stock options, the effect of ESO plans does not change, so it is important to keep in mind the need for financial participation by general employees. What is particularly interesting is that ESO plan participation has a particularly strong effect in firms that have high institutional investor/overseas investor share in ownership. This can be interpreted to be a result of the adverse effects arising from expanded participation in ESO plans – for example, excessive concern for the interests of employees, and the entrenchment effect arising from the increase in the stable shareholder holding ratio – being offset by market pressure, and enhancing the overall positive effect of ESO plans. These results mean that commitment toward employees and external monitoring, which are often viewed as substitutive, are actually complementary. It will be essential to accumulate further research on this point.

In the event that the ESO plan has a positive effect, another conceivable hypothesis is that there are practices that are complementary to the ESOP, and that it is possible that the implementation effect of these practices is detected as the effect of the former. For example, practices that encourage employee participation in decision-making, information sharing, and peer monitoring, or more broadly, a bundle of practices known as high-performance work systems including self-managed work teams, team incentives, cross-functional problem-solving teams, job rotation, may be introduced along with ESO plans, and participation in the latter may be enhancing the effect of these complementary practices.

However, the existence of such complementary systems suggests the possibility that the effect of ESO plans is dependent on the availability and operation of other systems, and therefore, that the effect of the ESO plans can differ widely among firms. If that is the case, then future efforts to systematically analyze these differences may allow us to understand the mechanisms at work. In our various analyses so far, however, we were not able to discover large heterogeneities in the ESO plan participation effect. In addition to the analyses presented above,

we have also compared industries such as steel, nonferrous metals, chemicals, electrical machinery, transport machinery, and other machinery where coordination is considered to be important, with other industries to investigate whether the effect of ESO plans varies across the industry groups, but could not detect a significant difference. There is a possibility that these results simply reflect that there is no correlation between the firm characteristics that we used, and the availability of other systems that enhance (or diminish) the effect of ESO plans. We will attempt to address these issues in our future research.

Finally, we also showed in this study that ESO plans have a productivity enhancing effect, and that part of the generated profits are returned to employees as wages, and moreover, that matching contributions will promote this effect. From these facts, can we claim that it is desirable to give ESO plans the same preferable treatment under the tax system that is extended in the U.S. and France? Basically, since no externalities and other phenomena that signify market failure are apparent, it seems that there is little room for the government to intervene. If there are merits for individual firms, they will take steps to actively adopt the ESO plan even without preferential tax measures, so there is no reason to implement tax incentives.

In fact, a greater concern is that latent adverse effects could arise from preferential tax measures such as excessive adoption of ESO plans and incentives for participation. If there are tradeoffs between the positive effects of ESO plans on productivity, and the negative effects such as the entrenchment effect as well as increases in the income risk of employees, there are also tradeoffs between the positive and negative effects on social welfare. In this case, the desirable level of matching contribution should be the level at which the marginal impacts of both effects are equal. There is a danger that preferential treatment under the tax system could push participation in ESO plans up to inefficient levels. In fact, Kim and Ouimet (2014) and other studies have shown in analyses based on U.S. data that the ESO plan's positive effect on productivity will be completely offset by negative effects for groups of firms whose ESO holding share exceeds 5%. If the income risks for employees are also taken into consideration, then ESO holding of ownership that exceeds 5% may have negative effects that exceed positive

effects. Therefore, extra caution needs to be exercised when considering the adoption of tax incentives.

However, before discussing policy interventions, it is important to note the possibility that considerable inefficiencies have arisen today because corporate management does not have a proper understanding of the true effect of ESO plans, and thus may have lagged in implementing them. Since the current ESO share is indeed around 2%, we can expect on average that there will be an increase in social welfare with further participation. The first thing that is desirable from a policy perspective is to attempt to more widely publicize the effects of ESO plans.

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