Corporate Structure and Monitoring: Comparison of Alternative Systems of Corporate Governance

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This Version; May, 2006

Abstract

Japanese traditional corporate system has long been argued to produce a lower level of monitoring than the US corporate system, as the traditional Japanese system is "home-grown." To address this issue, a new style of corporate system referred to as "company with committees" was recently introduced in Japan. This paper develops a model based on the framework of Hermalin and Weisbach[1998], and compares the equilibrium level of monitoring under the new Japanese system with those under the traditional Japanese system and the U.S. system. We find that the new system does not necessarily produce more monitoring than the traditional system. Moreover, we find that an intense monitoring is not generated by simply changing the governance structure, but rather it may be achieved by moving some key parameters such as the benefit of the CEO.

Keywords: Monitoring; Japanese Traditional Corporate Structure; The New Japanese Structure; US Structure

JEL Codes: K22, P51

*Ph.D. Student, The University of Tokyo, Tokyo, Japan. Email: megsato@nifty.com I appreciate Takashi P. Shimizu and Taizo Takeno for their advice and helpful suggestions. I also appreciate Masahiro Okuno and Masaki Nakabayashi for their helpful comments. I acknowledge Hideki Kanda and Sadakazu Ohsaki for their comments on law. I am most grateful to Kazuya Kamiya, Hideshi Itoh, and Richard A. Braun for their advice and invaluable supports which had made enormous difference to me; as always, I learned a lot and benefited so much from them. Any errors are my own.

1 Introduction

This paper compares the level of monitoring produced by three different governance structures: the US system, the traditional Japanese system, and the new Japanese system. In particular, we analyze the monitoring level of a newly introduced corporate structure following recent amendments of Company Law in Japan. For long years doubts have been raised about the monitoring level produced by the "home-grown" governance system which we refer to as the traditional Japanese system. It has been argued that the board monitoring of the CEO is relatively weak under the traditional governance system where the board and the CEO are long-term employees and legally related to each other. To address this issue, the law was amended in 2002 to give some companies a choice of governance structure of the traditional Japanese system or the new Japanese system. The newly introduced legislation adopts the framework of the US governance system where the board and the CEO are basically not related, and hence the new system is expected to produce stronger monitoring than the traditional system. Our question is whether this is in fact so. The results, however, show that the new system does not necessarily produce more monitoring than the traditional system. Moreover, we find that the traditional Japanese governance system may produce the highest level of monitoring followed by the new Japanese system, and the US system.

We briefly go over the new policy implementation preceding the details of the governance systems. Before 2003, there was only one style of corporate governance in Japan which we refer to as the traditional Japanese system. This system, however, has been argued to yield low level of monitoring. One of the reasons is that this system is a "home-grown." We define "home-grown" as a system in which most or all of the directors and the CEOs usually called *shacho* (presidents) are long term employees and also legally related to each other. Legally related means the law states that the CEO must be appointed from the current directors. [Company Law, art. 362 paras. 2[3], 3.][1] Having long term employees affects the board composition and also limits the pool of CEOs under the law which states CEOs must be selected from the board of directors. For example, if one of the directors is retired, one of the long-term employees is promoted to takeover the ex-director's post, and at the same time, this new director becomes a candidate for the future CEO. The claim is under such system, a strong personal relationship among directors and CEO is created and hence it makes it more costly for the directors to monitor the

[1] We use the new company law which is effective from May 2006.

CEO as compared to the directors with less relations with the CEO.[2] To address this issue of the traditional structure, some new articles are introduced into Company Law to allow large companies[3] to adopt new corporate structure referred to as "company with committees."[4] Under this new system of corporate governance, the long term relations among directors and the CEOs are reduced. The law came effective in 2003, and now large companies in Japan can choose to adopt the new committee style or adhere to the existing traditional style.

Now we turn to describe some statutory framework of the two Japanese corporate governance systems. The traditional Japanese governance system is quite different from the US governance system in that the CEO must be selected from the board of directors, whereas the board of directors is the body responsible for decision makings of the company and also entrusted of monitoring the CEOs. [Company Law, art. 362 paras. 1, 2.][5] In practice, becoming a director is a result of promotion from a successful employee.[6] In addition to these two bodies, companies must comprise a board of statutory auditors. [Company Law, art. 328 para.1.] Statutory auditors referred to as *kansayaku,* are assigned internally for checking the legality of corporate activity, and they cannot serve in the board of directors let alone become CEO. Thus we do not include statutory auditors in our model for their job is limited and they account for only small fraction in practice. On the other hand, the corporate structure for the new Japanese system is more simple. Its governance framework is similar to that of the US system. That is, the board of directors and the CEO are the two main legally required bodies in the governance mechanism. No such body as statutory auditors are required under this new system. Moreover, the post as a CEO is not restricted to the existing directors and literally almost anybody besides the directors we note below may become a CEO. First, all directors serving in audit committee are forbidden to become a CEO. An audit committee is one of the three committees[7] that the new governance system is required to constitute within the board of directors [Company Law, art. 404 para.

[2]It is not an obligation to appoint outside directors under the traditional system. Egashira [2004] states that the board of the new Japanese system is expected to monitor the CEO with more scrutiny because of the presence of the outside directors.

[3]Large company [Company Law Art. 2-6.] is defined as a company with assets of at least 500 million yen, or liabilities of at least 20 billion yen. Note that from May 2006 the choice of the alternative system is given to companies that comprise the board of directors and certified public accountant, and the size of the company no longer matters.

[4]See See Egashira [2004] and Sarra and Nakahigashi [2002].

[5]Also see the Supreme Court decision of 22 May 1973, 27-5, min-shu, 655.

[6]See Abegglen and Stalk [1985].

[7]The three committees are audit committee, compensating committee, and nominating committee. [Company Law, art. 400 paras, 1,2,3,4.]

2.] and they are especially responsible for monitoring the CEO. In addition to the monitoring done by the audit committee, the board as a whole is also responsible for the monitoring of the CEO. To effect this purpose, the law states that the majority of the directors in each committee must be outside directors who are also forbidden to become a CEO. [Company Law, art. 2-15, art. 400 paras. 1,2,3,4.] However, directors including outsiders are not forbidden to serve in the several committees at the same time. Therefore, it is innocuous to assume that the outside directors serving in the audit committee also sit in the other two committees, which in turn implies the directors those who serve in the audit committee may not become a CEO, but all the other directors can equally become a CEO under our new Japanese model.

Given these facts, general consensus is that the board of directors in the new governance system will monitor more intensively as versus that of the traditional Japanese governance system. The newly introduced legislation, therefore, is expected to increase the level of monitoring. Our goal is to find out whether this is in fact so. We can describe the summary of the structure and goal of this study as follows. Our model is based on Hermalin and Weisbach [1998] that deals with solely on the US system, but this study shows their model works well to compare the monitoring levels generated by the US, the traditional Japanese, and the new Japanese systems, on a broader context. We start with the US system of governance structure. Here, we assume the board and the CEO are the two separate bodies, and thus a new CEO is chosen from outside of the company. Then, we model the traditional Japanese model. Under this system, we assume that all directors and the CEO are home-grown and legally related to each other, and hence the new CEO is always appointed from the board of directors. Finally, we model the new Japanese system which is built somewhat between these two models: some directors (those who do not serve in the audit committee) are related to CEO while the others are not. As a result of this comparative analysis, this paper successfully gives the insight to evaluate three different systems. Hence, this study deducts some normative implications from their model, which was originally a positive analysis of the US specific conditions.

To be more specific, contrary to what may be expected, we find that the new Japanese system does not necessarily produce more monitoring than the traditional system. Moreover, the traditional system may even generate intense monitoring than both the US system and the new Japanese system if the benefit of the CEO is sufficiently large. If the benefit is fairly small, the opposite ordering is true, and the traditional Japanese governance system produces the worst as perceived by many. Benefit is exogenously paid to the CEO at the end of the game.

It can be interpreted as either pecuniary or non-pecuniary, such as a retirement allowances, a reputation for being a good manager, and so on. The logic behind these results are that the monitoring level is determined through Nash bargaining between the board and the CEO, and its intensity is largely affected by the total utility of all executives those participate in the bargaining process. That is, participants of negotiation act in a way to avoid a pay out to a person who is not involved in the bargaining process. (e.g. a new CEO or a new director who will move up to the executive class in the future). Hence, it is important to emphasize that although the newly adopted legislation is designed to set up the new governance structure based on the US style which is less "home-grown," merely adopting the formality does not affect the monitoring level. Thus, the way they implement the law was flawed. This is consistent with the argument offered by Gilson and Milhaupt [2005] who examined the recent amendment in Japanese corporate governance structure in their case study, and conclude that the adoption of this new system is formal but not functional convergence of the US system.

Now, at this point, one might ask "Is more monitoring a good thing?" As we saw the cases of Enron and Seibu, the CEOs do not always take the best actions for the shareholders and end up decreasing the corporate value. Thus, in this paper, we take it as given that more monitoring is good because in our model, intense monitoring increases the final output of the firm and in turn increases shareholder value.

The rest of the paper is organized as follows. The next section of the paper provides some specifics on the basic game structure which are common in all three governance structures. The basic structure is built on Hermalin and Weisbach [1998]. Section 3 describes the US model, an environment where the board and the CEO are not related. Section 4 provides the traditional Japanese model where the board and the CEO are related. Section 5 provides the new Japanese model which is a combination of the US model and the traditional Japanese. Moreover, we show that this model is the generalization of all three systems. Section 6 concludes.

2 Game Structure

We begin with some specifics on the timings. We consider the strategic interaction between the CEO and the board in 7-stage game in this paper. This is common in all three governance systems. In section 2.2 we explain the concerns and interests of the players. We assume that there are 1 CEO, and n directors throughout the game, and we refer to the total of the directors and the CEO as "executives." We also assume that directors make a decision collectively, so the board of directors can be regarded as 1 player. In section 2.3, we provide the formal model which is extended to three separate environments: the US governance system, the traditional Japanese governance system, and the new Japanese governance system. The model we present here is built on Hermalin and Weisbach [1998].

2.1 Timing

In what follows, we provide some specifics on timing.[8] There are 7 stages. The three exogenous variables are, number or directors n, and the initial board composition $\overline{k}_{0,}$ and the benefit b.

1. In the 1st stage, a new CEO is hired. Nature decides whether he has high-ability (H) or low-ability (L) with probability of $\frac{1}{2}$. Neither the board nor the CEO knows the true ability. When the game proceeds, there are two stages where the board obtain a signal on the ability. If they believe the probability of the CEO being type L is more than $\frac{1}{2}$, they replace the incumbent CEO with the new CEO.[9] The prior estimates for the newly hired CEO at any stage are $\frac{1}{2}$ for both abilities.

2. In the 2nd stage, the CEO works for a while and produces a signal y_1, which is a stochastic function of the CEO's ability and is the noisy indicator of the true ability. $y_1 \in Y = \{y_H, y_L\}$. The board may receive some share from $y_{1,}$ but primary usage of y_1 is to update CEO's ability by obtaining this signal.

3. In the 3rd stage, the board and the CEO update the CEO's ability according to the outcome in the 2nd stage, and the board decide to retain or remove him.[10] The board decision is determined by the final expected payoff based on the Bayes' update. When the incumbent CEO is removed, a new CEO is hired.

Now at this point, we emphasize that stages 1 through 3 are the preparation stages for the analysis we focus from stage 4 onwards.

4. From the 4th stage onwards, the way the board interact with the CEO differs by the observation of y_1 in the previous stage. If the incumbent CEO produces good $y_{1,}$ he is retained from the 3rd stage and hence gains the bargaining power and the continuing directors and this CEO proceed into negotiation. They negotiate over the wage of the CEO and the new board

[8] See Timeline in Figure 1.

[9] For simplicity, we use $\frac{1}{2}$, but of course this can be more general.

[10] When CEO is believed to be a bad match, intuitively he will be fired in the US companies. But in Japanese companies they are rather forced to quit CEO.

composition. When Nash bargaining succeeds, the wage of the CEO w, and the new board composition denoted $\overline{k}_1$ is endogenously determined. Board disutility is a function of $\overline{k}_1$, which is a measure of a lack of independency of the whole board. After the negotiation, all the directors in this new board act collectively and choose the monitoring level as to maximize the utility of the board.[11] We denote the monitoring level as ζ, and assume that this is synonymous with the probability of succeeding in obtaining an additional information. The wage w is paid to the CEO right after the negotiation regardless of whether or not the CEO may survive to the last stage.

If the bargaining fails, we assume the CEO leaves his position and the board hire a new CEO. Another case in which a new CEO is hired is a case that the incumbent CEO was thought to be a bad match in the 3rd stage. In both cases, the board beliefs on the ability of the CEO goes back to $\frac{1}{2}$ as they were in stage 1. We assume that the newly hired CEO in either case does not have any bargaining power so there will be no negotiation regarding the wage of the CEO and the filling of the vacancies in the board. Thus, in these two cases, the board whose level of independency is $\overline{k}_0$ determine both monitoring level and the wage of the CEO. They maximize their expected payoff given that they guarantee at least the threat point of the newly hired CEO. w is paid to the new CEO right after the board determine its level, regardless of whether the CEO may survive to the last stage or not. Also note that w in these cases may become negative. (This is shown in Appendix.)

5. In the 5th stage, the board update the ability of the CEO by observing signal y_2. The board obtain an additional signal $y_2 \in Y = \{y^H, y^L\}$ about the ability of the CEO only when they succeed in monitoring. This is equivalent to saying they obtain y_2 with probability ζ. The board incur private cost $\overline{k}_1 \cdot d(\zeta)$ in obtaining this additional signal.

6. In the 6th stage, the board decide to retain or remove the CEO. They retain the CEO who is believed to have H ability, and remove if he is assumed to have L ability and replace a new CEO. With probability $1 - \zeta$, the board fail to get an additional signal y_2 on the CEO's ability and they have no choice but to retain the incumbent CEO.

7. At the last stage, the proceeds of production X are realized. $X \in \{X_H, X_L\}$. The board obtain $\rho X = x$ from this total value of the firm. $(1 - \rho)X$ will be distributed to shareholders, investments, and so forth. The benefit b is paid out to the CEO who survived to this last stage.

[11] The board is maximizing their expected payoff with respect to $\overline{k}_1$, but we show in *Proposition 1,3,6* that when $\overline{k}_1$ is determined, ζ is uniquely pinned down and hence, we may regard as if the board maximize their expected payoffs with respect to ζ.

2.2 The Players' Concern and Interests

2.2.1 The CEO's Concern

The CEO, whose ability is determined either high or low by nature, is concerned about surviving the game till the last stage in all three governance models. His job is to produce y_1, y_2, and X which are all stochastic function of the ability of the CEO. X is the final product and is the liquidation value of the firm realized at the last stage of the game. y_1, and y_2 are each produced during the game in this order and they appear to the board as signals on the true ability of the CEO. We assume y_1 is observed by the board without any cost, but y_2 is obtained only when the board succeed in monitoring. Each time the board obtain signals, the CEO's ability is updated by the board by the Bayes' rule and they decide to retain or remove the CEO; when the CEO is considered to have low ability, he is removed and a new CEO who is expected to produce higher X is hired and takes the ex-CEO's position from the point he is replaced. We assume that the reservation utility of the CEO who's been removed is 0. When the CEO is thought to have high ability, he is retained and he proceeds his job till the end of the game. The CEO's payoffs are the wage w and the benefit b. w is determined in the negotiation and paid to the incumbent CEO right after the negotiation regardless of whether or not he may survive to the last stage. b is a benefit exogenously given to the CEO at the last stage of the game. b permits some interpretations, such as bonus, retirement allowances, reputations, and fringe benefits.[12] The feature of this game is that the CEO does not exert effort in producing the goods throughout the game. Thus the true ability determined by nature is what matters for both players. The more signals the board obtain from the CEO, it is more likely that CEO puts himself in the risk of getting removed by the Bayes' update. There is no way to prevent the board from obtaining free signal y_1, but since signal y_2 is only available to the board when they monitor the CEO with certain intensity, the CEO certainly wants to reduce the monitoring level. The CEO who has been retained for being expected as "high-ability" after producing y_1 gains the bargaining power to negotiate over w and the composition of the board which directly affects the monitoring level. On the other hand, any CEO hired in the middle stage of the game has no bargaining power at all.

[12] In Japan, the CEOs who fulfilled a duty without causing any trouble are usually given a post as advisers etc., which is referred to as *Soudan-yaku,* or *Komon* even after the retirement. They may no longer serve in the board of directors, but they receive a certain amount of benefits.

2.2.2 The Board's Interest

The board interest is basically the same in three governance models but there are some differences among them based on the board structure. We start with the common interest. The board, whose cost of monitoring is a function of the level of lack of independency denoted $\overline{k}_0$, is interested in maximizing the final output of the firm X, which is a stochastic function of the ability of the CEO. $\overline{k}_0$ is a total of k_is, where k_i is a measure of each director i's lack of independence from the company.[13] [14] That is, $\overline{k}_0 = \sum_{i=1}^{n} k_i$. The board disutility is a function of $\overline{k}_0$, and the more independent the board is from the CEO, the less cost it is for them to monitor the CEO. (We express how $\overline{k}_0$ affects the board utility later in section 2.3). The initial composition of the board $\overline{k}_0$ remains the same until it is endogenously changed; i.e. by the negotiation between them and the CEO. We denote $\overline{k}_1$ for the new board level of independence endogenously determined by negotiation. We assume that some directors will leave the board[15] in the middle of the game, and to fill in the vacancy, the remaining directors and the CEO negotiate over the new candidate. The essence of the negotiation is whether they hire a director who monitors with scrutiny or with less intensity. Since we assume that it is less costly for directors who do not have personal relations with CEO, the more independent the new director is, the more independent the whole board would become and in turn they monitor more intensively.

The board expected payoff is composed from the expected utility which is a share from X, which we denote as $\rho X = x$, and disutility of monitoring and the wage they pay to the CEO. To raise X as high as possible, the board act to get rid of the "low" ability CEO. Thus according to the signals they obtain, their job is to either keep the CEO or remove and hire a new CEO. We assume the level of monitoring is the probability of obtaining an additional signal, and it depends on how independent the board is from the CEO.

The difference among the three governance models are that in addition to the above arguments, we assume that directors in traditional Japanese model can become CEO themselves. We also assume that in the new Japanese system, some directors may become CEO while some may not.

[13] The more independent the directors are, the less personal relations they have for each other. Thus it is assumed that less costly it is for more independent directors to monitor the CEO.

[14] The smaller the k_i, the more independent the director is. Thus, smaller the $\overline{k}_m$, the more independent is the board.

[15] For example, retirement.

2.3 The Formal Model

We assume the utility function for each director to be

$$\pi_D^i = \frac{x}{n} - k_i \cdot d(\zeta) - \frac{w}{n}. \tag{1}$$

$\frac{x}{n}$ is the utility of each directors in the board, where $x = \rho X$ is a share from the total liquidation value of the firm, and hence a stochastic function of the CEO's ability. There are n directors in the board. Since the board's utility is a function of total firm's value, we can assume that the directors' interests are aligned with those of shareholders. k_i is a lack of each director's independency from the company and $d(\cdot)$ expresses the disutility of monitoring and is a common, strictly increasing, strictly convex, twice-differentiable continuous function. ζ is the probability that the board obtain an additional signal y_2, about the CEO. w is the wage they must pay to the CEO. Thus the utility of the board consisted of n directors is given as

$$\Omega_{Board} = \sum_i \pi_D^i. \tag{2}$$

The CEO's profits are the wage w determined in the negotiation and the benefit b given to the CEO who survived to the last stage of the game. The CEO dismissed prior to this stage does not receive any b. We assume $b > 0$.

The relations between the final outcome X_j, $j \in \{H, L\}$, where $X_H > X_L$, and the ability of the CEO a_i, $i \in \{H, L\}$ are assumed as follows. We start with $P_j^i = \Pr\{X_j | a_i\}$. For example, P_L^H is the probability of CEO producing a low outcome conditional on high ability. We assume

$$P_H^H > P_H^L \tag{3}$$

From (3), (4) is derived.

$$P_L^L > P_L^H. \tag{4}$$

We denote $E(X_j|a_i) = P_H^i X_H + P_L^i X_L \equiv \check{X}^i$. We assume that the board receive $\rho\check{X}^i$ from this whole amount. Then it is obvious from (3) and (4) that $\rho\check{X}^H \equiv A > B \equiv \rho\check{X}^L$.

The first signal y_1, $y_1 \in Y = \{y_H, y_L\}$ is obtained in stage 3 and we denote by μ_j^i the posterior probability that CEO has ability a_i conditional on the observation of $y_1 = y_j$ by the Bayes' rule,[16] $\mu_j^i \equiv \Pr(a_i | y_1 = y_j)$. We assume $\mu_H^H > \frac{1}{2} > \mu_H^L$, and $\mu_L^H < \frac{1}{2} < \mu_L^L$. The expected

[16] Thus, when the CEO sends its first signal y_1 at stage 3, the board believe the CEO has H with probability μ_H^H and has L with probability μ_H^L . Likewise, when the board observe poor y_1 at this stage, the board believe the CEO has H with probability μ_L^H, and has L with probability μ_L^L .

payoff at this point is $\mu_j^H A + \mu_j^L B$. We denote this as $\varphi_j \equiv E(X|y_1 = y_j)$. The expected payoff conditional on an entirely new CEO is $\frac{A+B}{2}$. We denote this as $\varphi_N \equiv E(X)$. Thus, the CEO whose performance is "poor" for y_1 is removed at this stage because his expected payoff is lower than that of the new CEO.[17] Therefore, if the board observe "good" y_1, they retain the incumbent CEO but if they observe "poor" $y_{1,}$ they remove the incumbent CEO and hire a new CEO.

In stage 4, we must be careful that based on the signal y_1 the board observed in the previous stage, the interaction between the board and the CEO differs. If they have observed "good" y_1, the incumbent CEO and the board enter into negotiation and decide the wage w and the new board composition $\overline{k}_{1.}$ If they have observed "poor" y_1, then the incumbent CEO has been takenover by a new CEO and the board interact with this new CEO from stage 4 onwards. In this latter case, the new CEO does not have any bargaining power, thus the board alone choose the wage and the their new composition.

In either case, the new board composition is determined as $\overline{k}_1$, which is a measure of the monitoring cost. Thus, in the 5th stage the new board act collectively and maximize their whole utility with respect to the monitoring level ζ. With probability ζ, they succeed in obtaining an additional signal $y_2 \in Y = \{y_H, y_L\}$. With $1-\zeta$, they fail to get $y_{2,}$ and hence have no choice but to retain the current CEO.

In the 6th stage, the board decide to retain or remove the CEO based on signal $y_{2.}$ We denote by $\widehat{\mu}_j^i$ the posterior probability based on a Bayes' rule that CEO[18] has ability i conditional on the observation of y_2 and a "good" y_1. $\widehat{\mu}_j^i \equiv \Pr(a_i|y_1 = y_H, y_2 = y_j)$. [19] We assume $\widehat{\mu}_H^H > \mu_H^H$, $\widehat{\mu}_L^H \leq \frac{1}{2}$. The expected payoff X at this point is expressed as $\widehat{\mu}_j^H A + \widehat{\mu}_j^L B$. We denote this as $\varphi_{Hj} \equiv E(X|y_1 = y_{H,}\ y_2 = y_j)$.

Next, we denote by $\eta_j^i \equiv \Pr(a_i|y_2 = y_j)$ the posterior probability that the new CEO[20] hired from stage 3 has ability i conditional on the observation of y_2. We assume $\eta_H^H \geq \mu_H^H$, $\eta_L^H \leq \mu_L^H$, that is signal y_2 is more informative than signal y_1. The expected payoff X at this point is expressed as $\eta_j^H A + \eta_j^L B$. We denote this as $\varphi_{N\text{ j}} \equiv E(X|y_2 = y_j)$. From these assumptions it

[17] From (3) and (4), $\mu_L^H A + \mu_L^L B < \frac{1}{2}(A+B)$

[18] This is the case that board obtained "good" y_1 in the 3rd stage, and hence the incumbent CEO is still on the role.

[19] Thus, conditional on the observation of "good" y_1 in the 3rd stage, if the board observe "good "y_2 again, they believe the incumbent CEO's ability is H with probability $\widehat{\mu}_H^H$, and is L with probability $\widehat{\mu}_H^L$. If they observe "poor" $y_{2,}$ they believe the CEO's ability is H with probability $\widehat{\mu}_L^H$, and has L with probability $\widehat{\mu}_L^L$.

[20] This is the case which the board obtained "poor" y_1 and the new CEO has takenover the post of the ex-CEO.

is clear that the expected payoff of the board is lower if they keep the CEO who has produced "poor" y_2 as versus hiring a new CEO, and hence they remove the CEO who produces "poor" $y_{2.}$. Thus, $\varphi_{HL} = \varphi_{NL} = \varphi_N$.

We also assume

$$\Pr(y_2 = y_H | y_1 = y_H) \equiv Z > Q \equiv \Pr(y_2 = y_H) \tag{5}$$

From the next section onwards, we focus on the case in which the board observed "good" y_1 in the 3rd stage. The case in which they observe "poor" y_1 is shown in Appendix. However, the results in both cases precisely give same ordering.

3 Case 1: The US System

3.1 The Expected Value for the US Governance System

Given the above arguments, now we focus our attention on each case. The utility for the US board is

$$\Omega_1 = \zeta_{US}[Z \cdot \varphi_{HH} + (1 - Z) \cdot \varphi_N] + (1 - \zeta_{US})\varphi_H - \overline{k}_1 \cdot d(\zeta_{US}) - w. \tag{6}$$

The first term of the above expression is the expected payoff after the successful monitoring, and the second term is the expected payoff after the board failed to monitor the CEO. The first term is the expected payoff when they obtain a good signal from the CEO, and the second term is the expected payoff when they replace the CEO with the new CEO. The third and the forth terms are the cost of monitoring and the wage they must pay. Ω_1 is concave in ζ_{US}, where $d(\zeta_{US})$ is strictly convex, and twice continuously differentiable function. All the directors in the board act collectively and choose the monitoring level as to maximize Ω_1. Thus, the first-order condition for ζ_{US} is

$$\frac{\partial \Omega_1}{\partial \zeta_{US}} = Z \cdot \varphi_{HH} + (1 - Z) \cdot \varphi_N - \varphi_H - \overline{k}_1 \cdot d'(\zeta_{US}) = 0. \tag{7}$$

The above expression is sufficient as well as necessary.

Proposition 1 *Define $\zeta^*_{US}\left(\overline{k}_1\right)$ to be the solution to (7). The intensity with which the board monitor the CEO, $\zeta^*_{US}\left(\overline{k}_1\right)$, is decreasing in its collective lack of independence.*

Proof. 1) From the implicit function theorem,$-\overline{k}_1 \cdot d''(\zeta^*_{_{US}}(\overline{k}_1))\zeta^*_{_{US}}{}'(\overline{k}_1) - d'(\zeta^*_{_{US}}(\overline{k}_1)) = 0$, and hence $\zeta^{*\prime}_{_{US}}(\overline{k}_1) = -\frac{-d'(\zeta^*_{_{US}}(\overline{k}_1))}{-\overline{k}_1 \cdot d''(\zeta^*_{_{US}}(\overline{k}_1))} < 0$. Therefore, $\zeta^{*\prime}_{_{US}}(\overline{k}_1) < 0$. ■

The implication of Proposition 1 is that when the board is consisted with directors who have less relations with the company or the CEO, the level of monitoring increases as versus the board with more relations.

3.2 Negotiation Between the CEO and The Board

The negotiation is held between the continuing directors and the CEO who survived the third stage. The board bring their expected utility subtracted by the threat point into the negotiation;

$$\begin{aligned} &\zeta_{_{US}}[Z \cdot \varphi_{HH} + (1-Z) \cdot \varphi_N] + (1-\zeta_{_{US}})\varphi_H \\ &-\overline{k}_0 \cdot d(\zeta_{_{US}}) - w - \theta_0^{Board}. \end{aligned} \tag{8}$$

The expected utility subtracted by the threat point of the CEO is

$$\left[\zeta_{_{US}} \cdot Z + \left(1-\zeta_{_{US}}\right)\right] b + w. \tag{9}$$

θ_0^{Board} is the threat point for the board, which is the expected utility if they hire a replacement CEO. Let V_0 be the expected earnings of the replacement CEO. Denote the fixed level of independency of the board as $\overline{k}_0$. Since the prior belief for the newly hired CEO after the negotiation failed is $\frac{1}{2}$ for the quality of the match, V_0 is expressed as

$$V_0 = Q \cdot \varphi_{NH} + (1-Q)\,\varphi_N.$$

Hence, θ_0^{Board} can be written as

$$\theta_0^{Board} = \zeta^*_{0_{US}} V_0 + (1-\zeta^*_{0_{US}})\varphi_N - \overline{k}_0 \cdot d(\zeta^*_{0_{US}}), \tag{10}$$

where $\zeta^*_{0_{US}}$ is the optimum level of monitoring chosen by the board if they hired a new CEO. The threat point for the CEO, on the other hand, is 0. The participation constraint is satisfied[21] and they enter into negotiation. The board and the CEO choose the optimum $\overline{k}_1^*$ and w^* to maximize the following Nash product;

[21] Proof is in the Appendix.

$$V_1^T = \left\{\left[\zeta^*_{US}\left(\overline{k}_1\right) \cdot Z + \left(1 - \zeta^*_{US}\left(\overline{k}_1\right)\right)\right] b + w\right\} \times \left\{\zeta^*_{US}\left(\overline{k}_1\right) \cdot [Z \cdot \varphi_{HH} + (1 - Z) \cdot \varphi_N] + (1 - \zeta^*_{US}\left(\overline{k}_1\right))\varphi_H - \overline{k}_0 \cdot d(\zeta^*_{US}\left(\overline{k}_1\right)) - w - \theta_0^{Board}\right\}. \tag{11}$$

$\overline{k}_0$ in the above expression indicates the directors who will continue to sit on the board after the negotiation are the participants of the Nash bargaining. Define the solution for $Max\ V_1^T$ as $\overline{k}_1^*$ and w^* , then the monitoring level is denoted as $\zeta^*_{US}(\overline{k}_1^*)$. The equilibrium level of monitoring is expressed as[22]

$$d'\left(\zeta^*_{US}(\overline{k}_1^*)\right) = \frac{1}{\overline{k}_0}\left\{Z\varphi_{HH} + (1 - Z)\varphi_N - \varphi_H - (1 - Z)b\right\}, \tag{12}$$

which establishes:

Proposition 2 *The higher the benefit of the CEO, the less the board monitor under the US system.*

The implication of this proposition is that the level of monitoring ζ_{US} is negatively related to the benefit b under the US governance system. Notice that we are assuming any director cannot become a CEO under the US system, and also if an incumbent CEO is removed, a new CEO must take over his job. This simply means if the CEO is removed after the monitoring, a new CEO who was not involved in the Nash bargaining will be hired from a pool of CEOs outside of the company. Hence, benefit b is given to a new CEO who was not involved in the Nash bargaining. We refer to the effect of giving some amount of total profit of the firm to the party who is not involved in the bargaining process as "leak." The higher is b, the higher is the amount of "leak." To avoid this " leak," the board decrease the monitoring level to keep the incumbent CEO. Hence, when b becomes high, the board bargain to act in a way to reduce the monitoring level. See the graph for the US system in Figure 2.

[22] Proof is in the Appendix.

4 The Traditional Japanese System

4.1 The Expected Value for The Traditional Japanese Board

Now, we derive the utility function of the board for the traditional Japanese system in which all directors and the CEO are assumed to be home-grown. Again, there are always $n+1$ executives; n directors and 1 CEO. A director i becomes a CEO by a chance of $\frac{1}{n}$. However, when one of the executives is removed of his position (it could be that he is leaving the company or he may be given a post as a counselor, who is no longer responsible for the management), one of the long term employees is promoted to executive to always hold the size $n+1$. Thus the director i's utility function expressed as

$$\begin{aligned} \pi_{D2} &= \zeta_{_{TJ}} \left[Z \cdot \frac{\varphi_{HH}}{n} + (1-Z) \left(\frac{n-1}{n} \cdot \frac{\varphi_N}{n} + \frac{b}{n} \right) \right] \\ &\quad + (1-\zeta_{_{TJ}}) \cdot \frac{\varphi_H}{n} - k_i \cdot d(\zeta_{_{TJ}}) - \frac{w}{n}. \end{aligned}$$

The first term of the above expression is the expected payoff of the director when they succeed in monitoring. Z is the probability of obtaining a good signal, and $(1-Z)$ is the probability of obtaining a bad signal. When they obtain a good signal, they retain the CEO, and hence the expected payoff is $\frac{\varphi_{HH}}{n}$. But when they obtain a bad signal, they replace this CEO with a new CEO; with probability $\frac{1}{n}$, one of the directors is promoted to a CEO and receive b at the end of the game, and the rest of the directors remain in the board and receive a share from φ_N. There are two issues we must note here. One is when a director becomes a CEO, he no longer receives a share from φ_N. The other is when the previous CEO (the one who sent a bad signal) is removed, the number of the executives becomes n, but in order to keep the number of executives to be $n+1$, one of the long term employee is promoted to a director and he receives a share from φ_N as well as the other directors. Hence, the utility of the board as a whole is expressed as

$$\begin{aligned} \Omega_2 &= \zeta_{_{TJ}} \left[Z \cdot \varphi_{HH} + (1-Z) \left(\frac{n-1}{n} \cdot \varphi_N + b \right) \right] \\ &\quad + (1-\zeta_{_{TJ}})\varphi_H - \overline{k}_1 \cdot d(\zeta_{_{TJ}}) - w. \end{aligned} \tag{13}$$

All the directors in the board act collectively and choose the optimum level of monitoring. That is, maximizing Ω_2 with respect to $\zeta_{_{TJ}}$,

$$\begin{aligned}\frac{\partial \Omega_2}{\partial \zeta_{TJ}} &= Z \cdot \varphi_{HH} + (1-Z)\left(\frac{n-1}{n}\varphi_N + b\right) \\ &\quad -\varphi_H - \overline{k}_1 \cdot d'(\zeta_{TJ}) \\ &= 0.\end{aligned} \tag{14}$$

We determine the solution to the above expression to be $\zeta^*_{TJ}(\overline{k}_1)$.

Proposition 3 ***(Analogous to Proposition 1)*** *Define $\zeta^*_{TJ}(\overline{k}_1)$ to be the solution to (14). The intensity with which the board monitor the CEO is decreasing in its collective lack of independence.*

The proof of Proposition 3 proceeds in a similar way to the proof of Proposition 1.

4.2 Negotiation Between the CEO and The Board

Now the CEO and the continuing directors enter into the negotiation. We start with the threat points for both players. The traditional board is highlighted by the "long-term" employees and this reflected in the model as follows. The post as a CEO is held concurrently by the director. Each time the CEO is removed, one of the board members is chosen to become a CEO. We assume that the threat point for the CEO who has been removed is 0 as in Case 1.[23] Whenever there arises a vacancy in the board, one of the long-term employees are promoted to a director ("home-grown") to compensate the loss in order to keep the board size n. The threat point for the board is therefore expressed as

$$\begin{aligned}\theta_0^{Board} &= \zeta^*_{0_{TJ}} \cdot Q\left[(n-1)\varphi_{NH} + b\right] + \zeta^*_{0_{TJ}}(1-Q)\left((n-2)\cdot\varphi_N + \frac{n-1}{n}\cdot bn\right) \\ &\quad +(1-\zeta^*_{0_{TJ}})\left[(n-1)\varphi_N + b\right] - \overline{k}_0 \cdot d(\zeta^*_{TJ}).\end{aligned} \tag{15}$$

[23] In Japanese practice, when CEO resigns, he is often given an alternative post in the company. He may remain in the board as a plain director, or he may be given a post out of the board, such as an advisor.

See the Supreme Court decision of 20 Dec, 1966, 20-10, *min-syu,* 2160.

Also see Kanda [2006].

In such cases, the threat point of the incumbent CEO will not be 0. When CEO remains in the board, his threat point becomes that of the directors, but when he becomes an advisor, he receives a constant amount. In the former case, we must build another model, but it is more natural in practice that once a CEO is removed, he is out of the company or given a post out of the board (e.g. an advisor). In either case, the threat point is a constant, so we may simplify it by using 0.

where $\zeta^*_{0_{TJ}}$ is the optimum level of monitoring chosen by the board if they hired a new CEO. The participation constraint is satisfied,[24] thus they enter into negotiation. A director becomes a CEO himself with probability of $\frac{1}{n}$, and remain in the board with probability $\frac{n-1}{n}$ after the negotiation failed. Further, there is another chance for a director to become a CEO when the board obtain "poor" y_2 with probability $(1-Q)$. Therefore, under Nash bargaining game, the CEO and the board choose $\overline{k}_1^*$ and w^* to maximize

$$\begin{aligned} V_2^T &= \left\{\left[\zeta^*_{TJ}(\overline{k}_1)\cdot Z + \left(1-\zeta^*_{TJ}(\overline{k}_1)\right)\right] b + w\right\} \times \\ & \left\{\zeta^*_{TJ}(\overline{k}_1)\left[Z\cdot\varphi_{HH} + (1-Z)\left(\frac{n-1}{n}\cdot\varphi_N + b\right)\right]\right. \\ & \left. +(1-\zeta^*_{TJ}(\overline{k}_1))\varphi_H - \overline{k}_0\cdot d(\zeta^*_{TJ}(\overline{k}_1)) - w - \theta_0^{Board}\right\}. \end{aligned} \tag{16}$$

$\overline{k}_0$ in the above expression indicates the directors who will continue to sit on the board after the negotiation are the participants of the Nash bargaining. Define $\overline{k}_1^*$ and w^* to be the solution to $Max\ V_2^T$, then the equilibrium level of monitoring is denoted as $\zeta^*_{TJ}(\overline{k}_1^*)$, and it is expressed as[25]

$$d'(\zeta^*_{TJ}(\overline{k}_1^*)) = \frac{1}{\overline{k}_0}\left[Z\varphi_{HH} + (1-Z)\,\varphi_N - \varphi_H - (1-Z)\frac{1}{n}\varphi_N\right], \tag{17}$$

which establishes:

Proposition 4 *The monitoring level of the traditional Japanese system is not affected at all by the benefit of the CEO, although all the board members have equal chances of becoming a CEO themselves. However, the number of the directors and the monitoring level have positive relations.*

The implication of this proposition is that the bigger the size of the board, the more they monitor in the traditional system. Notice that we are assuming that CEO is selected from the board of directors, and the number of all the executives is always $n+1$; 1 CEO and n board of directors. When one of the directors are to leave the board or to become a CEO to replace the old CEO, the exact same number of new directors are hired to fill in the vacancy to keep the number of executives $n+1$. This is usually done by promoting the long term employee to a director.However, if a director becomes the CEO after the monitoring, an old CEO is removed and the number of the whole executives becomes n. To keep the number of executives $n+1$,

[24] Proof is in the Appendix.
[25] Proof is in the Appendix.

a new director who was not involved in the negotiation will join the board. This induces the "leak" of $\frac{1}{n}\varphi_N$, which will be paid to the new director who was not involved in the bargaining. Thus, when n is large, the less "leak" there will be, and hence the continuing directors bargain to increase the monitoring level. See the graph for Japanese traditional system in Figure 2.

Next, we compare the level of monitoring between the US system and the traditional Japanese system:

Proposition 5 *1. Suppose $b < \frac{1}{n}\varphi_N$, that is the benefit b is sufficiently low, or the size of the board n is sufficiently small. Then for all levels of independence $\overline{k}_1$,the directors in the US system monitor the incumbent CEO more intensely as versus the directors in the traditional Japanese system; $\zeta^*_{US}\left(\overline{k}_1\right) > \zeta^*_{TJ}\left(\overline{k}_1\right)$. Suppose next $b > \frac{1}{n}\varphi_N$, then for all levels of independence $\overline{k}_1$, the opposite is true; $\zeta^*_{TJ}\left(\overline{k}_1\right) > \zeta^*_{US}\left(\overline{k}_1\right)$.*

2. Moreover, the level of independency differs between the two systems. When $b < \frac{\varphi_N}{n}$, it is less costly for the directors in the US system to monitor as versus the directors in the traditional Japanese system; $\overline{k}_1^{*US} < \overline{k}_1^{*TJ}$. When $b > \frac{1}{n}\varphi_N$, the directors in the US system incur more cost in monitoring as compared to the directors in the traditional system; $\overline{k}_1^{*US} > \overline{k}_1^{*TJ}$

3. Thus, when $b < \frac{\varphi_N}{n}$ holds, the US system produces far intensive monitoring than the traditional Japanese system. When $b > \frac{\varphi_N}{n}$ holds, the traditional Japanese system produces far intensive monitoring than the US system.

Proof. 1:

Recall that we assume $d'(\zeta) > 0$. Then, by comparing (12) and (17) , the greater the right-hand side, the greater is the level of monitoring. Holding fix both the US and the traditional $\overline{k}_1$ at the same level, it is obvious that $\zeta^*_{US}\left(\overline{k}_1\right) > \zeta^*_{TJ}\left(\overline{k}_1\right)$ holds when b is smaller than $\frac{\varphi_N}{n}$, and $\zeta^*_{US}\left(\overline{k}_1\right) < \zeta^*_{TJ}\left(\overline{k}_1\right)$ holds when b is larger than $\frac{\varphi_N}{n}$.

2:

$\overline{k}_1$ may become the same in the two systems, but usually they are different across the systems. In the US system, from (7) and (12), $\overline{k}_1$ is expressed as

$$\overline{k}_1^{US} = \overline{k}_0\{1 + \frac{(1-Z)b}{Z\cdot\varphi_{HH} + (1-Z)\cdot\varphi_N - \varphi_H - (1-Z)b}\}. \tag{18}$$

In the traditional Japanese system, from (14) and (17), $\overline{k}_1$ is expressed as

$$\overline{k}_1^{TJ} = \overline{k}_0\{1 + \frac{(1-Z)b}{Z\cdot\varphi_{HH} + (1-Z)\cdot\varphi_N - \varphi_H - (1-Z)\frac{\varphi_N}{n}}\}. \tag{19}$$

From these two equations, we can conclude when $b > \frac{\varphi_N}{n}$, (18) is larger than (19) and when $b < \frac{\varphi_N}{n}$, the opposite is true.

3:

Hence, when $b > \frac{\varphi_N}{n}$ holds, from (12), (17), (18), and (19), the traditional Japanese system produces far intensive monitoring than the US system. When $b < \frac{\varphi_N}{n}$ holds, the US system produces far intensive monitoring than the traditional Japanese system. ■

Proposition 5 indicates that the traditional Japanese system may produce stronger monitoring than the US system. Then, why is the board of the traditional Japanese system always argued to monitor less? One of the reasons is the difference in $\overline{k}_0$. Recall that $\overline{k}_0$, an initial board composition, is exogenously given and equal across all governance systems. Under such assumption, the level of the right-hand side of (18) and (19) is compared with only 2 parameters; b and $\frac{\varphi_N}{n}$. However, in practice, $\overline{k}_0$ is much larger in the Japanese firms because of the "home-growness." The board of the Japanese firms are consisted almost entirely of long term employees who have strong personal relations with the CEO. Thus $\overline{k}_0$ tends to be much larger in Japanese firms. Let us be more specific. First, we focus on the case where $b > \frac{\varphi_N}{n}$. From Proposition 5, if $\overline{k}_0$ is fixed at the same level, (18) > (19), which suggests it is more costly for the board of the US system to monitor the CEO. However, if $\overline{k}_0$ of the traditional system is larger than that of the US system, this inequality may reverse. That is, even if (17) > (12), the Japanese system may yield weak monitoring. Next, we focus on the case where $b < \frac{\varphi_N}{n}$. In this case, it is obvious that if $\overline{k}_0$ in the traditional system is large, this supports the result in the Proposition even stronger. This is why it is perceived by many that the board of the Japanese system produce relatively weak monitoring despite the results we obtained in the Proposition 5.

5 Case 3: The New Japanese System

5.1 The Expected Payoff for The New Japanese Board

In this section we develop a model that explains the monitoring level generated by the new Japanese system. Moreover, this model is a generalization of the US model and the traditional Japanese model.

We first derive the utility function of the board. We assume that this board is highlighted with the following rules. Directors who serve in the audit committee are forbidden to become a CEO but directors other than those who serve in the audit committee can equally become a CEO when the incumbent CEO is removed. Notice also that post as a CEO can be held by anybody[26] but audit committee members. Therefore, the board is characterized with directors who face the same environment as in Case 1 and those who face the same environment as in Case 2. Therefore, the expected payoff of the board of this system is expressed as a combination of the utility of the directors who serve in the audit committee:

$$\frac{n_1}{n_1+n_2}\{\zeta_{NJ}[Z\cdot\varphi_{HH}+(1-Z)\cdot\varphi_N]+(1-\zeta_{NJ})\varphi_H\}-\frac{n_1}{n_1+n_2}\overline{k}_1\cdot d(\zeta_{NJ})-w_1, \tag{20}$$

and the utility of the other directors:

$$\frac{n_2}{n_1+n_2}\left\{\zeta_{NJ}\left[Z\varphi_{HH}+(1-Z)\left(\frac{n_2-1}{n_2}\cdot\varphi_N+b\right)\right]+(1-\zeta_{NJ})\varphi_H\right\}-\frac{n_2}{n_1+n_2}\overline{k}_1\cdot d(\zeta_{NJ})-w_2, \tag{21}$$

where $w_1+w_2=w$, and $n_1+n_2=n$. We denote

$$G_1 = \{\zeta_{NJ}[Z\cdot\varphi_{HH}+(1-Z)\cdot\varphi_N]+(1-\zeta_{NJ})\varphi_H\},$$

and

$$G_2 = \left\{\zeta_{NJ}\left[Z\varphi_{HH}+(1-Z)\left(\tfrac{n_2-1}{n_2}\cdot\varphi_N+b\right)\right]+(1-\zeta_{NJ})\varphi_H\right\}.$$

Then, the expected payoff of the board as a whole is expressed as

$$\Omega_3=\frac{n_1}{n_1+n_2}G_1+\frac{n_2}{n_1+n_2}G_2-\overline{k}_1\cdot d(\zeta_{NJ})-(w_1+w_2).$$

Notice that Ω_3 is the general model that encompasses all three systems; when $n_1=0$, $n_2=n$, and $w_1=0$, Ω_3 is equal to equation (13), which is the utility of the traditional Japanese board members, and when $n_1=n$, $n_2=0$, and $w_2=0$, Ω_3 equals equation (6), which is the utility of the US board members.[27]

When all the directors in the board act collectively and maximize the whole board utility Ω_3 with respect to ζ_{NJ}, the first order condition yields

$$\begin{aligned}\frac{\partial\Omega_3}{\partial\zeta_{NJ}} &= Z\cdot\varphi_{HH}+\frac{(1-Z)}{n_1+n_2}(n_1+n_2-1)\cdot\varphi_N+\frac{(1-Z)n_2}{n_1+n_2}b-\varphi_H-\overline{k}_1\cdot d'(\zeta_{NJ}) \\ &= 0.\end{aligned} \tag{22}$$

[26] This includes a pool of managers who do not work for the relevant company.

[27] G_2 is not defined when $n_2=0$.

Proposition 6 ***(Analogous to Proposition 1)*** *Define $\zeta^*_{NJ}(\overline{k}_1)$ to be the solution to (22). The intensity with which the board monitor the CEO is decreasing in its collective lack of independence.*

The proof of Proposition 6 proceeds in a similar way to the proof of Proposition 1.

5.2 Nash Bargaining

Now we turn to analyze the effect of the Nash bargaining between the CEO and the board in what follows. The new composition of the board and the wage of the CEO are determined in the negotiation as in the previous two cases. Again, we can regard as if they determine the monitoring level in the negotiation because the new composition of the board and the monitoring level is related. (See Proposition 9.) The unique point of this negotiation is that the bargaining is held between 3 players; the CEO, the directors who serve in the audit committee, and the rest of the directors.[28] We start with the threat points for each player. The reservation price for the CEO is 0, so the threat point for the CEO is 0. As for the board, since there are two types of board members, each have different threat points. The threat point for the set of directors who serve in audit committee is (10) with its n replaced by $n_{1.}$ In terms of the other set of directors, the threat point is (15) with its n replaced by $n_{2.}$ As in the traditional system, whenever there is a vacancy in the board, one of the long-term employees are promoted to a director to compensate the loss in order to keep the number of executive to be $n+1$. The continuing directors and the CEO enter into negotiation and Nash product is expressed as below.

$$
\begin{aligned}
V_3^T \;=\; & \left\{\frac{n_1}{n_1+n_2}\left[G_1-\overline{k}_0\cdot d(\zeta^*_{NJ}\left(\overline{k}_1\right))-\theta_a\right]-w_1\right\}^{\frac{n_1}{n_1+n_2}} \\
& \times\left\{\frac{n_2}{n_1+n_2}\left[G_2-\overline{k}_0\cdot d(\zeta^*_{NJ}\left(\overline{k}_1\right))-\theta_b\right]-w_2\right\}^{\frac{n_2}{n_1+n_2}} \\
& \times\{\left[(\zeta^*_{NJ}\left(\overline{k}_1\right)\cdot Z+\left(1-\zeta^*_{NJ}\left(\overline{k}_1\right)\right)\right]\cdot b+w_1+w_2-\theta_c\},
\end{aligned}
\tag{23}
$$

where V_3^T is the general expression of the Nash product ; when $n_1=0$, $n_2=n$, and $w_1=0$, V_3^T is equal to the Nash product of the traditional Japanese board members, and when $n_1=n$, $n_2=0$, and $w_2=0$, V_3^T equals the Nash product of the US board members. Note that all ζ_{NJ} in G_1 and G_2 are $\zeta^*_{NJ}(\overline{k}_1)$ in the above expression.

[28] See Alvin E. Roth [1979] for n-player Nash bargaining games.

Define $\overline{k}_1^*$ and w^* to be the solution to Max V_3^T , then the equilibrium level of monitoring is expressed as $\zeta^*_{_{NJ}}(\overline{k}_1^*)$. Solving for $d'\left(\zeta^*_{_{NJ}}(\overline{k}_1^*)\right)$ yields[29]

$$d'(\zeta^*_{_{NJ}}(\overline{k}_1^*)) = \frac{1}{\overline{k}_0}\left\{Z\varphi_{HH} + (1-Z)\,\varphi_N - \varphi_H - (1-Z)\left(\frac{n_1}{n_1+n_2}b + \frac{n_2}{n_1+n_2}\frac{\varphi_N}{n_2}\right)\right\}. \quad (24)$$

Proposition 7 *The monitoring level achieved by the new Japanese system is always between that of the US system and the traditional Japanese system.*

Proof. Recall the equilibrium level of monitoring for the Anglo system (12) and the traditional Japanese system (17). Since $d(\zeta)$ is convex function, it is straightforward that the equilibrium level of monitoring for the new Japanese system (24) is always between the US system(Case 1) and the traditional Japanese system(Case 2). ■

This proposition implies the monitoring level of the new system is always between the traditional system and the US system, which means the newly adopted system does not necessarily yield better monitoring than the traditional system. See Figure 2. Also notice that the level of monitoring determined in the negotiation is affected by the "leak" of the total profit of the firm. As we have seen in the previous sections, the "leak" in the US system is b, whereas the "leak" in the traditional system is $\frac{\varphi_N}{n}$. Since the new system is a combination of the US and the traditional Japanese system, the "leak" appears as a combination of such; with probability $\frac{n_1}{n_1+n_2}$, a new CEO is selected from outside of the company, and in turn b will be leaked to the newly hired CEO with according probability, and with probability $\frac{n_2}{n_1+n_2}$, a new CEO is selected from within the board and $\frac{\varphi_N}{n_2}$ will be leaked to the newly promoted director from inside of the company with according probability.

Proposition 8 1. *Suppose $b < \frac{1}{n}\varphi_N$, that is the benefit b is sufficiently low, or the size of the board n is sufficiently small. Then for all levels of independence $\overline{k}_1$,the directors in the US system monitor the incumbent CEO most intensely followed by the directors in the new Japanese system and the traditional Japanese system; $\zeta^*_{US}\left(\overline{k}_1\right) > \zeta^*_{NJ}\left(\overline{k}_1\right) > \zeta^*_{TJ}\left(\overline{k}_1\right)$. Suppose next $b > \frac{1}{n}\varphi_N$, then for all levels of independence $\overline{k}_1$, the opposite is true; $\zeta^*_{TJ}\left(\overline{k}_1\right) > \zeta^*_{NJ}\left(\overline{k}_1\right) > \zeta^*_{US}\left(\overline{k}_1\right)$.*

2. *Moreover, the level of independency differs across the three systems. When $b < \frac{\varphi_N}{n}$, monitoring cost is high in the order of the traditional Japanese system, the new Japanese*

[29] Proof is in the Appendix.

system, and the US system; $\overline{k}_1^{US} < \overline{k}_1^{NJ} < \overline{k}_1^{TJ}$ *. When* $b > \frac{1}{n}\varphi_N$*, the opposite is true;* $\overline{k}_1^{US} > \overline{k}_1^{NJ} > \overline{k}_1^{TJ}$*.*

3. *Thus, when* $b < \frac{\varphi_N}{n}$ *holds, the US system produces far intensive monitoring than the new Japanese and the traditional Japanese system. When* $b > \frac{\varphi_N}{n}$ *holds, the traditional Japanese system produces far intensive monitoring followed by the new Japanese system and the traditional Japanese system.*

Proof. 1:

Recall that we assume $d'(\zeta) > 0$. Then, by comparing (12),(17) and (24) , the greater the right-hand side, the greater is the level of monitoring. Holding fix all three $\overline{k}_1$s at the same level, it is obvious that $\zeta^*_{US}\left(\overline{k}_1\right) > \zeta^*_{NJ}\left(\overline{k}_1\right) > \zeta^*_{TJ}\left(\overline{k}_1\right)$ holds when b is smaller than $\frac{\varphi_N}{n}$. With the same logic, $\zeta^*_{US}\left(\overline{k}_1\right) < \zeta^*_{NJ}\left(\overline{k}_1\right) < \zeta^*_{TJ}\left(\overline{k}_1\right)$ holds when b is larger than $\frac{\varphi_N}{n}$.

2:

From (22) and (24), $\overline{k}_1$ for the new Japanese systems is
expressed as

$$\overline{k}_1^{NJ} = \overline{k}_0\{1 + \frac{(1-Z)b}{Z\cdot\varphi_{HH} + (1-Z)\cdot\varphi_N - \varphi_H - (1-Z)\left[\frac{n_1}{n_1+n_2}b + \frac{n_2}{n_1+n_2}\frac{\varphi_N}{n_2}\right]}\}. \tag{25}$$

The we can conclude (24) is always between (18) and (19) regardless of the inequality signs between b and $\frac{\varphi_N}{n}$.

3:

From (12), (17), (24), (18), (19), and (25), it is clear that when $b < \frac{\varphi_N}{n}$, then the level of monitoring is intense according to priority of the US system, the new Japanese system, and the traditional system. Next Suppose $b > \frac{\varphi_N}{n}$, then the level of monitoring is intense according to priority of the traditional Japanese system, then New Japanese system, and the US system. ■

The above proposition implies that the new Japanese system does not necessarily produce more monitoring than Japanese traditional system. Moreover, formally changing the governance system does not have any effect on the monitoring level. Rather, changing some key parameters such as the benefit of the CEO may yield the traditional system to produce the best amongst of all three systems.

Proposition 9 *(1) Holding fix* n_2*, and increasing* n_1*, the monitoring level* ζ *is affected as a result of these two conflicting effects; decrease in* ζ *due to the possibility of leakage of* b*, and increase in* ζ *due to less leakage regarding* $\frac{\varphi_N}{n}$*.*

(2) Holding fix n_1, and increasing n_2, the board monitor more intensively.
(3) Increasing both n_1 and n_2 in the same proportion, the board monitor more intensively.

Proof of Proposition 9 is in the Appendix.

Above Proposition holds because the equilibrium level is determined through negotiation between the CEO and the board. Since the board in the new Japanese system is concerned about the "leak" from the profit of the firm after the negotiation, they negotiate to increase the monitoring level when there is no probability of leakage, but they negotiate to decrease the monitoring level when there is possibility of the "leak," and higher is the possibility, the less they monitor.

6 Conclusion

In this paper, we offered a model of corporate governance based on Hermalin and Weisbach [1998]. In our model we compared the level of monitoring between three governance systems: the US system, the traditional Japanese system, and the new Japanese system. We assume that under the US system, the board and the CEO are not related, but in traditional system, the board and the CEO are related, and in the new Japanese system, the board is quasi-related. The result we have is despite the general expectation, the new Japanese system does not necessarily produce more monitoring than Japanese traditional system. Moreover, the traditional system may produce the best amongst of all three systems. We have shown that the logic behind this result is a "leakage" of the whole utility of the executives those participate in the negotiation. We also note that although we have treated the initial composition of the board $\overline{k}_0$ as exogenously given and common in all three governance systems, it should be noted that in practice, $\overline{k}_0$ is much larger in Japanese traditional system as compared to the the US system.

As for the future research, we will see the effects of the parameters which we treated exogenous in this paper; the initial board composition $\overline{k}_0$, the size of the board n, and the benefit b of the CEO. Specifically we wish to treat some of these parameters endogenously by extending this model to the repeated game model.

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Appendix

Proof of participation constraint for the negotiation in the US system

The addition of the threat points for the board and the CEO is

$$\zeta^*_{0_{US}} \left[Q\varphi_{NH} + (1-Q)\,\varphi_N \right] + \left(1-\zeta^*_{0_{US}}\right)\varphi_N - \overline{k}_0 \cdot d(\zeta^*_{0_{US}}). \tag{26}$$

$$\begin{aligned} &\zeta_{US}[Z \cdot \varphi_{HH} + (1-Z) \cdot \varphi_N] + (1-\zeta_{US})\varphi_H \\ &-\overline{k}_0 \cdot d(\zeta_{US}) + \left[\zeta_{US} Z + (1-\zeta_{US})\right] b. \end{aligned} \tag{27}$$

From (5), it is clear that (26)> (27) when we plug $\zeta^*_{0_{US}}$ into (27). Hence, participation constraint is satisfied.

q.e.d.

Proof of (12)

The first-order condition with respect to $\overline{k}_1$ yields

$$\begin{aligned}
& (Z-1)\, b \times \{\zeta^*_{US}\left(\overline{k}_1\right)[Z \cdot \varphi_{HH} + (1-Z)\cdot \varphi_N] \\
& +(1-\zeta^*_{US}\left(\overline{k}_1\right))\varphi_H - \overline{k}_0 \cdot d(\zeta^*_{US}\left(\overline{k}_1\right)) - w - \theta_0^{Board}\} \\
& +\{\left[\zeta^*_{US}\left(\overline{k}_1\right)\cdot Z + \left(1-\zeta^*_{US}\left(\overline{k}_1\right)\right)\right] b + w\} \\
& \times\{Z\cdot\varphi_{HH} + (1-Z)\cdot\varphi_N - \varphi_H - \overline{k}_0 \cdot d'(\zeta^*_{US}\left(\overline{k}_1\right))\} \\
= \;& 0.
\end{aligned} \tag{28}$$

The first-order condition with respect to w yields

$$\begin{aligned}
& \Big\{\zeta^*_{US}\left(\overline{k}_1\right)\cdot[Z\cdot\varphi_{HH} + (1-Z)\cdot\varphi_N] - (1-\zeta^*_{US}\left(\overline{k}_1\right))\varphi_H - \overline{k}_0 \cdot d(\zeta^*_{US}\left(\overline{k}_1\right)) \\
& -w - \theta_0^{Board}\} - \Big\{\left[\zeta^*_{US}\left(\overline{k}_1\right) Z + (1-\zeta^*_{US}\left(\overline{k}_1\right))\right] b + w\Big\} \\
= \;& 0.
\end{aligned} \tag{29}$$

Solving for w yields $w = \frac{1}{2}\{\zeta^*_{US}\left(\overline{k}_1\right)[Z\cdot\varphi_{HH} + (1-Z)\cdot\varphi_N] + (1-\zeta^*_{US}\left(\overline{k}_1\right))\varphi_H - \overline{k}_0 \cdot d(\zeta^*_{US}\left(\overline{k}_1\right)) - \theta_0^{Board} - \left[\zeta^*_{US}\left(\overline{k}_1\right) Z + (1-\zeta^*_{US}\left(\overline{k}_1\right))\right] b\}$. Substitute this expression into (28). Solving this for $d'\left(\zeta^*_{US}\left(\overline{k}_1^*\right)\right)$ yields the equilibrium level of monitoring

$$d'\left(\zeta^*_{US}\left(\overline{k}_1^*\right)\right) = \frac{1}{\overline{k}_0}\{Z\varphi_{HH} + (1-Z)\varphi_N - \varphi_H - (1-Z)b\}.$$

q.e.d.

Proof of participation constraint for the negotiation in the traditional Japanese system
The addition of the threat points for the board and the CEO is

$$\begin{aligned}
& \frac{n-1}{n}\Big\{\zeta^*_{0_{TJ}}\cdot\left[Q\cdot\varphi_{NH} + (1-Q)\left(\frac{n-1}{n}\cdot\varphi_N + \frac{1}{n}\cdot bn\right)\right] \\
& +(1-\zeta^*_{0_{TJ}})\varphi_N - \overline{k}_0 \cdot d(\zeta^*_{0_{TJ}})\Big\} \\
& +\frac{1}{n}[\zeta^*_{0_{TJ}}\cdot Q + (1-\zeta^*_{0_{TJ}})]bn,
\end{aligned} \tag{30}$$

$$
\begin{aligned}
&\left[\zeta^*_{TJ}\left(\overline{k}_1\right)\cdot Z+\left(1-\zeta^*_{TJ}\left(\overline{k}_1\right)\right)\right]b+ \\
&\zeta^*_{TJ}\left(\overline{k}_1\right)\left[Z\cdot\varphi_{HH}+(1-Z)\left(\frac{n-1}{n}\cdot\varphi_N+b\right)\right] \\
&+(1-\zeta^*_{TJ}\left(\overline{k}_1\right))\varphi_H-\overline{k}_0\cdot d(\zeta^*_{TJ}\left(\overline{k}_1\right)).
\end{aligned}
\tag{31}
$$

From (5), it is clear that (30)> (31) when we plug $\zeta^*_{0_{TJ}}$ into (30). Hence, participation constraint is satisfied.

q.e.d.

Proof of (17)

The first-order condition for V_2^T with respect to $\overline{k}_1$ yields,

$$
\begin{aligned}
&(Z-1)b\cdot\left\{\zeta^*_{TJ}\left(\overline{k}_1\right)\left[Z\varphi_{HH}+(1-Z)\left[\frac{(n-1)}{n}\varphi_N+b\right]\right]\right. \\
&\left.+(1-\zeta^*_{TJ}\left(\overline{k}_1\right))\varphi_H-\overline{k}_0\cdot d(\zeta^*_{TJ}\left(\overline{k}_1\right))-w-\theta_0^{Board}\right\} \\
&+\left\{\zeta^*_{TJ}\left(\overline{k}_1\right)(Z-1)b+b+w\right\} \\
&\times\left\{Z\varphi_{HH}+(1-Z)\left[\frac{(n-1)}{n}\varphi_N+b\right]\right. \\
&\left.-\varphi_H-\overline{k}_0\cdot d'(\zeta^*_{TJ}\left(\overline{k}_1\right))\right\} \\
=\ &0.
\end{aligned}
\tag{32}
$$

The first-order condition for V_2^T with respect to w yields,

$$
\begin{aligned}
&\left\{\zeta^*_{TJ}\left(\overline{k}_1\right)\left[Z\varphi_{HH}+(1-Z)\left(\frac{n-1}{n}\cdot\varphi_N+b\right)\right]\right. \\
&\left.+(1-\zeta^*_{TJ}\left(\overline{k}_1\right))\varphi_H-\overline{k}_0\cdot d(\zeta^*_{TJ}\left(\overline{k}_1\right))-w-\theta_0^{Board}\right\} \\
&-\left\{\left[\zeta^*_{TJ}\left(\overline{k}_1\right)\cdot Z+\left(1-\zeta^*_{TJ}\left(\overline{k}_1\right)\right)\right]b+w-\theta_0^{CEO}\right\} \\
=\ &0.
\end{aligned}
\tag{33}
$$

Solving for w yields,

$$\begin{aligned} w &= \frac{1}{2}(\theta_0^{CEO} - \theta_0^{Board} - Zb\zeta^*_{TJ}\left(\overline{k}_1\right) - \overline{k_0}d'\left(\zeta^*_{TJ}\left(\overline{k}_1\right)\right) - b\left(1-\zeta^*_{TJ}\left(\overline{k}_1\right)\right) \\ &\quad +\zeta^*_{TJ}\left(\overline{k}_1\right)\left(Z\varphi_{HH} + (1-Z)\left(\frac{n-1}{n}\cdot\varphi_N + b\right)\right) + \varphi_H\left(1-\zeta^*_{TJ}\left(\overline{k}_1\right)\right)). \end{aligned}$$

Substitute this expression into (32), then solving for $d'\left(\zeta^*_{TJ}\left(\overline{k}_1\right)\right)$ yields the equilibrium monitoring level,

$$d'\left(\zeta^*_{TJ}\left(\overline{k}^*_1\right)\right) = \frac{1}{\overline{k}_0}\left\{Z\cdot\varphi_{HH} + (1-Z)\left(\frac{n-1}{n}\varphi_N + b\right) - \varphi_H - (1-Z)b\right\}.$$

q.e.d.

Proof of (24)

$$\begin{aligned} V_3^T &= \left(\frac{n_1}{n_1+n_2}\left[\zeta^*_{NJ}\left(\overline{k}_1\right)\cdot\left[Z\varphi_{HH} + (1-Z)\,\varphi_N\right] + \left(1-\zeta^*_{NJ}\left(\overline{k}_1\right)\right)\varphi_H - \overline{k}_0\cdot d(\zeta^*_{NJ}\left(\overline{k}_1\right)) - \theta_a\right]\right. \\ &\quad \left.-w_1\right)^{\frac{n_1}{n_1+n_2}} \times \left(\frac{n_2}{n_1+n_2}\left[\zeta^*_{NJ}\left(\overline{k}_1\right)\cdot\left[Z\varphi_{HH} + (1-Z)\,(\frac{n_2-1}{n_2}\varphi_N + b)\right] + \left(1-\zeta^*_{NJ}\left(\overline{k}_1\right)\right)\varphi_H\right.\right. \\ &\quad \left.\left.-\overline{k}_0\cdot d(\zeta^*_{NJ}\left(\overline{k}_1\right)) - \theta_b\right] - w_2\right)^{\frac{n_2}{n_1+n_2}} \times \left([\zeta^*_{NJ}\left(\overline{k}_1\right)\cdot Z + (1-\zeta^*_{NJ}\left(\overline{k}_1\right))]b + w_1 + w_2 - \theta_c\right). \end{aligned}$$

For simplicity, we denote the first bracket as A, the second bracket as B, and the third bracket as C.

The two first-order conditions $\frac{\partial V_3^T}{\partial w_1} = \frac{\partial\left(A^{\frac{n_1}{n_1+n_2}}B^{\frac{n_2}{n_1+n_2}}C\right)}{\partial w_1} = 0$, and $\frac{\partial V_3^T}{\partial w_2} = \frac{\partial\left(A^{\frac{n_1}{n_1+n_2}}B^{\frac{n_2}{n_1+n_2}}C\right)}{\partial w_2}$ $= 0$ constitute 2 equations in the 2 unknown endogenously chosen wages, w_1 and w_2.

$$\begin{aligned} w_1 &= \frac{n_1}{2\,(n_1+n_2)}[\zeta^*_{NJ}\left(\overline{k}_1\right)Z\varphi_{HH} + (1-\zeta^*_{NJ}\left(\overline{k}_1\right))\varphi_H - \overline{k}_0 d(\zeta^*_{NJ}\left(\overline{k}_1\right)) + \theta_c + b\left(\zeta^*_{NJ}\left(\overline{k}_1\right) - \zeta^*_{NJ}\left(\overline{k}_1\right)Z\right. \\ &\quad \left.-1\right)] + \frac{n_1(n_1+2n_2)}{2\,(n_1+n_2)^2}\zeta^*_{NJ}\left(\overline{k}_1\right)(1-Z)\varphi_N - \frac{n_1(n_1+2n_2)}{2\,(n_1+n_2)^2}\theta_a + \frac{n_1 n_2}{2\,(n_1+n_2)^2}\theta_b \\ &\quad -\frac{n_1 n_2}{2\,(n_1+n_2)^2}\zeta^*_{NJ}\left(\overline{k}_1\right)(1-Z)(b + \frac{n_2-1}{n_2}\varphi_N). \end{aligned}$$

$$
\begin{aligned}
w_2 &= \frac{n_2}{2(n_1+n_2)}[\zeta^*_{NJ}\left(\overline{k}_1\right)Z\varphi_{HH}+(1-\zeta^*_{NJ}\left(\overline{k}_1\right))\varphi_H-\overline{k}_0 d(\zeta^*_{NJ}\left(\overline{k}_1\right))+\theta_c+b\left(\zeta^*_{NJ}\left(\overline{k}_1\right)-\zeta^*_{NJ}\left(\overline{k}_1\right)Z\right.\\
&\quad \left.-1\right)]-\frac{n_1 n_2}{2(n_1+n_2)^2}\zeta^*_{NJ}\left(\overline{k}_1\right)(1-Z)\varphi_N+\frac{n_1 n_2}{2(n_1+n_2)^2}\theta_a-\frac{(2n_1+n_2)n_2}{2(n_1+n_2)^2}\theta_b\\
&\quad +\frac{n_2(2n_1+n_2)}{2(n_1+n_2)^2}\zeta^*_{NJ}\left(\overline{k}_1\right)(1-Z)(b+\frac{n_2-1}{n_2}\varphi_N).
\end{aligned}
$$

Plugging w_1 into A yields

$$
\begin{aligned}
&\frac{n_1}{2(n_1+n_2)}\zeta^*_{NJ}\left(\overline{k}_1\right)Z\varphi_{HH}+\frac{n_1^2}{2(n_1+n_2)^2}\zeta^*_{NJ}\left(\overline{k}_1\right)(1-Z)\varphi_N\\
&+\frac{n_1 n_2}{2(n_1+n_2)^2}\zeta^*_{NJ}\left(\overline{k}_1\right)(1-Z)(b+\frac{n_2-1}{n_2}\varphi_N) \qquad (34)\\
&+\frac{n_1}{2(n_1+n_2)}[\left(1-\zeta^*_{NJ}\left(\overline{k}_1\right)\right)\varphi_H-\overline{k}_0\cdot d(\zeta^*_{NJ}\left(\overline{k}_1\right))-\theta_c-b\left(\zeta^*_{NJ}\left(\overline{k}_1\right)-\zeta^*_{NJ}\left(\overline{k}_1\right)Z-1\right)]\\
&-\frac{n_1^2}{2(n_1+n_2)^2}\theta_a-\frac{n_1 n_2}{2(n_1+n_2)^2}\theta_b.
\end{aligned}
$$

Plugging w_2 into B yields

$$
\begin{aligned}
&\frac{n_2}{2(n_1+n_2)}\zeta^*_{NJ}\left(\overline{k}_1\right)Z\varphi_{HH}+\frac{n_1 n_2}{2(n_1+n_2)^2}\zeta^*_{NJ}\left(\overline{k}_1\right)(1-Z)\varphi_N\\
&+\frac{n_2^2}{2(n_1+n_2)^2}\zeta^*_{NJ}\left(\overline{k}_1\right)(1-Z)(b+\frac{n_2-1}{n_2}\varphi_N) \qquad (35)\\
&+\frac{n_2}{2(n_1+n_2)}[\left(1-\zeta^*_{NJ}\left(\overline{k}_1\right)\right)\varphi_H-\overline{k}_0\cdot d(\zeta^*_{NJ}\left(\overline{k}_1\right))-\theta_c-b\left(\zeta^*_{NJ}\left(\overline{k}_1\right)-\zeta^*_{NJ}\left(\overline{k}_1\right)Z-1\right)]\\
&-\frac{n_1 n_2}{2(n_1+n_2)^2}\theta_a-\frac{n_2^2}{2(n_1+n_2)^2}\theta_b.
\end{aligned}
$$

Plug w_1 and w_2 into C yields

$$
\begin{aligned}
C &= \frac{1}{2}[\zeta^*_{NJ}\left(\overline{k}_1\right)Z\varphi_{HH}+(1-\zeta^*_{NJ}\left(\overline{k}_1\right))\varphi_H-\overline{k}_0\cdot d(\zeta^*_{NJ}\left(\overline{k}_1\right))-\theta_c-b\left(\zeta^*_{NJ}\left(\overline{k}_1\right)-\zeta^*_{NJ}\left(\overline{k}_1\right)Z\right. \qquad (36)\\
&\quad \left.-1\right)]+\frac{n_1}{2(n_1+n_2)}\zeta^*_{NJ}\left(\overline{k}_1\right)(1-Z)\varphi_N+\frac{n_2}{2(n_1+n_2)}\zeta^*_{NJ}\left(\overline{k}_1\right)(1-Z)(b+\frac{n_2-1}{n_2}\varphi_N)\\
&\quad -\frac{n_1}{2(n_1+n_2)}\theta_a-\frac{n_2}{2(n_1+n_2)}\theta_b.
\end{aligned}
$$

Then, we multiply (35) with $\frac{n_1+n_2}{n_2}$. That is,

$$\frac{n_2}{2\left(n_1+n_2\right)}\frac{n_1+n_2}{n_2}\zeta^*_{_{NJ}}\left(\overline{k}_1\right)Z\varphi_{HH}+\frac{n_1n_2}{2\left(n_1+n_2\right)^2}\frac{n_1+n_2}{n_2}\zeta^*_{_{NJ}}\left(\overline{k}_1\right)\left(1-Z\right)\varphi_N$$
$$+\frac{n_2^2}{2\left(n_1+n_2\right)^2}\frac{n_1+n_2}{n_2}\zeta^*_{_{NJ}}\left(\overline{k}_1\right)(1-Z)(b+\frac{n_2-1}{n_2}\varphi_N)$$
$$+\frac{n_2}{2\left(n_1+n_2\right)}\frac{n_1+n_2}{n_2}[\left(1-\zeta^*_{_{NJ}}\left(\overline{k}_1\right)\right)\varphi_H-\overline{k}_0\cdot d(\zeta^*_{_{NJ}}\left(\overline{k}_1\right))-\theta_c-b\left(\zeta^*_{_{NJ}}\left(\overline{k}_1\right)-\zeta^*_{_{NJ}}\left(\overline{k}_1\right)Z-1\right)]$$
$$-\frac{n_1n_2}{2\left(n_1+n_2\right)^2}\frac{n_1+n_2}{n_2}\theta_a-\frac{n_2^2}{2\left(n_1+n_2\right)^2}\frac{n_1+n_2}{n_2}\theta_b.$$

It is obvious that

$$\frac{n_2C}{n_1+n_2}=B. \tag{37}$$

Next, multiply (34) with $\frac{n_1+n_2}{n_1}$,

$$\frac{n_1}{2\left(n_1+n_2\right)}\frac{n_1+n_2}{n_1}\zeta^*_{_{NJ}}\left(\overline{k}_1\right)Z\varphi_{HH}+\frac{n_1^2}{2\left(n_1+n_2\right)^2}\frac{n_1+n_2}{n_1}\zeta^*_{_{NJ}}\left(\overline{k}_1\right)\left(1-Z\right)\varphi_N$$
$$+\frac{n_1n_2}{2\left(n_1+n_2\right)^2}\frac{n_1+n_2}{n_1}\zeta^*_{_{NJ}}\left(\overline{k}_1\right)(1-Z)(b+\frac{n_2-1}{n_2}\varphi_N)$$
$$+\frac{n_1}{2\left(n_1+n_2\right)}\frac{n_1+n_2}{n_1}[\left(1-\zeta^*_{_{NJ}}\left(\overline{k}_1\right)\right)\varphi_H-\overline{k}_0\cdot d(\zeta^*_{_{NJ}}\left(\overline{k}_1\right))-\theta_c-b\left(\zeta^*_{_{NJ}}\left(\overline{k}_1\right)-\zeta^*_{_{NJ}}\left(\overline{k}_1\right)Z-1\right)]$$
$$-\frac{n_1^2}{2\left(n_1+n_2\right)^2}\frac{n_1+n_2}{n_1}\theta_a-\frac{n_1n_2}{2\left(n_1+n_2\right)^2}\frac{n_1+n_2}{n_1}\theta_b.$$

Again, it is clear that

$$\frac{n_1C}{n_1+n_2}=A. \tag{38}$$

Recollect that

$$V_3^T=A^{\frac{n_1}{n_1+n_2}}B^{\frac{n_2}{n_1+n_2}}C,$$

and hence the first order condition with respect to $\zeta^*_{_{NJ}}\left(\overline{k}_1\right)$, and plugging (38) and (37) yields

$$\frac{n_1}{n_1+n_2}\left[\left(Z\varphi_{HH}+(1-Z)\,\varphi_N\right)-\varphi_H-\overline{k}_0\cdot d'(\zeta^*_{NJ}\left(\overline{k}_1\right))\right]$$
$$+\frac{n_2}{n_1+n_2}\left[\left(Z\varphi_{HH}+(1-Z)\,(\frac{n_2-1}{n_2}\varphi_N+b)\right)-\varphi_H-\overline{k}_0\cdot d'(\zeta^*_{NJ}\left(\overline{k}^*_1\right))\right]$$
$$+(Z-1)\,b=0.$$

Thus,

$$d'(\zeta^*_{NJ}\left(\overline{k}^*_1\right))=\frac{1}{\overline{k}_0}\left\{Z\varphi_{HH}+(1-Z)\,\varphi_N-\varphi_H-(1-Z)\left(\frac{n_1}{n_1+n_2}b+\frac{n_2}{n_1+n_2}\frac{\varphi_N}{n_2}\right)\right\}.$$

q.e.d.

Proof of Proposition 11

(1)

$$d''(\zeta^*_{NJ}\left(\overline{k}^*_1\right))\cdot\frac{\partial\zeta^*_{NJ}(\overline{k}^*_1)}{\partial n_1}=\tfrac{1}{\overline{k}_0}(n_1+n_2)^{-2}(1-Z)(\varphi_N-n_2b).$$

Thus when $\frac{\varphi_N}{n_2}>b$, $d''(\zeta^*_{NJ}\left(\overline{k}^*_1\right))\cdot\frac{\partial\zeta^*_{NJ}(\overline{k}^*_1)}{\partial n_1}>0$, and when $\frac{\varphi_N}{n_2}<b$, $d''(\zeta^*_{NJ}\left(\overline{k}^*_1\right))\cdot\frac{\partial\zeta^*_{NJ}(\overline{k}^*_1)}{\partial n_1}<0$.

(2)

$$d''(\zeta^*_{NJ}\left(\overline{k}^*_1\right))\cdot\frac{\partial\zeta^*_{NJ}(\overline{k}^*_1)}{\partial n_2}=\tfrac{1}{\overline{k}_0}(n_1+n_2)^{-2}(1-Z)(\varphi_N+n_1b).$$

Thus $d''(\zeta^*_{NJ}\left(\overline{k}^*_1\right))\cdot\frac{\partial\zeta^*_{NJ}(\overline{k}^*_1)}{\partial n_2}>0$.

(3)

$$d''(\zeta^*_{NJ}\left(\overline{k}^*_1\right))\cdot\frac{\partial\zeta^*_{NJ}(\overline{k}^*_1)}{\partial\alpha}=\tfrac{1}{\overline{k}_0}(n_1+n_2)(1-Z)\alpha^{-2}\varphi_N,$$

where $\alpha>0$, and hence $d''(\zeta^*_{NJ}\left(\overline{k}^*_1\right))\cdot\frac{\partial\zeta^*_{NJ}(\overline{k}^*_1)}{\partial\alpha}>0$.

q.e.d.

Proof of the result for the level of monitoring after observing "poor" y_1.

Below we show that the order of the monitoring level is the same as in the case with "good" y_1. This is the game in which the CEO does not have any bargaining power. Hence, this holds true to the case where the bargaining failed and the new CEO is hired. We start with the US system. Here, all the directors act collectively and the board alone choose the level of monitoring to maximize their utility. Their only constraint is that they guarantee at least non negative utility for the CEO.

$$\begin{array}{ll} Max & \zeta[Q\varphi_{NH} + (1-Q)\,\varphi_N] + (1-\zeta)\,\varphi_N - \overline{k}_0 \cdot d(\zeta) - w, \\ s.t. & (\zeta Q + (1-\zeta))\,b + w \geq 0. \end{array}$$

Solving this maximization problem yields the following equation.

$$d'(\zeta_{US}) = \tfrac{1}{\overline{k}_0}\left\{Q(\varphi_{NH} - \varphi_N) - (1-Q)b\right\}.$$

Next, we solve the level of monitoring for the traditional case. Again, all the directors act collectively and the board alone choose the level of monitoring to maximize their utility. Their only constraint is that they guarantee at least non negative utility for the CEO.

$$\begin{array}{ll} Max & \zeta[Q\varphi_{NH} + (1-Q)\,(\tfrac{n-1}{n}\varphi_N + b)] + (1-\zeta)\,\varphi_N - \overline{k}_0 \cdot d(\zeta) - w, \\ s.t. & (\zeta Q + (1-\zeta))\,b + w \geq 0. \end{array}$$

Solving this maximization problem yields the following equation.

$$d'(\zeta_{TJ}) = \frac{1}{\overline{k}_0}\left\{Q(\varphi_{NH} - \varphi_N) - (1-Q)\frac{1}{n}\varphi_N\right\}.$$

Finally, we solve the level of monitoring for the new system. Again, all the directors act collectively and the board alone choose the level of monitoring to maximize their utility. Their only constraint is that they guarantee at least non negative utility for the CEO.

$$\begin{array}{ll} Max & \tfrac{n_1}{n_1+n_2}\{\zeta[Q\varphi_{NH} + (1-Q)\,\varphi_N] + (1-\zeta)\,\varphi_N - \overline{k}_0 \cdot d(\zeta)\} - w_1 + \\ & \tfrac{n_2}{n_1+n_2}\{\zeta[Q\varphi_{NH} + (1-Q)\,(\tfrac{n_2-1}{n_2}\varphi_N + b)] + (1-\zeta)\,\varphi_N - \overline{k}_0 \cdot d(\zeta)\} - w_2, \\ s.t. & (QZ + (1-\zeta))\,b + w_1 + w_2 \geq 0, \end{array}$$

where $w_1 + w_2 = w$.

Solving this maximization problem yields the following equation.

$$d'(\zeta_{NJ}) = \frac{1}{\overline{k}_0}\left\{Q(\varphi_{NH} - \varphi_N) - (1-Q)(\frac{n_1}{n_1+n_2}b + \frac{n_2}{n_1+n_2}\frac{\varphi_N}{n_2}\right\}.$$

Hence, we conclude the level of monitoring is intense in the order of the traditional Japanese system > the new Japanese system > the US system when $b > \frac{\varphi_N}{n_2}$, and the US system > the new Japanese system > the traditional Japanese system when $b < \frac{\varphi_N}{n_2}$.

q.e.d.

Figure 1

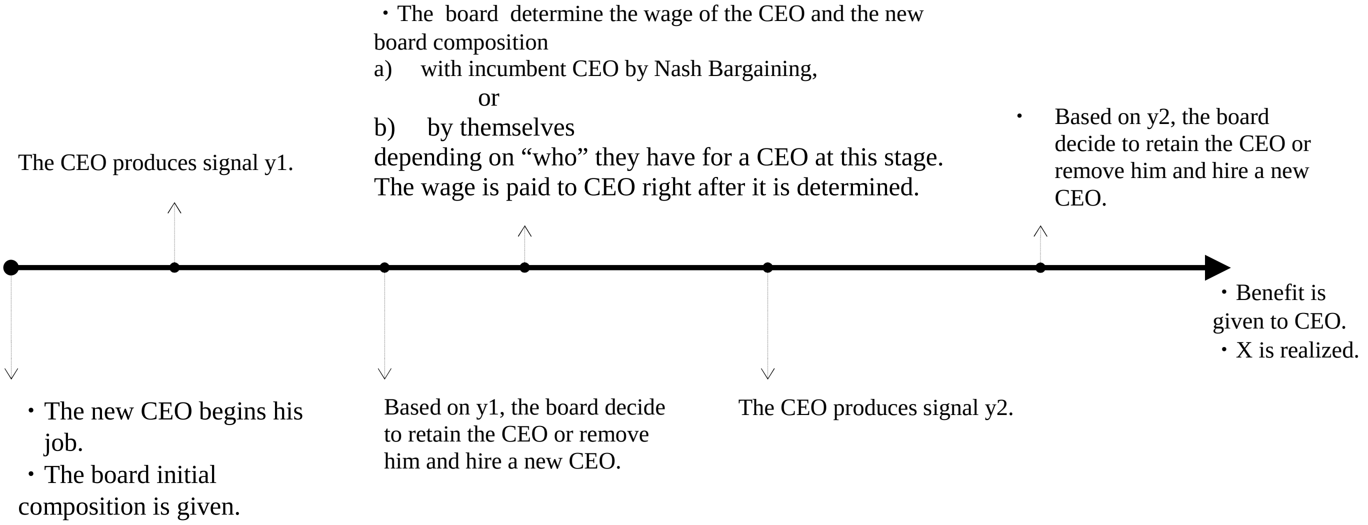
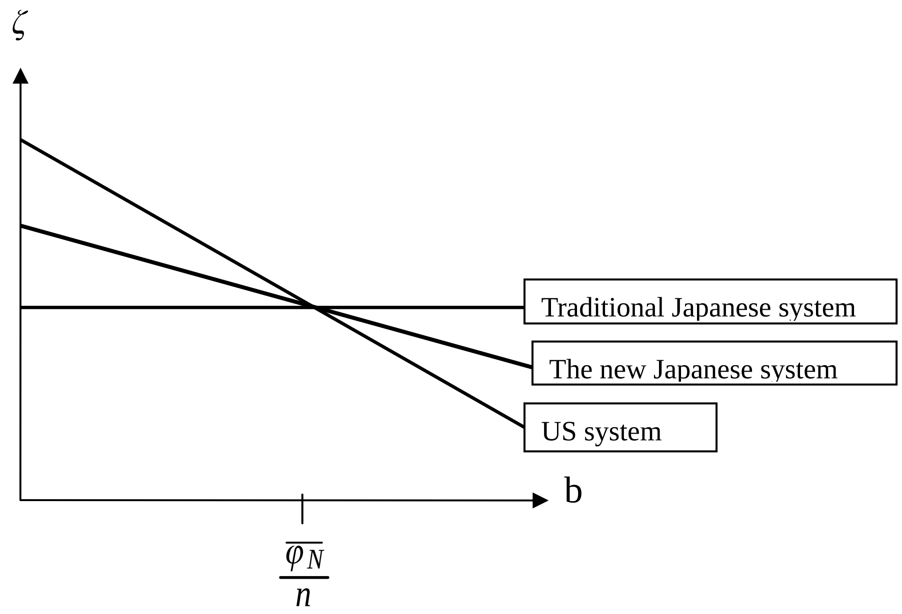

・The board determine the wage of the CEO and the new board composition
a) with incumbent CEO by Nash Bargaining,
or
b) by themselves
depending on "who" they have for a CEO at this stage.
The wage is paid to CEO right after it is determined.
The CEO produces signal y1.
・ Based on y2, the board decide to retain the CEO or remove him and hire a new CEO.
・Benefit is given to CEO.
・X is realized.
・The new CEO begins his job.
・The board initial composition is given.
Based on y1, the board decide to retain the CEO or remove him and hire a new CEO.
The CEO produces signal y2.

Figure 2


ζ
Traditional Japanese system
The new Japanese system
US system
b
$\frac{\overline{\varphi_N}}{n}$