

Separating the Titles of CEO and Chairman: A Model of Leadership and Authority

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Abstract

When a CEO holds the title of Chairman of the Board, the board has the formal authority, but the CEO often holds the leadership. This paper shows that if the board is not independent enough to discipline a CEO, it is optimal for the board to take leadership by separating the titles. However, the board (or shareholders) is better-off if it can increase its independence without separating the titles. These results do not change even if the separation of the titles leads to no-leadership, and explain why most US firms do not separate the titles despite the concerns for potential CEO frauds.

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1 Introduction

Separating the titles of CEO and Chairman of the Board has received much attention since recent corporate scandals. Proponents of separating the titles argue that the separation will improve the board's governance and reduce the risk of CEO fraud.¹ On the other hand, opponents argue that splitting the titles can create two power bases which could lead to competition and turf-battles², and that the independence of the board can be accomplished in other less costly ways.³ Empirical evidence is inconclusive as well. For example, Rechner and Dalton (1991) and Pi and Timme (1993) find that splitting the titles leads to better financial performance, but Baliga et al. (1996) and Brickley et al. (1997) find no such evidence.

Despite this debate, the vast majority of public firms in US do not separate the titles. Grinstein and Valles (2008) shows that 30% of firms in the S&P 1500 index separated the titles in 2004. But, if we exclude non-independent chairman (e.g. former CEO), less than 10% of firms have an independent non-executive chairman of the board (see also Brickley et al. 1997). Then, before criticizing the CEOs holding the title of chairman, as Hermalin and Weisbach (1998) argues, it is important to understand the market forces that have led to the non-separation of the titles as an apparent market equilibrium. The current system may be the market solution to the corporate leadership structure. Yet, the previous literature has largely focused on empirical analyses, and there exist few theoretical studies on the equilibrium corporate leadership structure.

This paper attempts to fill this gap by providing a simple model of leadership and authority. We assume Stackelberg leadership as the primary role of the chairman. One of the main responsibilities of the chairman of the board is to control the flow of information to the board and set the agenda. Thus, if a CEO holds both titles, s/he can take leadership by proposing his/her favorite projects *before* the board meeting. Then, the board would approve them unless it finds fraud or can propose

¹For example, see Jensen (1993), Garten (2002), or Felton (2004b).

²For example, see Lorsch and Lipton (1993), or Condit and Hess (2003).

³See, for example, Brickley et al. (1997), or Knowledge@Wharton (June 2, 2004) "Splitting Up the Roles of CEO and Chairman: Reform or Red Herring?"

better alternative projects.⁴ On the other hand, by separating the titles, the board can effectively take the leadership by setting its own agenda *before* the CEO make the proposals.

Regardless of the leadership structure, the board has the formal decision rights to ratify and to monitor the implementation of resource commitments. Thus, even if a CEO holds both titles, if the board has a better proposal or finds evidence of fraud in the CEO's project, the board can reject the CEO's project and implement its own. That is, the board always has the final decision right, or formal authority following Aghion and Tirole (1997).

From this perspective, we regard combining the titles of CEO and chairman as CEO-leadership⁵ or delegation of leadership. Similarly, we regard the separation of the titles as board-leadership, or non-delegation of leadership. Then, this paper focuses on whether and when it is optimal for the board to delegate the leadership.

We show that the optimal leadership structure varies depending on the board's independence level. If the board is independent (as will be defined precisely later), CEO leadership, where a CEO holds the title of the chairman, is optimal. In other words, if the board is already independent, separating the titles can do more harm than good to the shareholders/board. However, if the board is not independent, board leadership, or the separation of the titles, is optimal. These results support and reconcile the opposing views on the separation of the titles as discussed in the beginning, and show that board independence is the key to leadership reform.

Then, we allow the shareholders/board to choose the board's independence level, and the CEO to decide whether to invest with the interest of the shareholders in mind or to pursue his/her own private benefit (e.g. fraud). Endogenizing the board's independence level and the CEO project type leads to a unique equilibrium, where the board chooses the maximum level of independence *without* separating the titles of CEO and chairman. In this equilibrium, the CEO decides to invest in the interest of the shareholders. This result can explain why most US firms do not split the titles, and show that the current market solution to the corporate leadership structure may be efficient despite the apparent concerns. Furthermore, we show that this equilibrium is robust even if the

⁴"Immediately before every board meeting I receive 1 to 2 inches of material to prepare me for the meeting. The information is different every time I know the insight I need to be effective is in there somewhere, but I have a tough time extracting it and tracking it over time." - a survey respondent

- from Felton (2004a), "What directors and investors want from governance reform."

⁵In the literature, combining the titles is also referred as 'unitary leadership' or 'CEO duality'.

separation of the titles leads to no-leadership.

When the separation of the titles is optimal for the board/shareholders, CEO resistance is often considered as the main impediment. Yet, we have little understanding of when and how a CEO would resist separation of the titles. Thus, this paper also analyzes the CEO's preference of leadership structure, and characterizes the leadership structure that can satisfy both the CEO and the board. Somewhat surprisingly, the unique equilibrium characterized above is robust even when the board and the CEO jointly decide the optimal leadership structure.

As far as we know, this paper presents the first theoretical analysis of the separation of the titles of CEO and chairman of the board, especially with endogenous board independence and CEO project type. Hermalin and Weisbach (1998) considers endogenous board independence, but does not analyze leadership structure or separation of the titles. Maggi (1996) and Damme and Hurkens (2002) analyze endogenous (Stackelberg) leadership in the context of product market competition in a given strategic relationship. However, they don't study the role of authority. Moreover, they study neither how the optimal leadership changes in different strategic interactions nor how the strategic interaction can be chosen endogenously.

It is important to note that the roles of the chairman are complex and differ across companies, and that our model does not capture other roles of the chairman, such as evaluation of board members, communication with shareholders, etc. Also, leadership is a general and ambiguous concept. Thus, Stackelberg leadership in our model, as will be explained in detail in the next section, does not capture various other aspects of leadership. In this sense, this paper is exploratory.

Although we present the model in the context of separating the titles of CEO and Chairman of the Board, the model we develop addresses the delegation of leadership and endogenous relationships within hierarchical organizations in general. While the literature has largely focused on the delegation of authority (e.g. Aghion and Tirole 1997, Baker et al. 1999), many practices of bottom-up management or worker empowerment in reality represent the delegation of leadership, not necessarily the delegation of authority. For example, a firm may allow workers to propose new ideas and projects without imposing them from the top, but the top management still has the final authority to overturn those. Therefore, this paper provides a new framework to analyze such practices. Also most studies on hierarchical relationships, such as principal-agent models, assume a particular strategic relationship between the two, and do not ask where the relationship comes

from. This paper shows that a typical governance relationship as can be found in most hierarchical organizations is also an equilibrium outcome.

The rest of the paper is organized as follows. In section 2, we presents a simple model of authority and leadership. Section 3 characterizes the optimal leadership structure for the board for given level of independence. Then, in section 4, we endogenize the board's independence level and the CEO's type, and characterize the full equilibrium. Section 5 investigates possible CEO resistance by analyzing the CEO's preference for leadership structure, and determine the leadership structure that can satisfy both the board and the CEO. In section 6, we discuss the robustness of the equilibrium and more general implications of the model, and conclude in section 7.

2 Model

We consider a three-stage game by the board and a CEO. In the first stage, shareholders/board⁶ determine the degree of board independence, by, for example, changing the number of outside board members or hiring an independent auditor. The CEO also decides the type of his project, that is, whether to invest for the interests of the shareholders or pursue his own private benefits, including through fraud. In the second stage, the board decides whether to separate the titles of CEO and Chairman of the Board. In the third stage, the board exerts effort on its governance task, and the CEO exerts effort on his project. Since we will solve the game backwards, we present the details of each stage in reserve order.

Authority The third stage is essentially the same as Aghion and Tirole (1997). There are two risk-neutral players: the board⁷ and a CEO. The CEO exerts effort a_C to succeed in his project that was chosen in the first stage. For example, a CEO may search for a target of acquisition or a new business for expansion, and prepare these agendas for board approval. The probability that the CEO will succeed in the project is a_C where $0 < a_C < 1$. Thus, the harder the CEO works, the more likely the CEO is to succeed in his own project.

⁶Throughout the paper, we assume that the board reflects the shareholders' interests, and ignore the possible agency problem between the board members and the shareholders. Relaxing this assumption would be an interesting topic for future research.

⁷Throughout the paper, we treat the board as a single player.

The board exerts its governance effort a_B to detect and ratify any potential fraud by the CEO or to develop an alternative project. The probability of detection (or developing an alternative project) is a_B where $0 < a_B < 1$. If the board successfully detects any fraud (or develops an alternative project), it implements its own project regardless of the outcome of the CEO's project. In such a case, the board receives $\Pi (> 0)$ and the CEO receives $v (< \Pi)$. However, if the board fails to detect any fraud and if the CEO succeeds in his project, the board will implement the CEO's project. Then, the CEO receives $V (> 0)$, and the board receives $\pi (< V)$.

In other words, following Aghion and Tirole (1997), the board has the *formal* authority. Note that if the board does not detect any fraud or develop its own agenda, the board has no choice but to approve the CEO's project even when $\pi < 0$. In other words, the principal does not have veto power. If, however, the principal has veto power, we can restrict attention to the cases where $\pi > 0$, and the qualitative results of the paper do not change.

We normalize Π and V to one. Then, the expected utilities of the board (denoted by EU_B) and CEO (denoted by EU_C) are given as follows:

$$EU_B = a_B + (1 - a_B)a_C\pi - \frac{k}{2}a_B^2 \quad (1)$$

$$EU_C = a_Bv + (1 - a_B)a_C - \frac{k}{2}a_C^2 \quad (2)$$

, where $\frac{k}{2}a_i^2$ is the cost of effort by each player ($i = B, C$). We also assume $k > 2$ to ensure that the efforts (= probability of success) in the equilibrium remain between zero and one⁸.

Leadership and the Chairman In the second stage, the board (or shareholders) decides who can commit to the effort level first. Later, we will also consider a case where both the board and the CEO jointly decide the leadership structure. We assume that the chairman of the board represents the (Stackelberg) leadership. That is, if the CEO doubles as chairman, the CEO takes on the leadership and exerts (or commits) his executive effort before the board chooses its governance effort. For example, the CEO can commit the resources to develop his/her own private agenda such as acquisition and expansion before the board starts thinking about its own agenda or before the board schedules its own governance effort, such as a non-executive board meeting. Throughout the paper, we will use 'non-separation of titles' and 'CEO leadership' interchangeably.

⁸This model does not consider (performance-based) wage contracts. The role of such a contract would be another interesting topic for future research.

However, if the board has a non-executive chairman, the board has the leadership and commits to its governance effort before the CEO chooses his effort level. For example, the board can commit its resources through a non-executive board meeting. Throughout the paper, unless noted otherwise, we will use ‘separation of the titles’ and ‘board leadership’ interchangeably.

Opponents of splitting the titles argue, however, separation of the titles can lead to confusion and no clear leadership. Therefore, we will consider three possible leadership structures: CEO-leadership, board-leadership, and no-leadership.

Note that when the CEO is also the chairman, he may have the leadership, but the board always has the formal authority. Therefore, combining the titles of CEO and chairman can be considered as the delegation of leadership. Unlike Aghion and Tirole (1997), we do not focus on the delegation of formal authority⁹. Instead, this paper concerns the delegation of leadership.

Leadership does not necessarily lead to more effort. When a player takes the leadership and increases his effort, we refer to such leadership as *active* leadership. If a player takes the leadership and reduces his effort, we refer to such leadership as *passive* leadership.

Board Independence In the first stage, the shareholders determine the degree of board independence (v), and the CEO selects the type of his project (π). If the board is *independent* of the CEO, it would be able to impose a larger punishment upon the detection of fraud. Also, the board’s alternative project can be substantially different from the CEO’s favorite project. Therefore, if the board is independent of the CEO, we expect that v will be smaller. Recall that v is the CEO’s payoff when the board’s project succeeds and gets implemented. On the other hand, if the board is not independent or if the board’s main role is to assist the CEO, we expect v to be larger. Thus, we interpret v as the degree of the board’s (in)dependence.

In particular, from (2), if $v < a_C$, the board’s effort will decrease the CEO’s expected utility, i.e. $\frac{\partial EU_C}{\partial a_B} < 0$ if $v < a_C$. Thus, in an equilibrium, we define the board as *independent* if $v < a_C$, and *dependent* if $v > a_C$. An alternative interpretation is that if $v < a_C$, the board is primarily engaged in monitoring and auditing the CEO. If $v > a_C$, then the board is primarily assisting the CEO.

It is important to note that from (1) and (2), the level of board independence (v) does not

⁹For example, Baker, et al. (1999) argues that the formal authority cannot be credibly delegated to the CEO.

affect the board's payoff directly, but may change the CEO's behavior. That is, this paper focuses on the strategic value of the board's independence.

If the CEO pursues his own private benefit (e.g. empire building) or fraud, the implementation of the CEO's project can reduce the board's payoffs, or $\pi < 0$. However, if the CEO invests in the interest of the shareholders, we expect $\pi > 0$. Therefore, we consider π as a measure of the CEO's or project's type. Again note that from (1) and (2), the CEO's project type has no direct effect on the CEO's own payoffs.

In general, the choice of π and v determines the (strategic) relationship between the board and the CEO. Note that most previous studies have assumed the relationship between a principal and an agent to be exogenously given. For example, in most principal-agent models, the agent's success leads to larger profits of the principal (i.e. $\pi > 0$). Also, in Aghion and Tirole (1997), both π and v are assumed to be positive. In contrast, we endogenize the strategic relationship.

We summarize the timing of the game in Figure 1.

[Figure 1 here]

3 Optimal Leadership Structure: Separating the Titles of Chairman and CEO

In this section, we first characterize the equilibrium choice of efforts. Then, we analyze the optimal leadership structure that maximizes the board's expected payoffs for each given level of board independence (v) and CEO's project type (π). Even though we will endogenize v and π later, this section can be interesting by itself when the level of board independence and CEO's project type are exogenously given.

For a benchmark, consider a case with *no-leadership* where the board and the CEO simultaneously choose their effort levels. From (1) and (2), the board's and the CEO's best response functions are given as follows:

$$BR_B(a_C) = \frac{1}{k}(1 - \pi a_C) \tag{3}$$

$$BR_C(a_B) = \frac{1}{k}(1 - a_B) \tag{4}$$

Note that the slope of the board's best response is determined by the type of CEO project, π . If $\pi > 0$, for example, the board's best response function is downward sloping. In other words, if the CEO is engaged in a profitable investment project, the more the CEO works, the less need for the board's effort exists. However, if the CEO is pursuing his private benefits or engaged in a fraudulent project ($\pi < 0$), the more the CEO works, the harder the board has to work to prevent the CEO's project.

In contrast, the slope of the CEO's best response is always negative, and does *not* depend on the board's (in)dependence, or v . It is because the CEO receives v only when the board succeeds, over which the CEO has no control due to the lack of formal authority. As we will show below, this asymmetry plays an important role in the following analyses.

Let us denote the no-leadership equilibrium efforts by the board and the CEO by a_B^{NL} and a_C^{NL} , respectively. From (3) and (4), the no-leadership equilibrium is as follows:

$$a_B^{NL} = \frac{k - \pi}{k^2 - \pi}, \quad a_C^{NL} = \frac{k - 1}{k^2 - \pi} \quad (5)$$

3.1 Independent Board and Fraudulent CEO ($v < a_C^{NL}$ and $\pi < 0$)

One of the key issues in the debate on splitting the titles of the CEO and the chairman is whether the split is necessary when the board is already independent.

"In years to come, the issue of dividing the CEO and chairperson's roles may take on less importance as boards of directors adopt other ways of strengthening their independence to give them the ability to go head to head with hard-driving CEOs..."

- from "Splitting Up the Roles of CEO and Chairman: Reform or Red Herring?" Knowledge@Wharton (June 2, 2004)

However, many argue that if the CEO is also a chairman, the board cannot provide proper oversight on CEO activities, and this may lead to potential fraud. So we first study the optimal leadership structure when the board is independent (i.e. $v < a_C^{NL}$) and the CEO is engaged in a fraudulent project ($\pi < 0$).

From (4), the CEO's best response function is downward sloping. Therefore, if the board takes the leadership, it would want to increase its (monitoring) effort level to discourage the CEO's effort.

However, from (3), if $\pi < 0$, the board's best response function is upward sloping. Therefore, if the CEO takes the leadership, the CEO would want to *decrease* its effort level in order not to provoke the board's (monitoring) effort. In fact, if v is small enough, the CEO will reduce his effort enough so that CEO (passive) leadership can be more desirable to the board than board (active) leadership. We can formalize this intuition as follows:

Proposition 1 *Suppose that $v < a_C^{NL}$ and $\pi < 0$.*

- (i) *If $v \leq \theta$, then passive CEO leadership is optimal.*
- (ii) *If $\theta < v < a_C^{NL}$, then active board leadership is optimal.*
- (iii) *Either form of leadership is always better than no-leadership, where $0 < \theta = \frac{k-1}{\pi^2} \left((k^2 - \pi) - k\sqrt{k^2 - 2\pi} \right) < a_C^{NL}$.*

Proof. See appendix. ■

In other words, even when the CEO is engaged in a fraudulent project, if the board is independent enough, providing leadership to the CEO by combining the titles of CEO and chairman is optimal. This result is consistent with the arguments made by the opponents to splitting the titles. Intuitively, if the board has the leadership, in order to reduce the CEO's effort, the board will have to exert lots of monitoring effort. However, if the CEO has the leadership and if the board is independent enough, the CEO would reduce his effort voluntarily in order not to provoke the board's governance effort. That is, the board can reduce the CEO's fraud effort while exerting less governance effort under CEO-leadership than under board-leadership.

3.2 Independent Board and Cooperative CEO ($v < a_C^{NL}$ and $\pi > 0$)

Now suppose that the board is independent ($v < a_C^{NL}$), and that the CEO is investing for the interests of the board/shareholders ($\pi > 0$). Then, the board wants to encourage the CEO's effort, while the CEO wants to reduce the board's governance effort. This relationship is possibly the most common one in many firms and hierarchical relationship.

Recall that the CEO's best response function is always downward sloping. Therefore, if the board takes the leadership, it will *reduce* its (monitoring) effort in order to encourage more (investment) effort from the CEO.

Since $\pi > 0$, the board's best response function is also downward sloping. Therefore if the CEO takes the leadership, he will *increase* his (investment) effort in order to give comfort to the board and reduce the board's (monitoring) effort. In fact, if v is small enough, the CEO will increase his investment effort enough so that CEO leadership can be better for the board than board leadership. We can formalize this intuition as follows:

Proposition 2 *Suppose that $v < a_C^{NL}$ and $\pi > 0$.*

- (i) *If $v \leq \theta$, then active CEO leadership is optimal.*
- (ii) *If $\theta < v < a_C^{NL}$, then passive board leadership is optimal.*
- (iii) *Some form of leadership is always better than no-leadership, where $0 < \theta = \frac{k-1}{\pi^2} \left((k^2 - \pi) - k\sqrt{k^2 - 2\pi} \right) < a_C^{NL}$.*

Proof. See appendix. ■

From proposition 1 and 2, note that regardless of the type of CEO project (π), the optimal leadership structure is identical if the board is independent ($v < a_C^{NL}$), even though the style of optimal leadership (active vs. passive) is different. Also, note that no-leadership is the worst outcome. In other words, if separating the titles leads to no-leadership, then non-separation of the titles (i.e. CEO-leadership) would be always optimal. This result is consistent with the arguments made by the opponents of the separation of the titles.

"The creation of a non-executive chairman would signify a new power base in a corporation which theoretically could create competition and turf battles between a CEO and a chairman."

- Condit and Hess (2003)

3.3 Dependent Board and Cooperative CEO ($v > a_C^{NL}$ and $\pi > 0$)

Now suppose that the board is dependent ($v > a_C^{NL}$). Thus, it cannot severely punish the CEO even when it detects the fraud. Also, the board's own idea is similar to the CEO's favorite project. Then, v would be large, and the CEO's utility can increase in the board's effort. Also, suppose that the CEO invests for the benefit of the board/shareholders ($\pi > 0$).

While this type of cooperative relationship sounds ideal, it has a well-known free-rider problem. That is, if the board takes the leadership, it will reduce its effort to motivate more CEO effort.

Likewise, if the CEO takes the leadership, he will also reduce his effort level to encourage more effort from the board. Then, from the board's perspective, board leadership is optimal.

Proposition 3 *Suppose that $v > a_C^{NL}$ and $\pi > 0$.*

- (i) Passive board leadership is always optimal.*
- (ii) No-leadership is better than CEO leadership.*

Proof. See appendix. ■

Now the board prefers the passive board leadership because the CEO will have a greater chance to implement his own project, and work harder. Such passive leadership can take the form of 'minimal management intervention' or 'small government' in practice.

Note that unlike previous cases, if the board is dependent, CEO leadership is worse than no-leadership now, because CEO leadership allows the CEO to commit to shirking, leaving no choice to the board but to work by itself.

3.4 Dependent Board and Fraudulent CEO ($v > a_C^{NL}$ and $\pi < 0$)

Now suppose that the CEO is engaged in potential fraud or is pursuing private benefits that would lower the board's payoffs ($\pi < 0$), while the board is dependent and cooperative with the CEO ($v > a_C^{NL}$).

In this case, the board works for the CEO's interests, but still wants to reduce the CEO's fraudulent effort. Thus, if the board takes the leadership, it would increase its cooperative effort in order to discourage the CEO's fraudulent effort.

Since $\pi < 0$, the board's best response function is upward sloping. Therefore, if the CEO takes the leadership, he will increase his fraudulent effort as a threat to induce more cooperative effort from the board, which is the opposite of what the board wants. Therefore, (active) board leadership is always optimal.

Proposition 4 *Suppose that $v > a_C^{NL}$ and $\pi < 0$.*

- (i) Active board leadership is always optimal.*
- (ii) No-leadership is better than CEO leadership.*

Proof. See appendix. ■

From propositions 3 and 4, if the board is dependent, the CEO would exert the least investment effort or the most fraudulent effect when he has the leadership. Therefore, board leadership (or the separation of the titles) is optimal regardless of the CEO project's type if the board is not independent ($v > \theta$).

Moreover, from propositions 3 and 4, even when the separation of the titles leads to no-leadership (instead of board-leadership) as some fear, the qualitative results do not change.

Corollary 1 *Suppose that the separation of the titles of CEO and chairman leads to no leadership. Then, it is optimal to separate the titles if and only if $v > a_C^{NL}$.*

4 Endogenous Relationship

So far we have assumed that the type of relationship, that is, the board (in)dependence (v) and the CEO project's type (π) are exogenously given. In this section, we allow the board to choose its level of independence (v) and the CEO to decide the type of his project (π). More specifically, the board can choose $v \in [\underline{v}, \bar{v}]$ where $0 < \bar{v} < 1$ and $-\bar{v} < \underline{v} < \theta$. At the same time, the CEO can choose $\pi \in [\underline{\pi}, \bar{\pi}]$ where¹⁰ $0 < \bar{\pi} < 1$ and $-\bar{\pi} < \underline{\pi} < \bar{\pi}$. As shown below, the equilibrium does not change even if the board (or the CEO) can commit to its independence (or project type) first. Therefore, we don't discuss the Stackelberg leadership in this first stage of the game.

As a reference point, let us denote the CEO's equilibrium effort under board leadership when $\pi = \bar{\pi}$ by a_C^{BL+} . Then, we can characterize the CEO's best response as follows:

Proposition 5 *There exists γ ($\theta < \gamma < a_C^{BL+}$) such that*

- (i) *if $v \leq \gamma$, then it is optimal for the CEO to choose the most cooperative project, $\pi = \bar{\pi}$.*
- (ii) *if $v > \gamma$, then it is optimal for the CEO to choose the least cooperative project, $\pi = \underline{\pi}$.*

Proof. See appendix. ■

Intuitively, suppose that the board is independent enough ($v < \theta$). Then, from proposition 1 and 2, the board will choose CEO-leadership regardless of π . Recall that if the board is independent

¹⁰Recall that if the board has the veto power, we can restrict $\underline{\pi}$ to be positive.

enough, the CEO wishes to reduce the board's (monitoring) effort. With CEO leadership, the CEO can reduce the board's effort by investing in a more cooperative project. Therefore, the optimal type of project for the CEO is the most cooperative one, $\pi = \bar{\pi}$.

Now suppose that the board is dependent or cooperative enough ($v > a_C^{BL+}$). From propositions 3 and 4, the board will choose board leadership. Recall that since the board is cooperative, the CEO wishes to increase the board's effort. From proposition 3, if $\pi > 0$, the board will take the leadership and decrease its effort, while if $\pi < 0$, the board will take the leadership to increase its effort. Therefore, we can show that the board's effort decreases in π . In other words, to increase the board's effort, the CEO must choose the minimum π , or the least cooperative project. From continuity, there exists γ ($\theta < \gamma < a_C^{BL+}$) such that if $v = \gamma$, the CEO is indifferent between $\pi = \bar{\pi}$ and $\pi = \underline{\pi}$.¹¹

For the board, it turns out that it has a dominant strategy.

Proposition 6 *Regardless of π , it is always optimal for the board to choose $v = \underline{v}$.*

Proof. See appendix. ■

In other words, the board always wants to choose the maximum independence. This result is not trivial because from (1) and (2), the board's independence (v) has only strategic value, not direct benefit, to the board. Intuitively, if the board is dependent, from propositions 3 and 4, the board will choose board-leadership. Since the CEO's best response function does not depend on v , however, it is straightforward to show that the board's payoff under board-leadership does not depend on v .

Now suppose that the board is independent enough. Then, from propositions 1 and 2, CEO leadership is optimal. If $\pi > 0$, as v gets smaller and smaller, the CEO will increase his (cooperative) effort in order to reduce the board's (monitoring) effort. That is, the board's payoff decreases with v . If $\pi < 0$, as v gets smaller and smaller, the CEO will decrease his (fraud) effort in order not to

¹¹In our simple model, the CEO's optimal strategy is a corner solution. It is partly because we have fixed the payoffs from implementing one's own project (V and Π) to one. If changing v or π implies the changes in V or Π as well, the optimal strategy can be an interior solution.

provoke the board's (monitoring) effort. Therefore, the board's payoff decreases with v again. In other words, regardless of π , the board's payoff decreases in v , or increases with its independence.

Then, finally, we can characterize the equilibrium of the whole game as follows:

Proposition 7 *There exists a unique equilibrium characterized by (active) CEO-leadership (i.e. combining the titles of CEO and chairman) with the maximum board independence ($v = \underline{v}$) and CEO compliance ($\pi = \bar{\pi}$).*

Proof. The proof follows from the previous propositions. ■

An important implication of this result is that board independence should be a priority over 'splitting the titles of CEO and chairman'. From Proposition 1, when the board is not independent (i.e. when $v > \theta$), board-leadership (i.e. splitting the titles) is indeed optimal. However, Proposition 6 shows that the board can do better by lowering v . Since CEO-leadership is optimal when v is small (i.e. $v < \theta$), this implies that the board can do better by increasing board independence (i.e. by lowering v) *without* 'splitting the titles'.

As we show below, this equilibrium is robust even when the optimal leadership structure in the second stage must satisfy both the board and the CEO or when the separation of the titles leads to no-leadership. Also note that because the board has a dominant strategy, the equilibrium does not change even if the board (or the CEO) can commit to v (or π) first.

This result can explain why most US firms do not split the titles. Hermalin and Weisbach (1998) says;

"... it is easy to forget that the current system is, nonetheless, the market solution to an organizational design problem."

Indeed, this paper shows that the current market solution to the corporate leadership structure may be efficient despite the apparent concerns. For example, if the board is already independent enough, splitting the titles can do more harm to the shareholders than good.

Perhaps more importantly, proposition 7 shows that the relationship between the board and the CEO in the unique equilibrium can be characterized as a common governance relationship. That is, the board chooses a task that will reduce the CEO's payoffs (e.g. monitoring or auditing), while the CEO chooses a task that will increase the board's payoffs (e.g. profitable investment). While

most literature (e.g. principal-agent models) takes such a relationship as given, our results show that it is also an equilibrium outcome. We discuss this implication in more details in section 5.

Despite Proposition 7, some firms may have to split the two titles in order to reduce v (or improve independence). Recall that in our model, the board can choose any level of independence in the first stage. However, in reality, when the CEO has the leadership role already, the board may not be able to reduce v , especially not below θ . In such a case, the board would want to split the titles first in order to reduce v . After that, the board will be better off by combining the titles again. This might explain why some firms have split the titles only to combine them later. For example, GM, Allegheny Technologies, and Kennametal have all split the two titles, then combined them again later.

5 CEO Resistance

So far, we have analyzed the optimal leadership structure from the board's perspective. In reality, however, CEOs have a strong influence on leadership reform. For example, a survey shows that investors and directors expect CEOs to be most resistant to leadership changes (Felton 2004a).

Despite the potential importance of a CEO's role in leadership reform, we have little understanding of when and how a CEO would resist leadership changes, such as the separation of the titles. Thus, we analyze the CEO's preference over the different leadership structures, and characterize the leadership structure that can satisfy both the board and the CEO.

5.1 CEO Preference for Leadership

First, suppose that the CEO is pursuing his own private benefits or engaged in a fraudulent project (*i.e.* $\pi < 0$), and consider the CEO's preference for leadership structure depending on the board's (in)dependence level (v).

If v is sufficiently small, the CEO would like to reduce the board's monitoring effort. From proposition 1, however, board leadership is active (*i.e.* increases the board's effort). Therefore, the CEO would prefer CEO-leadership to board-leadership. On the other hand, recall that the CEO's utility can increase in the board's effort if $a_C < v$. Thus, if board-leadership induces a sufficiently lower a_C , the CEO may prefer board leadership to no-leadership or even to CEO-leadership.

If v is large enough, the CEO would like to increase the board's effort. From proposition 4, board-leadership leads to larger effort by the board, a_B . Thus, the CEO may prefer board-leadership to CEO-leadership. However, if v is too large, board-leadership may not induce large enough a_B . So the CEO would prefer to take the leadership and induce a larger a_B .

For simplicity, let us denote board leadership by BL , CEO leadership by CL , and no-leadership by NL . Also denote the CEO's preference over different leadership structures by \succ_C . Then, we can formalize these intuitions as follows.

Proposition 8 *Suppose that $\pi < 0$. There exist ϕ , γ , and γ' such that $0 < \theta < \phi < \gamma < a_C^{NL} < \gamma'$, and that*

- (i) *if $v < \phi$, then $CL \succ_C NL \succ_C BL$.*
- (ii) *if $\phi < v < \gamma$, then $CL \succ_C BL \succ_C NL$.*
- (iii) *if $\gamma < v < \gamma'$, then $BL \succ_C CL \succ_C NL$.*
- (iv) *if $v > \gamma'$, then $CL \succ_C BL \succ_C NL$.*

Proof. See appendix. ■

It is interesting to note that the CEO may prefer board-leadership to CEO-leadership for an intermediate value of v . That is, when the board is neither independent nor cooperative, the CEO prefers the separation of the titles. Intuitively, if $v \approx a_C^{NL}$, the board's effort level does not affect the CEO's utility much at the no-leadership equilibrium. Thus, the CEO does not gain much from CEO leadership. Interestingly, however, the board-leadership will force the CEO to reduce his effort (= lower probability of success) by increasing the board's monitoring effort. With a low probability of his own success, the CEO would now prefer the greater board effort which board-leadership brings. Therefore, the CEO may prefer board-leadership to CEO-leadership.

[Figure 2 here]

Figure 2 summarizes both the board's and the CEO's preference over leadership structures. Note that the board and the CEO may agree on the optimal leadership structure, as highlighted by the grey area in Figure 2. In such cases, we wouldn't need to worry about CEO resistance.

However, they do not always agree on the optimal leadership structure. In particular, we can provide the following corollary.

Corollary 2 *Suppose that $\pi < 0$. The board and the CEO disagree on the optimal leadership structure if and only if $v > \gamma'$ or $\theta < v < \gamma$. When they disagree, the board prefers the separation of the titles (BL) while the CEO prefers non-separation of the titles (CL).*

Now suppose that the CEO is investing for the interests of the board ($\pi > 0$). If v is large enough, from proposition 1, compared with the no-leadership equilibrium, the board would like to reduce its effort to increase the CEO's effort, but the CEO would like to reduce his effort to increase the board's effort. Therefore, as long as the CEO's utility increases in the board's effort, the CEO is likely to prefer CEO-leadership to board-leadership. On the other hand, as noted above, the CEO's utility increases in the board's effort if and only if $a_C < v$. Therefore, even when v is large, if $a_C > v$, the CEO's utility will decrease in the board's effort, and the CEO may prefer board leadership. The following proposition formalize these intuitions.

Proposition 9 *Suppose that $\pi > 0$. There exist ϕ , γ , and γ' such that $0 < \theta < \phi < \gamma < a_C^{NL} < \gamma'$, and such that*

- (i) *If $v < \gamma'$, then $CL \succ_C BL \succ_C NL$.*
 - (ii) *If $\gamma' < v < \gamma$, then $BL \succ_C CL \succ_C NL$.*
 - (iii) *If $\gamma < v < \phi$, then $CL \succ_C BL \succ_C NL$.*
 - (iv) *If $v > \phi$, then $CL \succ_C NL \succ_C BL$.*
- , where $\gamma' < 0$ and $\phi > \gamma > a_C^{NL}$.*

Proof. See appendix. ■

In general, the CEO prefers CEO-leadership when the board is dependent. However, when the board is independent, the CEO prefers board-leadership, with an exception for the case where $v < \gamma'$ (< 0). Note that from propositions 1 and 2, this is the opposite of the board's preference. In particular, if a dependent (or weak) board is trying to take the leadership by splitting the titles of CEO and chairman, the CEO would resist such a leadership reform even when the CEO is investing for the benefits of the board/shareholders.

Figure 3 summarizes the board's and the CEO's preferences more precisely when $\pi > 0$.

[Figure 3 here].

For an intermediate value of v (where $\theta < v < \gamma$), both the board and the CEO may find board-leadership optimal. Also, as in the previous case, if the board is independent enough, both the board and the CEO prefer CEO-leadership. However, in other cases, the board and the CEO would disagree as follows:

Corollary 3 *Suppose that $\pi > 0$. The board and the CEO disagree on the optimal leadership structure if and only if $v > \gamma$ or $\gamma' < v < \theta$. If the board is independent (where $\gamma' < v < \theta$), the board prefers non-separation of titles (CL) while the CEO prefers separation of the titles (BL). If the board is sufficiently dependent (where $v > \gamma$), however, the board prefers separation of the titles (BL) while the CEO prefers non-separation of the titles (CL).*

For successful changes in leadership, it is critical to understand when and how a CEO would resist the changes. Thus, our results provide important insights into such leadership reform. Corollaries 2 and 3 shows that if the board is dependent (or weak), the board will prefer board leadership (or separation of the titles), while the CEO will prefer CEO leadership, regardless of the type of CEO project (π). Assuming that it is the dependent boards that are pursuing the leadership changes, our result explains why CEOs appear to resist the separation of the titles. These results do not change much even if the separation of titles leads to no leadership, instead of board-leadership.

Corollary 4 *Suppose that the separation of the titles leads to no-leadership. If the board is independent ($v < a_C^{NL}$), both the board and the CEO prefer non-separation of the titles. If the board is dependent ($v > a_C^{NL}$), however, the board prefers separation of the titles (BL), while the CEO prefers non-separation of the titles (CL).*

This corollary follows directly from Figures 2 and 3 by ignoring board-leadership as an option. Note that when the board is dependent (or weak), there will be conflicts between the board and the CEO, which may prevent the separation of the titles.

5.2 Pareto Improving Leadership Change

If CEO resistance is strong enough, changes in leadership is feasible only when it improves the utility of *both* the board and the CEO.

"Clearly, they [CEOs] will strongly oppose giving up the power and influence they have worked so hard to accumulate. Yet given the growing demand for change, CEOs, directors, and investors must form a plan that works for everyone." (Felton 2004a)

Assuming that disagreement in the leadership structure will lead to no-leadership, we then may have to consider only pareto-improving leadership reform with respect to no-leadership. Thus, in this section, we modify the concept of optimal leadership structure as the one that makes the most pareto-improvement over no-leadership. For example, if board-leadership pareto-improves no-leadership, and CEO-leadership pareto-improves board-leadership. Then, we define CEO leadership as optimal.

First, suppose that the CEO is pursuing his own private benefits or engaged in a fraudulent project (i.e. $\pi < 0$). From figure 2, we can provide the following proposition.

Proposition 10 *Suppose that $\pi < 0$. To make the most pareto-improvement over no-leadership,*

- (i) if $v > \gamma$, board-leadership is optimal.*
- (ii) if $\phi < v < \gamma$, both board- and the CEO-leadership are optimal.*
- (iii) if $v < \phi$, CEO-leadership is optimal.*

Proof. Follows from Figure 2. ■

There are at least three implications that are noteworthy. First, this optimal leadership structure is qualitatively similar to the one that maximizes the board's payoff only (see proposition 1 and 4). The only difference arises when $\theta < v < \phi$, where CEO-leadership provides a pareto-improvement, but the board's payoff is maximized under board-leadership. Second, no-leadership is always pareto-dominated by some form of leadership. Thus, when $\pi < 0$, clear leadership can always play a positive role in the organization. Third, when the board is independent enough ($v < \phi$), only CEO-leadership provides a pareto-improvement over no-leadership.

Now suppose that the CEO is investing for the interests of the board (i.e. $\pi > 0$). From Figure 3, we can provide the following proposition.

Proposition 11 *Suppose that $\pi > 0$. To make the largest pareto-improvement over no-leadership,*

- (i) if $v > \phi$, neither leadership structure provides a pareto-improvement over no-leadership.*
- (ii) if $\theta < v < \phi$, board-leadership is optimal.*
- (iii) if $\gamma' < v < \theta$, both board- and CEO-leadership can be optimal.*
- (iv) if $v < \gamma'$, CEO-leadership is optimal.*

Proof. Follows from Figure 3. ■

Unlike the case where $\pi < 0$, if the board is dependent enough ($v > \phi$), there is no leadership structure that provides a pareto-improvement over no-leadership. This is because each player wants to commit to less effort and force the other to exert more effort. In such a case, we can expect that clear leadership may not arise. Otherwise, the optimal leadership structure is again qualitatively similar to the one that maximizes the board's payoff only. For example, if the board is independent enough, compared with the no-leadership outcome, combining the titles of CEO and the chairman would satisfy both the board and the CEO.

5.3 Endogenous Relationship

With CEO resistance, suppose that the leadership structure in the second stage will be chosen to make the largest pareto improvement over no-leadership as in proposition 10 and 11. Now consider the equilibrium when we endogenize board independence (v) and the CEO's project type (π) as in section 3.

When both board- and CEO-leadership are optimal, to break the tie, we assume that if the board is dependent ($v > a_C^{NL}$), the CEO can choose the leadership structure. However, if the board is independent ($v < a_C^{NL}$), the board can choose the leadership structure. Also, if neither leadership structure pareto-dominates no-leadership, we assume that there will be no-leadership in the second stage of the game.

Proposition 12 *Even with CEO resistance, the equilibrium (as specificity in proposition 7) does not change.*

Proof. See appendix. ■

In other words, the equilibrium in proposition 7, where the board selects the leadership structure, is robust even when the leadership structure must satisfy both the board and the CEO. It is also straightforward to show that the equilibrium is robust when the separation of the titles leads to no-leadership instead of board leadership¹². These results again explain why the vast majority of firms in the US do not separate the titles.

6 Discussion

6.1 Delegation of Leadership and Bottom-Up Management

In response to the increasingly popular use of bottom-up management or worker-empowerment movements, the literature has largely focused on the delegation of authority. However, in practice, the top managers may delegate the (Stackelberg) leadership to their subordinates, but not the formal authority. In other words, the subordinates may propose and work on new projects for themselves without being told what to do beforehand, but the top-managers typically have the final decision right to overturn the subordinates' proposals. Baker et al. (1999), for example, argues that all subordinates' decision rights are "loaned, not owned".

Therefore, the delegation of leadership can be a more realistic concept to analyze bottom-up management than the delegation of authority. Then, this paper shows that the top management's commitment to strict governance (i.e. being independent) is the key to the success of bottom-up management. For example, propositions 1 and 2 imply that if a manager can commit to tough and strict monitoring, the delegation of leadership will increase the subordinate's productive effort or decrease fraudulent effort.

However, propositions 3 and 4 imply that if a manager cannot commit to strict governance, the delegation of leadership would decrease the subordinate's productive effort or increase fraudulent effort. In this case, the delegation of leadership, or bottom-up management, would not be optimal.

6.2 Authority and Endogenous Relationship

This paper also shows how the formal authority endogenously determines the relationship between a principal (a player with authority) and an agent (a player without authority) in general. The

¹²The proof is omitted, but available from the author.

relationship between the two players can be defined by how the project/task of each player affects the other’s payoffs. For simplicity, let us define a project that reduces the other’s payoffs as a ‘negative’ project, and a project that increases the other’s payoffs as a ‘positive’ project.

If both players choose positive projects, we refer to such a relationship as ‘cooperation’. If both players choose negative projects, we define such a relationship as ‘conflict’. Also, if the principal chooses a positive project, and the agent chooses a negative project, we define such a relationship as ‘corruption’. Finally, if the principal chooses a negative project, and the agent chooses a positive project, we call such relationship as ‘governance’. Table I summarizes these different types of relationship.

Table I Types of Relationship

		Agent	
		positive project	negative project
Principal	positive project	cooperation	corruption
	negative project	governance	conflict

Proposition 7 shows that the relationship between the principal and the agent will be endogenously determined by the ‘governance’ relationship, where the principal’s task is to reduce the agent’s payoffs (e.g. monitoring and auditing), and the agent’s task is to increase the principal’s payoffs (e.g. production). Such asymmetry in tasks within hierarchical relationships is universal even in modern organizations as evident in terms like ‘manager’ and ‘worker’.

Note that there is no intrinsic asymmetry between the board (the principal) and the CEO (the agent) in our model, except that the board has the formal authority, or the decision right to choose among alternatives. Therefore, this paper shows that the formal authority alone can endogenously lead to the governance relationship between the principal and the agent.

This result may seem obvious. If the principal must trade-off between her own payoff and the agent’s payoff, the principal, with her formal authority, would choose to reduce the agent’s payoffs. Also, if the principal can overturn the agent’s negative project, or fire the agent, the agent would have no choice but to work to increase the principal’s payoffs.

However, it is worth emphasizing that the endogenous relationship in our model arises for a strategic reason. From (1) and (2), the board's choice of independence (v) and the CEO's choice of project type (π) have no direct effect on their own payoffs. Also, we have assumed that the principal does not have veto power, and cannot fire the agent. Thus, the endogenous choice of v and π is the only way to affect the other's behavior. In this sense, this paper uncovers the strategic reason for the governance relationship in hierarchical organizations.

7 Conclusion

This paper studies the strategic incentive to separate the titles of CEO and Chairman of the Board. If the board is not independent enough to discipline a CEO, it is optimal for the board to take the leadership by separating the titles. However, the board (or shareholders) is better-off if it can increase its independence *without* separating the titles. These results do not change even if the separation of the titles leads to no-leadership or if leadership structure is jointly decided by both the board and a CEO. Therefore, our results explain why most US firms do not separate the titles despite the growing concerns for potential CEO frauds.

In general, this paper shows when it is optimal to delegate leadership, and how formal authority determines the strategic relationship between a supervisor and a subordinate. Common governance relationship where the supervisor is engaged in monitoring and auditing, while the subordinate works for the supervisor is shown as an equilibrium outcome.

As far as we know, this paper is the first attempt to analyze separation of the titles, delegation of leadership, and endogenous hierarchical relationship. But there are many extensions to be considered in future research. For example, incorporating the agency problem of the board or performance-based wage contracts should provide richer insights on the corporate governance structure.

References

- [1] Aghion, Philippe, and Jean Tirole, 1997, Formal and real authority in organization, *Journal of Political Economy* 105, 1-29
- [2] Baker, George P., Robert S. Gibbons, and Kevin J. Murphy, 1999, Informal authority in organizations, *Journal of Law, Economics, and Organization* 15, 56-73
- [3] Baliga, Ram B., Charles R. Moyer, and Ramesh P. Rao, 1996, CEO duality and firm performance: What's the fuss?, *Strategic Management Journal* 17, 41-53
- [4] Brickley, James A., Jeffrey L. Coles, and Gregg Jarrell, 1997, Leadership structure: Separating the CEO and Chairman of Board, *Journal of Corporate Finance* 3, 189-220
- [5] Condit, Madeleine B., and Edward D. Hess., 2003, Is it time for the non-executive chairman?, *The Corporate Board* 24, 7-10
- [6] van Damme, Eric, and Sjaak Hurkens, 2004, Endogenous Price Leadership, *Games and Economic Behavior* 47, 404-420
- [7] Felton, Robert F., 2004a, What directors and investors want from governance reform, *The McKinsey Quarterly*, 2004 (2).
- [8] Felton, Robert F., 2004b, Splitting chairs: Should CEOs give up the chairman's role?, *The McKinsey Quarterly*, 2004 (4).
- [9] Garten Jeffrey E., 2002, Don't let the CEO run the board, too, *BusinessWeek*, November 11 (http://www.businessweek.com/magazine/content/02_45/b3807036.htm)
- [10] Grinstein, Yaniv, and Yearim Valles, 2008, Separating the CEO from the chairman position: Determinants and changes after the new corporate governance regulation, *mimeo*, Cornell University
- [11] Hermalin, Benjamin E., and Michael S. Weisbach, 1998, Endogenously Chosen Boards of Directors and Their Monitoring of the CEO, *American Economic Review* 88, 96-118

- [12] Jensen, Michael C., 1993, Presidential address: The modern industrial revolution, exit and failure of internal control system, *Journal of Finance* 48, 831-880
- [13] Knowledge@Wharton, 2004, Splitting Up the Roles of CEO and Chairman: Reform or Red Herring?, - (<http://knowledge.wharton.upenn.edu/article.cfm?articleid=987>)
- [14] Lorsch, Jay W., and Martin Lipton, 1993, On the leading edge: The lead director, *Harvard Business Review* 71, 79-80
- [15] Maggi, Giovanni, 1996, Endogenous Leadership in a New Market, *Rand Journal of Economics* 27, 641-659
- [16] Pi, Lynn, and Stephen G. Timme, 1993, Corporate control and bank efficiency, *Journal of Banking & Finance* 17, 515-530
- [17] Rechner, Paula L. and Dan R. Dalton, 1991, CEO duality and organizational performance: a longitudinal analysis, *Strategic Management Journal* 12, 155-160

Appendix Proof of Propositions

For the proof of propositions 1 to 4, we first establish the following lemmas, which also formalize some of the intuitions we discussed in the text.

Lemma 1 $a_B^{BL} > a_B^{NL}$ if and only if $\pi < 0$.

Proof For simplification, denote board leadership (i.e. the split of the titles) by BL , CEO leadership (i.e. CEO-chairman) by CL , and no-leadership by NL . From (1) and (4), if the board takes the leadership, the equilibrium effort levels of the board and the CEO (denoted by a_B^{BL} and a_C^{BL}) are as follows:

$$a_B^{BL} = \frac{k - 2\pi}{k^2 - 2\pi}, \quad a_C^{BL} = \frac{k - 1}{k^2 - 2\pi} \quad (\text{A.1})$$

Since $k > 2$, from (5) and (A.1) it is straightforward to show that $a_B^{BL} > a_B^{NL}$ if and only if $\pi < 0$. ■

Lemma 2 $a_C^{CL} > a_C^{NL}$ if and only if $\pi(v - a_C^{NL}) < 0$.

Proof From (2) and (3), if the CEO takes the leadership, the equilibrium effort levels of the board and the CEO (denoted by a_B^{CL} and a_C^{CL}) are as follows:

$$a_B^{CL} = \frac{k^2 - \pi - k\pi + v\pi^2}{k(k^2 - 2\pi)}, \quad a_C^{CL} = \frac{k - 1 - v\pi}{k^2 - 2\pi} \quad (\text{A.2})$$

Then, from (5) and (A.2) it is straightforward to show $a_C^{CL} > a_C^{NL}$ if and only if $\pi(v - a_C^{NL}) < 0$. ■

From (1) and (2), denote the expected utility of the board and the CEO at board leadership equilibrium by EU_B^{BL} and EU_C^{BL} respectively, those at CEO leadership equilibrium by EU_B^{CL} and EU_C^{CL} , and those at no-leadership equilibrium by EU_B^{NL} and EU_C^{NL} .

Also, let us denote the board's preference of leadership structure by \succ_B .

Lemma 3 $BL \succ_B NL$.

Proof Obvious from revealed preference.

Lemma 4 If $v < a_C^{NL}$, then $CL \succ_B NL$.

Proof Suppose that $v < a_C^{NL}$. Then, with some simplification, we can show the following:

$$\begin{aligned}
& \text{sign}(EU_B^{CL} - EU_B^{NL}) \\
&= \text{sign}(-v\pi^2(k^2 - \pi) + (2k^4 - 4k^2\pi + \pi^2)(k - 1)) \\
&= \text{sign}((2k^4 - 4k^2\pi + \pi^2)a_C^{NL} - v)
\end{aligned}$$

Since $v < a_C^{NL} = \frac{k-1}{k^2-\pi}$ and $k > 2$, $EU_B^{CL} > EU_B^{NL}$ or $CL \succ_B NL$. ■

Lemma 5 $CL \succ_B BL$ if and only if $v < \theta$, where $\theta \equiv \frac{k-1}{\pi^2} \left((k^2 - \pi) - k\sqrt{k^2 - 2\pi} \right)$.

Proof With some simplification, we can also show

$$\begin{aligned}
& \text{sign}(EU_B^{CL} - EU_B^{BL}) \\
&= \text{sign}(\pi^2 v^2 - 2(k-1)(k^2 - \pi)v - 2k + k^2 + 1)
\end{aligned}$$

Thus, given $v < a_C^{NL}$, $CL \succ_B BL$ if and only if $v < \theta$, where $\theta \equiv \frac{k-1}{\pi^2} \left((k^2 - \pi) - k\sqrt{k^2 - 2\pi} \right)$. ■

Lemma 6 $0 < \theta < a_C^{NL}$.

Proof Note that $\theta > 0$ since $(k^2 - \pi)^2 - k^2(k^2 - 2\pi) = \pi^2 > 0$. Also, $\theta < a_C^{NL}$ because

$$\begin{aligned}
& \text{sign}(\theta - a_C^{NL}) \\
&= \text{sign}((k^3 - 2k\pi) - (k^2 - \pi)\sqrt{k^2 - 2\pi}) \\
&= \text{sign}(-\pi^2(k^2 - 2\pi)) < 0
\end{aligned}$$

The inequality is from our assumption that $k > 2$ and $|\pi| < 1$. ■

Proof of Proposition 1 Suppose that $v < a_C^{NL}$ and $\pi < 0$.

(i) If $v \leq \theta$, from lemmas 3, 4 and 5, $CL \succ_B BL \succ_B NL$. Thus, CEO leadership is optimal. Also, from lemma 6 and 2, CEO leadership in this case will be passive.

(ii) If $\theta < v < a_C^{NL}$, from lemmas 3, 4, and 5, $BL \succ_B CL \succ_B NL$. Thus, board leadership is optimal. Also from lemma 6 and 1, board leadership in this case will be active.

(iii) From lemmas 3, 4, and 5, no-leadership is always the worst outcome for the board. ■

Proof of Proposition 2 Suppose that $v < a_C^{NL}$ and $\pi > 0$.

(i) If $v \leq \theta$, from lemmas 3, 4 and 5, $CL \succ_B BL \succ_B NL$. Thus, CEO leadership is optimal. Also, from lemma 6 and 2, CEO leadership in this case will be active.

(ii) If $\theta < v (< a_C^{NL})$, from lemmas 3, 4, and 5, $BL \succ_B CL \succ_B NL$. Thus, board leadership is optimal. Also from lemma 6 and 1, board leadership in this case will be passive.

(iii) From lemmas 3, 4, and 5, no-leadership is always the worst outcome for the board. ■

Proof of Proposition 3 Suppose that $v > a_C^{NL}$ and $\pi > 0$.

Since $a_C^{NL} > \theta$, from lemmas 3, 4, and 5, $BL \succ_B NL \succ_B CL$. Therefore, board leadership is optimal. Also, from lemma 1, board leadership in this case will be passive. Also, no-leadership is better for the board than CEO-leadership. ■

Proof of Proposition 4 Suppose that $v > a_C^{NL}$ and $\pi < 0$.

Since $a_C^{NL} > \theta$, from lemmas 3, 4, and 5, $BL \succ_B NL \succ_B CL$. Therefore, board leadership is optimal. Also, from lemma 1, board leadership in this case will be active. Also, no-leadership is better for the board than CEO-leadership. ■

Proof of Proposition 5

Claim 1 Suppose that $v \geq \theta$. If $v \geq \eta$, then it is optimal for the CEO to choose $\pi = \bar{\pi}$. If $v < \eta$, then it is optimal for the CEO to choose $\pi = \underline{\pi}$, where $\eta \equiv \frac{(k-1)(k^2 - \bar{\pi} - \pi)}{(k^2 - 2\bar{\pi})(k^2 - 2\underline{\pi})}$.

Since $v > \theta$, from propositions 1 and 2, board leadership is optimal.

From (2) and (A.1),

$$\frac{\partial EU_C^{BL}(\pi; k, v)}{\partial \pi} = 2(k^2 - 2\pi)^{-3} (-k^2v + 2v\pi + k - 1)(k - 1)k$$

Note that $\frac{\partial EU_C^{BL}(\pi; k, v)}{\partial \pi} > 0$ iff $\pi > \frac{1}{2v}(k^2v - k + 1)$.

Suppose that $v \geq \frac{(k-1)}{k^2-2}$. Then, it is straightforward to show that $\frac{1}{2v}(k^2v - k + 1) \geq 1$. Since $\bar{\pi} < 1$, EU_C^{BL} must be strictly decreasing over $[\underline{\pi}, \bar{\pi}]$. Therefore, the CEO must choose $\pi = \underline{\pi}$ to maximize the expected utility.

Now suppose that $v < \frac{(k-1)}{k^2-2}$. Then, we can show that $\frac{1}{2v}(k^2v - k + 1) < 1$. Thus, the CEO's expected utility is maximized either at $\pi = \underline{\pi}$ or $\pi = \bar{\pi}$. In particular, we can show that $EU_C^{BL}(\bar{\pi}; k, v) - EU_C^{BL}(\underline{\pi}; k, v) > 0$ if and only if $v > \eta \equiv \frac{(k-1)(k^2 - \bar{\pi} - \underline{\pi})}{(k^2 - 2\bar{\pi})(k^2 - 2\underline{\pi})}$.

Since $\eta < \frac{(k-1)}{k^2-2}$, if $v > \eta$, it is optimal for the CEO to choose $\pi = \bar{\pi}$. However, if $v < \eta$, then it is optimal for the CEO to choose $\pi = \underline{\pi}$.

Claim 2 Suppose that $v < \theta$. Then it is always optimal for the CEO to choose $\pi = \bar{\pi}$.

Since $v < \theta$, from proposition 1 and 2, CEO-leadership is optimal.

From (2) and (A.2),

$$\frac{\partial EU_C^{CL}(\pi; k, v)}{\partial \pi} = (k^2 - 2\pi)^{-2} k^{-1} ((k^2 - \pi)v - (k - 1)) (v\pi - k + 1)$$

Note that $((k^2 - \pi)v - (k - 1)) < 0$ because we assumed $v < \theta$ and because $\theta < a_C^{NL} = \frac{k-1}{k^2-\pi}$ from proposition 1.

If $v < 0$, then, $\frac{\partial EU_C^{CL}(\pi; k, v)}{\partial \pi} > 0$ iff $\pi > \frac{(k-1)}{v}$. Since $\frac{(k-1)}{v} < -1 < \underline{\pi}$, the CEO's expected utility must be increasing over $[\underline{\pi}, \bar{\pi}]$. Therefore, the CEO must choose $\pi = \bar{\pi}$ to maximize the expected utility.

If $v > 0$, then, $\frac{\partial EU_C^{CL}(\pi; k, v)}{\partial \pi} < 0$ iff $\pi > \frac{(k-1)}{v}$. Since $\bar{\pi} < 1 < \frac{(k-1)}{v}$, the CEO's expected utility must be increasing over $[\underline{\pi}, \bar{\pi}]$. Therefore, the CEO still must choose $\pi = \bar{\pi}$ to maximize the expected utility.

Claim 3 Define $\gamma = \max\{\eta, \theta\}$. Then, $\theta \leq \gamma < a_C^{BL+}$

By definition, $\gamma \geq \theta$. Also, $\gamma < a_C^{BL+}$ because $a_C^{BL+} > a_C^{NL}$ and $a_C^{NL} > \theta$ from proposition 1 and because $a_C^{BL+} > a_C^{BL+} \frac{k^2 - \bar{\pi} - \pi}{k^2 - 2\bar{\pi}} > \frac{(k-1)(k^2 - \bar{\pi} - \pi)}{(k^2 - 2\bar{\pi})(k^2 - 2\pi)} = \eta$.

Then, the proof of the proposition directly follows from these claims. ■

Proof of Proposition 6 Suppose that $v \geq \theta$. Then, board-leadership is optimal. From (A.1), the choice of efforts do not depend on v under board-leadership. Thus, the board is indifferent with respect to v .

Suppose that $v < \theta$. Then, CEO-leadership is optimal. From (1) and (A.2),

$$\frac{\partial EU_B^{CL}(v; k, \pi)}{\partial v} = -(k^2 - 2\pi)^{-2} k^{-1} (\pi - k\pi + k^3 - k^2 - v\pi^2) \pi^2$$

Note that $\frac{\partial EU_B^{CL}(v; k, \pi)}{\partial v} < 0$ iff $v < \frac{(k^2 - \pi)(k-1)}{\pi}$. It is straightforward to show that $\frac{(k^2 - \pi)(k-1)}{\pi} > \theta$.

Therefore, when $v < \theta$, under CEO-leadership, the board's payoff decreases in v . Therefore, it is optimal for the board to choose $v = \underline{v}$. ■

Proof of Proposition 8 First, to compare board leadership (BL) and CEO leadership (CL),

$$\begin{aligned}
& EU_C^{CL} - EU_C^{BL} \\
= & \frac{\pi}{2(k^2 - 2\pi)^2 k} ((k^2\pi - 2\pi^2)v \\
& + (2k^3 - 2k^2 - 4k\pi + 4\pi)v + 2k^2 - 4k + 2)
\end{aligned} \tag{A.3}$$

If $\pi < 0$, then $EU_C^{CL} - EU_C^{BL} > 0$ if and only if

$$\begin{aligned}
v < \gamma & \equiv \frac{(k-1)}{\pi(k^2 - 2\pi)} \left(k\sqrt{(k^2 - 2\pi)} - (k^2 - 2\pi) \right) \\
\text{or } v > \gamma' & \equiv -\frac{(k-1)}{\pi(k^2 - 2\pi)} \left(k\sqrt{(k^2 - 2\pi)} + (k^2 - 2\pi) \right)
\end{aligned}$$

Since $k > 2$ and $\pi < 0$, $\gamma' > 0$, it is also straightforward to show that $\gamma < a_C^{NL}$.

Second, to compare no leadership (NL) and board leadership (BL),

$$\begin{aligned}
& EU_C^{NL} - EU_C^{BL} \\
= & \frac{(k-1)k\pi}{2(k^2 - \pi)^2(k^2 - 2\pi)} \times \\
& ((2k^4 - 6k^2\pi + 4\pi^2)v - (2k^3 - 2k^2 - 3k\pi + 3\pi))
\end{aligned} \tag{A.4}$$

Since $k > 2$ and $\pi < 0$, $EU_C^{NL} - EU_C^{BL} > 0$ if and only if

$$v < \phi \equiv a_C^{NL} \frac{2k^2 - 3\pi}{2k^2 - 4\pi}.$$

It is also straightforward but tedious to show that $\phi < \gamma$ and that $\theta < \phi < \gamma < a_C^{NL} < \gamma'$.

Finally, from the revealed preference argument, $EU_C^{CL} > EU_C^{NL}$. Proposition 8 summarizes these results. ■

Proof of Proposition 9 Suppose that $\pi > 0$. From (A.3), if $\pi > 0$, then $EU_C^{CL} - EU_C^{BL} > 0$ if and only if $v > \gamma$ or $v < \gamma'$. Also from (A.4), $EU_C^{NL} - EU_C^{BL} > 0$ if and only if $v > \phi$. When $\pi > 0$, it is also straightforward to show that $\gamma' < 0 < \theta < a_C^{NL} < \gamma < \phi$. Again, from the revealed preference argument, $EU_C^{CL} > EU_C^{NL}$. Proposition 9 summarizes these results. ■

Proof of Proposition 12 First, consider the board's choice of v . Suppose that $\pi < 0$. From proposition 10, if $v > \gamma$, board leadership will satisfy both the board and the CEO. And if $v < \phi$,

CEO leadership will satisfy both. However, if $\phi < v < \gamma$, board leadership does not pareto-dominate CEO leadership, and vice versa. In this case, since $\gamma < a_C^{NL}$, the board is independent. Then, we have assumed that the board can choose the leadership structure. Since $\theta < \phi$, from proposition 1, the board will prefer board leadership to CEO leadership. To summarize, to satisfy both the board and the CEO, if $v > \phi$, board leadership will be chosen. If $v < \phi$, CEO leadership will be chosen. Then, from the proof of proposition 6, the board's payoff is maximized at $v = \underline{v}$.

Now suppose that $\pi > 0$. From proposition 11, if $v > \phi$, there will be no-leadership. If $\theta < v < \phi$, board leadership will be chosen. If $\gamma' < v < \theta$, from proposition 1, the board is independent, and it will choose the CEO-leadership under our assumption. Finally, if $v < \gamma'$, the CEO-leadership will be chosen. Note that from (5), the board's payoffs do not depend on v under no-leadership. Also, from (A.1), the board's payoffs do not depend on v under board-leadership, either. However, from the proof of proposition 6, the board's payoffs decreases in v under CEO-leadership. Therefore, the board's payoffs must be maximized at $v = \underline{v}$.

Then, regardless of π , the dominant strategy for the board is to choose $v = \underline{v}$.

Now, consider the agent's choice of π . Given that the board will always choose the minimum $v = \underline{v} (< \theta)$, from the discussion above, the CEO-leadership will be chosen regardless of π . Then, from Claim 2 in the proof of proposition 5, the CEO's payoffs is maximized at $\pi = \bar{\pi}$.

Therefore, the equilibrium in proposition 7 does not change even if the leadership structure must satisfy both the board and the CEO. ■

Figure 1 Timing of the Game

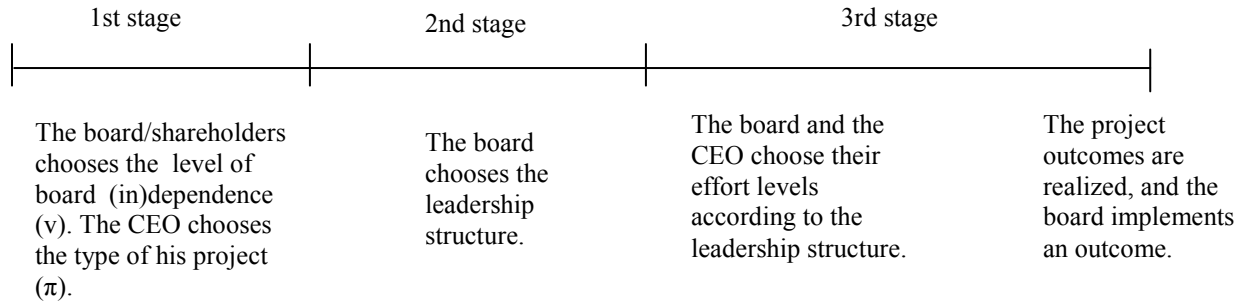
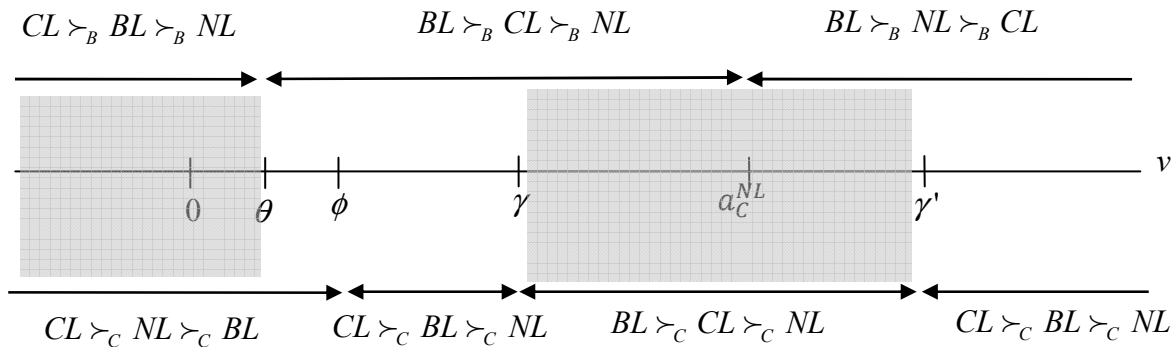
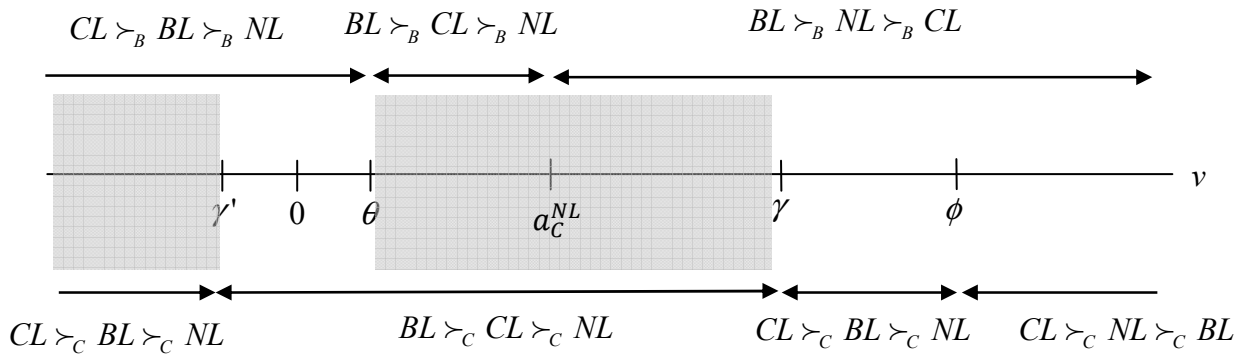


Figure 2 Board vs. CEO Preference: $\pi < 0$



Note: 'CL', 'BL', and 'NL' stand for CEO-leadership, Board-leadership, and No-leadership, respectively. The board's preference is based on proposition 1 and 4. The CEO's preference is based on proposition 8. The grey box area represents the range of ' v ' where both the board and the CEO agree on the optimal leadership structure.

Figure 3 Board vs. CEO Preference: $\pi > 0$



Note: 'CL', 'BL', and 'NL' stand for CEO-leadership, Board-leadership, and No-leadership, respectively. The board's preference is based on proposition 2 and 3. The CEO's preference is based on proposition 9. The grey box area represents the range of ' v ' where both the board and the CEO agree on the optimal leadership structure.