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## Board independence and competence

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# Board Independence and Competence

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# Board Independence and Competence

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## Abstract

This paper analyzes board independence and competence as distinct, but inextricably linked aspects of board effectiveness. Competent directors add shareholder value because they have better information about the quality of projects. While a CEO cares about shareholder value, he also wants his board to behave loyally to him by agreeing to projects that give him private benefits. Because many aspects of the CEO-board relationship are not contractible, the paper studies a model of relational contracts, a tool that has hitherto been rarely used in work on corporate governance. The analysis reveals a tradeoff: Inefficient loyalty is endogenously easier to obtain from a less competent board. The implied conflict of interest between shareholders and the CEO is particularly pronounced in difficult times. Fortunately, the tradeoff does not arise with respect to efficient loyalty. Several empirical predictions flow from the model, some of which explain existing empirical facts while others are new.

*Keywords:* Boards, Corporate Governance, Relational Contracts

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## 1. Introduction

The feeling that boards of directors sometimes, though certainly not always, act too much in line with CEOs' preferences, rather than with shareholders' preferences, and that some boards consist of individuals exceedingly loyal to CEOs has led many countries to adopt new standards of corporate governance. For example, governance codices of various countries as well as guidelines of exchanges such as the NYSE and the NASDAQ now prescribe a certain number of "independent" directors. The potential inadequacy of these structural reforms is brought out perhaps most forcefully by the case of WorldCom. The board of WorldCom would have qualified as independent by today's standards (and even the CEO and chairman positions were separated). However, as Kaplan (2005) points out, the directors "were not truly independent" (p. 7). But what is "true independence" (rather than *de iure* independence) as opposed to what one might describe as *de facto* loyalty or obedience?

This paper analyzes director independence as an optimally chosen behavior, not as a given trait that is determined by a director's status as an outsider or his character. It posits that both insiders and outsiders, however defined, respond to incentives in their relationship with the CEO.<sup>3</sup> In particular, section 2 considers a firm where a (male) CEO would like to implement projects (e.g., acquisitions) which sometimes have positive net present value (NPV) but sometimes are value-destroying. A more competent board is better at helping the CEO choose projects that increase shareholder value. In her monitoring role, the (female) board may oppose bad projects. The CEO would like the board to be loyal to him, i.e., to positively evaluate and ultimately agree to any project such as an acquisition, even if it is value-destroying. This is because the CEO has an empire-building motive that may be stronger than the incentives for value-creation that derive from his stock ownership in the firm. The board members also hold some stock in the firm, or care about their career. Therefore, they will only agree to bad projects if they receive some rewards that compensate them for costly acts of loyalty. For example, the board may be co-opted with gifts and perquisites. The paper begins by studying such inefficient loyalty because this problem has received great attention in the policy discussion. The CEO and the board usually cannot write an explicit contract on the exchange of loyalty for rewards. Rather, they need to sustain this exchange through a self-enforcing contract. Therefore, this paper uses a repeated game model to study the board-CEO relationship. As such, one contribution of this paper is to introduce this methodology to the governance context from which it has so far been conspicuously absent. The relational contract framework yields several predictions.

First, inefficient loyalty may be feasible only for less than fully competent boards, because highly competent directors require large rewards for loyalty, but these rewards may not be credibly promised by the manager. Although this finding is in itself not too surprising – it can be interpreted as a corollary of the Folk Theorem – its implication is relevant for the corporate governance debate: *Ceteris paribus*, where shareholders are powerful enough to elect a competent board, they will have to worry less about that board becoming too obedient to the CEO. The current discussion on boards often emphasizes the importance of competent and independent boards, but rarely recognizes

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<sup>3</sup>This is not to say that personality plays no role for loyalty; of course, it does. So do personal connections that exist between CEOs and boards. This paper analyzes aspects of director independence that are due to economic incentives.

their inherent connection. The analysis here reveals that these two valued qualities are distinct, but inextricably linked. Highly competent boards usually behave more independently, but may behave loyally if the CEO has the right incentives at his disposal. Conversely, even incompetent boards may behave independently if the environment makes it too costly for the CEO to obtain loyalty from them. It is, therefore, by no means to be taken for granted that CEOs are always able to capture their boards.

Second, the model shows that while in difficult situations shareholders would prefer a competent board to help them identify the rare positive NPV projects, it is precisely in these situations that the conflict of interest between the CEO and shareholders is most pronounced; in particular, in these situations the CEO needs a less than fully competent board in order to secure loyalty. Only when the costs of bad projects become too steep will the CEO prefer to forego loyalty and instead interact with a competent board. By contrast, in easy situations (where the expected NPV of projects is positive), the directors, even if they are ignorant about the state of the world, will approve all projects; there is, thus, no need for the CEO to pay the board to act loyally, and no need for a repeated loyalty agreement.

Third, empirical predictions arise from recognizing how the CEO's optimal choice of board competence varies with the model parameters. Factors that decrease the level of competence compatible with loyalty will make loyalty relatively costly to obtain, thus making it more attractive for the CEO to get a competent board after all. Thus, the model implies that we should expect a positive correlation between director competence on the one hand and measures of the power of the CEO's and the board's incentives, short-horizon interactions of the CEO and the board, difficulty of appropriation of private benefits by the CEO, and the volatility of outcomes of projects, respectively, on the other hand. Section 2 cites evidence that supports some of the model's predictions, and details how the model's hypotheses can be tested and expanded by taking into account additional features of the real world.

Fourth, there may be cases where cooperation between CEOs and directors does not lead to costs for the firm but rather improves firm performance, for example, because of a more effective information exchange. Fortunately, under such circumstances, CEOs will themselves favor more competent directors because their competence increases the "pie" that is available for sustaining the relational contract. There is, thus, no tradeoff between competence and efficient loyalty. Section 3 discusses this extension and other implications of the model for term limits, voting requirements on boards, etc. Section 3 also demonstrates that the results are robust to changes in modeling assumptions. It shows that partial loyalty agreements – where the CEO only requires and pays for loyalty in some states – are strictly dominated by comprehensive agreements. It also demonstrates how the results hold under an alternative timing assumption.

Section 4 analyzes how shareholders would optimally incentivize the CEO and the board in this setting. Not surprisingly, with no constraints on incentives, shareholders could avoid inefficient board loyalty and obtain competent boards by setting sufficiently high pay-performance sensitivities. This comes at a cost: Because in expectation more good projects are realized, executive pay is higher. In this extreme case the empirical predictions for board competence would not apply, as all boards would be competent. Of course, the board co-option problem is not the primary problem that performance-related pay is designed to solve. Thus, if setting executive and director incentives that address the

co-option problem is not costless, or if these incentives also need to address other problems such as moral hazard, board co-option may well still obtain, as will the empirical predictions developed earlier.

Section 5 offers concluding remarks.

### *1.1. Related literature*

The central and new feature of the analysis is that board independence is modeled as strategic behavior that is partly determined by, but not identical to, board competence. As such, this paper contributes to the literature, going back to Mace (1986) and Jensen (1993), that studies the practical difficulties inherent in making boards perform their function as stewards of shareholders' interests. It analyzes one element of what Williamson (2008) calls the "intrinsic limitations of boards in monitoring and managing respects" (p. 247). Among other things, he warns that de facto CEO control can arise from lack of board competence (p. 261). This is also consistent with the results of Cohen et al. (2009) that suggest that CEOs may favor incompetent "cheerleaders" (in Cohen et al.'s case, poorly performing analysts) on the board. These studies, among others, reflect a growing sense in the literature that competence cannot be analyzed separately from independence. This paper formalizes this idea, investigates its robustness, and derives implications that follow from it. To do so, it recognizes that CEOs often wield substantial power in the choice of boards. For example, the by far most common procedure for filling open seats on boards is for the CEO and the existing directors to propose a slate of candidates, where the number of proposed directors corresponds exactly to the number of open seats Cai et al. (2009b). Open contests over the choice of directors are still exceedingly rare Bebchuk (2003), and the impact of new SEC regulation aimed at fostering competition for board seats remains to be seen. All this suggests that formal measures of independence may not be highly informative about a board's actual effectiveness.

This is particularly important because there is a large number of empirical studies on the corporate performance effects of boards that have used board independence as a key explanatory variable. As dependent variables, empirical studies have considered corporate decisions as well as firm performance. As an example for the first group of studies, the turnover-performance sensitivity is indeed higher in firms with outsider-dominated boards Weisbach (1988), but the effect is not very large and tends to disappear in later sample periods. Importantly for the present paper, Agrawal and Chadha (2005) find that independence of directors per se does not decrease the probability of a company having to restate earnings; only independence combined with financial literacy leads to this desired result. In the second group of studies, while board independence predicts higher share prices in emerging markets Black et al. (2006), for developed countries the evidence for greater performance of firms with more formally independent directors is weak (see Bhagat and Black (2002) and Yermack (2006) for reviews). Indeed, recent research emphasizes the difficulties of generating reliable and valid measures for corporate governance and the actual independence of directors Larcker et al. (2007).<sup>4</sup> In sum, standard measures of *de iure* independence appear to be at most imperfect predictors of

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<sup>4</sup>Detecting a relation between performance and governance characteristics in the data is also likely to have been due to a failure to include all appropriate exogenous variables that determine both performance and endogenously chosen governance characteristics together (see Demsetz and Lehn (1985), Himmelberg et al. (1999) and Palia (2001), for example). Recently, the literature has used GMM panel techniques and has unearthed some evidence of the value-relevance of independence of directors and other governance features in international contexts Chhaochharia and Laeven (2009) while for the US the data continue to show no causal relation between board structure and current firm performance Wintoki et al. (2008).

actual behavior, governance outcomes, and firm performance. This motivates this paper's inquiry into the *de facto* independence of boards.

A growing theoretical and empirical literature has analyzed boards as an endogenous institution. For space reasons, the discussion is limited to the most closely related theoretical papers.<sup>5</sup> Warther (1998) provides a model where the CEO ejects dissenting board members, leading directors to threaten to fire the CEO only in especially dire times. By contrast, the present paper explicitly models the CEO's decisions and focuses on the CEO's choice of director competence.<sup>6</sup> In their seminal paper, Hermalin and Weisbach (1998) show that powerful and competent CEOs can make the board less independent. Independence in that paper is modeled as a preference parameter, namely, distaste for monitoring, that is chosen by way of negotiation between the CEO and the board. Here it is modeled as behavior. Harris and Raviv (2008b) study a model that allocates control of the board to insiders (whom they define as dependent board) or outsiders (independent directors). They find that optimal boards employ larger numbers of outsiders when managers' private benefits are high and the cost of monitoring is low. This paper instead considers a CEO who chooses his own board, and focuses exclusively on the economic incentives, not the provenance of the director. Kumar and Sivaramakrishnan (2008) show that dependent boards can actually increase shareholder value. In their model, board dependence is modeled as intrinsic alignment with the interests of the CEO. Here, the focus is on the monitoring role of the board and board dependence is not intrinsically given but a behavior. Moreover, boards vary in competence, and the model yields the result that board competence needs to be sacrificed only for inefficient loyalty, not for efficient loyalty. Drymiotis and Sivaramakrishnan (2007) also model strategic board behavior, but focus on the consulting role and study how the board's consulting behavior is affected by the incentive structure. Next, CEO-board friendships may have advantages in terms of information revelation Adams and Ferreira (2007). Consistent with this notion, the results in this paper imply that although more competent boards are less easily induced to inefficient loyalty, efficient loyalty relationships are easier to sustain with them. Finally, Song and Thakor (2006) study a career concerns setup where the CEO controls the board's screening information. Among other things, they find that a CEO may desire a less able director in economic upturns. The present paper is, therefore, consistent with this work, but provides another angle by considering the co-option problem between the CEO and the board, rather than an information transmission problem. It is interesting that two such different modeling frameworks both yield the prediction that a CEO may prefer less than fully competent directors.

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<sup>5</sup>Recent empirical work on how boards tend to be composed according to economic needs include Klein (2002), Lehn et al. (2003), Boone et al. (2007), Coles et al. (2008a), Coles et al. (2008b), and Linck et al. (2008).

<sup>6</sup>A recent attempt to study extreme board obedience is Morck (2008). He makes the connection between directors' subservience and the innate psychological predisposition to obey authority that was famously demonstrated by Milgram (1974). He concludes that dissenting peers and independent directors are the solution. This paper serves as a formalization of some of the arguments, but also as a caveat to these conclusions. Independence and dissent are always (also) choice variables, not (only) given traits of character.

## 2. *De facto* board independence or obedience

### 2.1. Setup

Consider the interaction between a (male) CEO (C) and a (female) board (B).<sup>7</sup> Every period, a project opportunity comes along. The projects are sufficiently large for the board to be directly involved in decision-making. For example, one might consider acquisitions, strategy choices, and other large projects. With probability  $p$ , the project is of high quality and yields an NPV  $y_H > 0$  for the firm. With probability  $(1 - p)$ , the project is of low quality and yields an NPV  $y_L < 0$  for the firm. The expected NPV is  $Ey = y_L + p\Delta$ , where  $\Delta = y_H - y_L > 0$ . We can allow  $Ey$  to be positive or negative.<sup>8</sup>  $Ey > 0$  describes *easy* situations, and  $Ey < 0$  indicates *difficult* situations. The main analysis concentrates on difficult situations. For example, although there is some discussion in the literature on the average wealth creation or destruction effect of acquisitions, one plausible case is that in some industries, acquisitions are on average a bad idea for shareholders. The formal results for easy situations are available on request; they are discussed them informally below.

*Basic payoffs.* C and B both receive a fraction of output as compensation.<sup>9</sup> For some output  $y_i$ , C's and B's payoffs are  $ay_i$  and  $sy_i$ , respectively. A more complete model would also consider a moral hazard problem to motivate and explicitly describe the (typically non-linear) incentive scheme for a risk-averse C, but linear compensation schemes are convenient to present the paper's point. The two agents' participation constraints are satisfied, e.g., because holding a position in the company is sufficiently rewarding in itself. Shareholders are the residual claimants and receive  $(1 - a - s)y_i$ . In section 4, the paper discusses the extent to which shareholders can circumvent some of the challenges described in this model.

*C's private benefits.* C does not observe project quality on his own; he requires the help from the board. However, C derives private benefits from implementing any project, be it a positive or negative NPV project. Denote these private benefits with  $\psi > 0$ . (The results also hold if the board also receives some private benefits, albeit smaller ones than the CEO.) Assume that  $\psi + y_L < 0$ . Thus, there is an incentive scheme  $\hat{a}$  that falls short of selling the firm completely to C ( $\hat{a} < 1$ ) such that C does not derive sufficiently large private benefits from implementing projects that he is willing to implement a bad project. Put yet another way: Negative NPV projects and board loyalty are also socially inefficient, even taking into account that C receives benefits from them. We will say that CEO incentives are (relatively) *high-powered* when  $\psi + ay_L < 0$ , and (relatively) *low-powered* when  $\psi + ay_L > 0$ . In this section, we consider the case where  $\psi + ay_L > 0$ , i.e., C wants to implement all projects. We turn to high-powered incentives in section 4.

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<sup>7</sup>Like most of the literature, the model does not consider interactions within the board, but rather treats the board as a unitary actor. See Gillette et al. (2008) for an exception.

<sup>8</sup>It is assumed that the firm otherwise generates sufficient profits to keep the firm in business even if it implements negative NPV projects. The model abstracts from the complication that there may be periods where  $Ey$  is positive and others where it is negative.

<sup>9</sup>That there is some degree of pay-for-performance for CEOs is not controversial. For directors, this assumption is a shortcut to model the various explicit incentives and career concerns documented by Gilson (1990), Kaplan and Reishus (1990), Farrell and Whidbee (2000) and Yermack (2004), for example.

*B's action.* B decides on the project (whether or not she has learned the quality). Some of the biggest corporate decisions do involve board approval as modeled here. For other, smaller decisions, C has the decision rights. In those instances, the assumption that B decides about the project is a shortcut for a more elaborate apparatus, in which B sends a message about the project quality to C, perhaps also stating the intensity of her preferences. C can implement a project even if the message B sends is very bad, but this is costly to him, because by virtue of B's monitoring role she can also ultimately overrule or fire C. Thus, C has to expend effort to overcome resistance of B. A more detailed model of the advisory process between boards and CEOs along these lines would be more realistic, but for the purposes of the present analysis, not much seems lost in terms of economic insights by having B agree or disagree to the project. When B agrees to a project, she acts *loyally*. When B is against a project, C's utility is reduced to what he would earn if he were fired. C earns zero as his reservation utility.

*Rewards for costly loyalty.* Given that B suffers costs from agreeing to a negative (expected) NPV-project, C has to offer B rewards if she consents nonetheless. Denote these rewards by  $x$ . Rewards may, for example, consist in C lauding B's abilities in his conversations with other CEOs such that B's chances for securing additional directorships are enhanced. The CEO may also provide perquisites like planes (as in the case of WorldCom). To make matters as hard as possible for C, assume that he bears all the costs. To the extent that it is the company – or rather the shareholders – that pays these costs, a C with low-powered incentives has an incentive to always try to induce loyalty.

The notion that loyalty is costly for board members and that CEOs have various options at their disposal for rewarding loyalty frequently appears in anecdotes and in the empirical literature on corporate governance (see, e.g., Bebchuk and Fried (2004)). There is substantial evidence that directors who participate in corporate governance changes that reflect greater board control over management are subjected to informal social sanctioning by the CEO and other directors who are loyal to the CEO Westphal and Khanna (2003). They may be ejected Mace (1986). Conversely, when they behave loyally, directors can avail themselves of pecuniary and non-pecuniary benefits Main et al. (1995), and directors who ingratiate themselves with the CEO are more likely to gain additional board appointments Westphal and Stern (2007, 2006). Moreover, Lorsch and MacIver (1989) document that prestige and business contacts are very important, sometimes more important than explicit monetary rewards. What this analysis adds is that it shows how the required rewards vary endogenously with the level of board competence.

Note that the costs that B needs to bear in order to be loyal need not be restricted to the direct monetary cost of lower present compensation. For example, to the extent that C requires B to participate in fraudulent behavior, the director may lose other directorships when a lawsuit is filed. Fich and Shivdasani (2008) provide evidence for this and calculate the median value of a directorship as close to US\$1 million, not taking into account the effort needed for the directorship. Srinivasan (2005) finds that outside directors are penalized with a loss of directorships when their firms issue an accounting restatement, with the greatest loss in directorships for audit committee members and for the most severe earnings restatements.

*Noncontractibility.* Rarely will C and B be able to write a court-enforceable contract about B's voting behavior and C's rewarding behavior. The essence of B-C loyalty lies in the non-contractibility of important aspects of their interaction. Because contracts are incomplete, C can only aim to establish loyalty through repeated interaction.

*B's competence.* The board's competence is denoted by  $\theta$ , and C chooses  $\theta$ . One interpretation is that  $\theta$  describes the amount and quality of information the CEO shares with the board. Alternatively,  $\theta$  is a characteristic of the board itself, such as cognitive ability, industry experience, or financial or technological expertise. For purposes of cross-firm empirical work, the latter interpretation is probably more operational, while for understanding individual cases, the former interpretation is useful. The assumption that C determines  $\theta$  may appear to exaggerate C's power. However, in many firms, CEOs indeed frequently play a dominant role vis-a-vis their shareholders.<sup>10</sup>

The role of competence is to allow the board to identify the quality of projects that come the firm's way. In particular, with probability  $\theta$ , B learns the project type. B passes on this information to C; the only friction in the B-C-interaction is the non-contractibility of behavior.<sup>11</sup> With probability  $(1 - \theta)$ , B does not learn anything.

Each period, there are thus 3 states: In *state H*, B has learned that the project type is High. In *state L*, B has learned that the project type is Low. And in *state U*, B remains ignorant. The stage payoffs in these three states are given by the following payoff matrices.

**Table 1: Payoff matrix in state where B learns that the project is High**

**State High (H): probability  $\theta p$**

	B consents	B dissents
C rewards	$ay_H + \psi - x, sy_H + x$	$-x, x$
C does not reward	$ay_H + \psi, sy_H$	0, 0

**Table 2: Payoff matrix in state where B learns that the project is Low**

**State Low (L): probability  $\theta(1 - p)$**

	B consents	B dissents
C rewards	$ay_L + \psi - x, sy_L + x$	$-x, x$
C does not reward	$ay_L + \psi, sy_L$	0, 0

<sup>10</sup>Between 2003 and 2005, in 2484 out of 2488 shareholder meetings in a sample of the largest US corporations, the number of directors to be elected equaled the number of seats Cai et al. (2009b). Speaking for DWS, the largest German mutual fund company, Kaldemorgen and Gruber (2007) point out that also for the European case they have "the impression that CEOs choose their own boards of directors" (p. 264).

<sup>11</sup>Note that because of the assumed decision-making power allocation,  $\theta$  is measuring board competence. In isolation,  $\theta$  could mean CEO competence or even the quality of the CEO-board match. But this would be inconsistent with the assumption that B makes the decisions - in that case, we would need to specify an information transmission game. This is an interesting alternative route, outside the scope of this paper. It is also possible that a board could try to extract bribes from the CEO by threatening to veto the project even if it is a good project. At least in the model presented here, this threat is not credible in the sense of being subgame-perfect. See Drymiotis and Sivaramakrishnan (2007) for an analysis when the board is unable to commit ex ante to supplying monitoring and consulting inputs.

**Table 3: Expected payoff matrix in state where B does not learn project quality State Unknown (U) :**

	probability $(1 - \theta)$	
	B consents	B dissents
C rewards	$aEy + \psi - x, sEy + x$	$-x, x$
C does not reward	$aEy + \psi, sEy$	$0, 0$

*Timing.* In period 0, C has to announce which  $x$  he is intending to pay for loyalty. He can only announce one reward, independent of the state.

In period 1, with probabilities  $\{\theta p, \theta(1-p), (1-\theta)\}$  the three states  $\{H, L, U\}$  get realized. This is commonly observed.

In period 2, the agents play the game of the relevant stage in a simultaneous-move fashion.

In the case of repeated interaction, the economy restarts in period 0. Depending on the history of play, players optimize their strategies (on the strategies used to sustain cooperation see below).

## 2.2. *Statically optimal behavior (spot interaction)*

Consider first the case where the above game is played once only. To solve for the level of board competence that C prefers, we determine the equilibria in each of the three possible states. C then chooses  $\theta$  to maximize his expected utility.

It is easy to verify that the Nash equilibrium in state H is {not reward, consent}. In states L and U, it is {not reward, dissent}. C's expected utility in spot interaction is, therefore, given by

$$Eu_C^S = \theta p (ay_H + \psi) + \theta(1-p)0 + (1-\theta)0, \quad (1)$$

Shareholder utility is given by

$$Eu_S^S = \theta p (1-a-s)y_H + \theta(1-p)(1-a-s)0 + (1-\theta)(1-a-s)0. \quad (2)$$

Clearly, in difficult environments ( $Ey < 0$ ),  $\theta = 1$  is optimal for the CEO. Intuitively, C would rather avoid B possibly not learning the state of the world, because in case of doubt, B dissents. In other words, C is no worse off when B finds out that the state is L than if the state is U. Thus, C maximizes the probability that B finds out that the state is H.

In summary:

**Proposition 1.** *In spot interaction, the CEO prefers a maximally competent board.  $\theta_S^* = 1, Eu_C^S = p(ay_H + \psi), Eu_S^S = p(1-a-s)y_H.$*

## 2.3. *Repeated interaction*

Because C derives private benefits that outweigh his losses even from negative NPV projects when his incentives are low-powered, he would like B to agree to the projects in all states. (The case where C does not require loyalty in all three states is discussed in the robustness section below.) Although B's loyalty to C may not be in the shareholders' interests, C may be able to secure loyalty by offering sufficient loyalty rewards  $x$ . However, since loyalty and its

rewards are non-contractible, the only way to achieve this result is through repeated interaction and a relational (self-enforcing) contract. The crucial difference of this analysis from that of a standard repeated Prisoner's Dilemma is that C can choose which amount  $x$  to offer and with whom to play the game.

C and B will usually not know when their interaction will end; most likely the end date will not be common knowledge. Therefore, it is appropriate to analyze their interaction as if it were infinitely repeated. That is, both agents discount the future with discount factor  $\delta < 1$ .<sup>12</sup> For example, we might think of the discount factor being determined by the probability of a hostile takeover; everything else being equal, if that probability is lower, it is more likely that the CEO-board interaction is long-lasting.

In this setting, consider self-enforcing (relational) *loyalty with rewards* contracts. We concentrate on stationary contracts of the following form: B promises to be loyal to C. C promises to pay  $x$  in each period.<sup>13</sup>

The timing of events becomes relevant. In particular, we need to ask whether C can take  $\psi$ , but not pay  $x$ , and whether B can take  $x$ , but still dissent. That is, can the parties deviate from the loyalty agreement and still obtain the other side's cooperative contribution? In the standard Prisoner's Dilemma, the answer to this question is yes. Even when C and B do not literally move simultaneously, this is the correct assumption to make when they do not learn the other party's move until later in the period. As this is a plausible relevant case in real-world interaction between the CEO and the board, the analysis proceeds under this assumption. The robustness section below considers sequential moves.

### 2.3.1. Feasibility of loyalty and non-renegeing constraints

We now turn to the conditions for loyalty with rewards to be an equilibrium. As is common in the literature on self-enforcing contracts, this equilibrium is supported by trigger strategies, i.e., strategies in which C and B promise each other allegiance and rewards, and any one-time deviation results in both players exerting the statically optimal behavior in all future periods.<sup>14</sup> We need to consider two cases: the case of  $\theta > 0$  and the case of  $\theta = 0$ . The difference is that with  $\theta > 0$ , the quality of the project is never unknown, while under  $\theta = 0$ , the quality of the project is always unknown.

Suppose that  $\theta > 0$ . Both agents know that on the renegeing path, B will only agree to the project when she knows

<sup>12</sup>This discount factor combines pure time preference with the assumption that the game between B and C ends each period with some probability. Specifically, suppose that the rate of time preference of B and C is  $r$ , the period length is  $\Delta$ , and there is a probability  $\rho$  of continuing from one period to the next. Then \$1 tomorrow, to be collected if the game lasts that long, is worth nothing with probability  $1 - \rho$  and worth  $\delta = e^{-r\Delta}$  dollars with probability  $\rho$ . This uncertain future inflow thus has expected discounted value of  $\delta' = \rho\delta$ . This corresponds to the situation where  $\rho' = 1$  and  $r' = r - \ln(\rho) / \Delta$ . In short, the infinitely repeated game represents a game that terminates in finite time with probability 1. See Fudenberg and Tirole (1996) for more details (p. 148). Numerous papers studying trust and cooperation have used the same approach, in areas such as economic history and culture Greif (1998), labor economics Bull (1987), industrial organization Rotemberg and Saloner (1986), incentive theory Levin (2003), and organizational economics Baker et al. (2002), among others.

<sup>13</sup>Levin (2003) provides a general theorem that shows we can limit our attention to stationary contracts in settings like the one considered here. There would be state-varying payments if the outside wage were also state-varying Thomas and Worrall (1988). The robustness section below shows that C is better off with loyalty payments every period than just in states where loyalty is costly to B.

<sup>14</sup>Using trigger strategies may not be particularly realistic, but it is the standard approach for studying related problems Bull (1987); MacLeod and Malcomson (1989); Baker et al. (2002). This assumption is motivated by the work of Abreu (1988) who showed that if cooperation is attainable in a repeated game, it is without loss of generality to concentrate on the worst punishment path. The static equilibrium remains an equilibrium also in the repeated game. Considering the newly arising cooperation equilibrium is the standard assumption for the analysis of self-enforcing contracts.

it is of high quality. C's non-renegeing constraint, therefore, is,<sup>15</sup>

$$\begin{aligned}
& ay_L + \psi - x + \frac{\delta}{1-\delta} \left[ \frac{\theta p (ay_H + \psi - x) + \theta (1-p) (ay_L + \psi - x) +}{(1-\theta) (aEy + \psi - x)} \right] \quad (\text{NR-C}) \\
& \geq ay_L + \psi + \frac{\delta}{1-\delta} [\theta p (ay_H + \psi) + \theta (1-p) (0) + (1-\theta) (0)], \quad (3)
\end{aligned}$$

which implies that

$$x \leq \delta (\psi + aEy) - \delta \theta p (\psi + ay_H). \quad (4)$$

This condition says that the CEO will not renege only if the reward is less than the discounted value of the net gain from one more period of loyalty. This net gain is smaller if the board is more competent, because a more competent board is more likely to agree even if it is not loyal, *ceteris paribus*.

For B, honoring her promise of loyalty is preferred if and only if deviating today (and thus avoiding the negative NPV project) plus spot interaction going forward is dominated by suffering  $sy_L < 0$ , but obtaining  $x$  in each period. Formally, B's non-renegeing constraint (NR-B) is, in a state where B knows that the project is of low quality,<sup>16</sup>

$$\begin{aligned}
& sy_L + x + \frac{\delta}{1-\delta} \left[ \frac{\theta p (sy_H + x) + \theta (1-p) (sy_L + x) +}{(1-\theta) (sEy + x)} \right] \quad (\text{NR-B}) \\
& \geq x + \frac{\delta}{1-\delta} [\theta p sy_H + \theta (1-p) (0) + (1-\theta) (0)]. \quad (5)
\end{aligned}$$

Simplifying yields

$$x \geq -\frac{sy_L}{\delta} - sp (y_H (1-\theta) - y_L). \quad (6)$$

That is, the minimal amount of rewards B requires are increasing in B's competence. Loyalty is costly for competent boards because they may know with greater certainty that a bad state was realized.

Combining the two NR's yields the maximum level of competence compatible with loyalty,

$$\theta \leq \frac{\delta^2 \left( \psi + aEy + sp \frac{\Delta}{\delta} \right) + sy_L}{\delta^2 p \left( \psi + ay_H + s \frac{y_H}{\delta} \right)}. \quad (7)$$

From this inequality, we can make the following observation.

**Proposition 2. (*Feasibility of loyalty*)** *Loyalty of too competent boards may be infeasible.*

In other words, if a CEO is given a sufficiently competent board, or if his power in lobbying for a less competent board is limited, there will likely be no loyalty. The basic insight of the model, therefore, is that independence and competence are linked, but separate concepts: Even a highly competent board may act loyally, and even an incompetent

<sup>15</sup>In studying the non-renegeing constraints, we can restrict ourselves to the case where we start in state L. That is the state where the renegeing temptation is greatest for B.

<sup>16</sup>Note that the non-renegeing constraint when B does not learn the project's quality is implied by NR-B.

board may act independently, depending on the economic environment in which the CEO and the board interacts. In particular, there is a positive level of competence for which loyalty is feasible only if

$$\psi + y_L \left( a + \frac{s}{\delta^2} \right) + p \left( a + \frac{s}{\delta} \right) \Delta > 0, \quad (8)$$

in which case the numerator in expression (7) is positive. This result can be interpreted as a version of a Folk Theorem.

Loyalty may also be infeasible for completely incompetent boards. To see this, consider the case of  $\theta = 0$ . This changes B's non-renege constraint, because now it is certain that the state is U now and forever. Thus, the non-renege constraint in this case is

$$x \geq -\frac{sEy}{\delta}. \quad (9)$$

Combining this with C's non-renege constraint (which remains unchanged), loyalty is feasible for zero board competence if

$$\psi + \left( a + \frac{s}{\delta^2} \right) Ey > 0. \quad (10)$$

Note that this condition will fail for a small enough  $\delta$ , too large  $a$  and  $s$ , and too negative  $Ey$ .

### 2.3.2. Desirability of loyalty

To determine whether C, in fact, desires to implement loyalty, the analysis proceeds in two steps. First, we determine the optimal competence level C would choose if he wants to implement loyalty. Then, we compare the welfare C obtains under optimal loyalty with the welfare under spot interaction.

If C is free to choose his board when implementing loyalty, which competence level will he prefer? From equation (6), we see that loyalty is cheaper to obtain for less competent boards. Thus, C's cost of inducing loyalty is minimized by setting  $\theta = 0$ , which, by equation (9), implies loyalty costs  $-\frac{sEy}{\delta}$  per period. This leads to C's expected utility per period,  $Eu_C^L = aEy + \psi + \frac{sEy}{\delta}$ . Thus, we find that the present value of spot interaction in all future periods is greater than the present of loyalty if and only if

$$\begin{aligned} \Omega &\equiv \frac{\delta}{1-\delta} [Eu_C^S - Eu_C^L] > 0 \Leftrightarrow \\ p(ay_H + \psi) &> aEy + \psi + \frac{sEy}{\delta}. \end{aligned} \quad (11)$$

Simplifying this condition and rearranging yields

**Proposition 3. (Desirability of loyalty)** *The CEO prefers loyalty (which involves zero competence of the board) to spot interaction (which involves maximal board competence) if and only if*

$$(1-p)(\psi + ay_L) + \frac{sEy}{\delta} > 0. \quad (12)$$

Note that desirability does not imply feasibility. Comparing conditions (10) and (12), it is apparent, for example, that there are discount factors for which loyalty with zero board competence is desirable but not feasible. As long as C and B are patient enough, as long as the low state is not too likely, and as long as the CEO's pay-performance-sensitivity is sufficiently large compared to the directors', C can credibly promise to reward loyalty.

### 2.3.3. Comparative statics and empirical predictions

The model holds several empirical predictions. The first prediction is that more competent directors will behave less loyally. This is a relatively difficult hypothesis to test because loyalty may occur in ways unobservable to the econometrician. However, there is some evidence that supports the prediction. For example, Agrawal and Chadha (2005) find that the formal independence of boards as such is unrelated to the probability of a company restating earnings. By contrast, the probability of restatement is lower in companies whose boards or audit committees have an independent director with financial expertise. As Agrawal and Chadha argue, this finding is consistent with the idea that only competent directors provide effective oversight of a firm's financial reporting practices. Of course, part of their phenomenon may arise simply because incompetent boards may not understand the facts, but the model here also implies that *de iure* independent directors who are not competent are more easily coopted by a CEO who wishes to manage earnings. (The CEO's motivation for earnings management may arise not solely from private benefits but also from higher short-term compensation. Short-term shareholders may also benefit from this, but long-term shareholders will be hurt by the ultimately needed earnings restatement.)

The next set of predictions relates to how observed behavior is likely to vary with several parameters of the model. In particular, the comparative statics that follow from Proposition 3 imply that:

- Corollary 1.** (i) *When C has a greater stake in the firm's performance, he will less likely implement loyalty.*  
(ii) *When B has a greater stake in the firm's performance, C will less likely implement loyalty.*  
(iii) *The more private benefits C obtains from implementing projects, the more likely he is to implement loyalty.*  
(iv) *For a given expected NPV  $Ey < 0$ , the worse the bad project outcome gets, the less likely C is to implement loyalty.*  
(v) *The shorter the expected duration of the interaction between C and B is, the less likely C is to implement loyalty.*

**Proof.** Properties (i) to (iv) follow immediately from inspection of (11). Property (v) is not obvious and is derived in detail in the Appendix. ■

The same factors that make loyalty less feasible also make it less desirable for C. Moreover, loyalty entails lower director competence. This is relevant empirically because it opens up the possibility of making board competence the dependent variable. The set of key empirical predictions in this respect is that:

**Corollary 2.** *There is a positive correlation between director competence on the one hand and measures of the power of C's and B's pay-performance-sensitivities, short-horizon interactions of C and B, difficulty of appropriation of private benefits by C, and a mean-preserving spread of outcomes of projects, on the other hand, respectively.*

Thus, the model yields multiple hypotheses that should be tested jointly. These variables are measurable, both in principle and in practice. Director competence can be gleaned (albeit imperfectly) from the director's educational background, her previous professional experience (perhaps in particular in the relevant sector), the level of positions attained in other companies, etc.<sup>17</sup> In addition to the level of previous experience, the diversity of experience is also

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<sup>17</sup>Biographical data is available, for example, through the Corporate Library, BoardEx, and other sources. Various datasets now also offer direct measures of board-specific skills.

likely to matter.<sup>18</sup> One might also consider abnormal announcement returns when a new director joins, assuming that the market can accurately gauge a director's competence. There are various measures of pay-performance-sensitivities. Proxies for the duration of the interaction include the extent of interlocking relationships, the extent of pre-existing ties Fracassi and Tate (2009) or CEO and director age. Another measure could be the number of anti-takeover provisions; more such provisions tend to imply longer CEO and director tenure.<sup>19</sup> Volatility of earnings and returns, either for the same firm or for firms in the same industry, may be appropriate measures of the potential downside,  $y_L$ , for a given expected future development.<sup>20</sup> Finally, for the difficulty of appropriation of private benefits by the CEO, one might use a firm's free cash flow or indices of other corporate governance qualities Boone et al. (2007). For example, even if the board of directors fails to adequately reign in the CEO, the market for corporate takeovers may still put a limit on what the CEO can achieve. This would indicate that where the CEO is strongly protected against takeovers (through poison pills etc.), he can expect more private benefits (higher  $\psi$ ) once he gets the board on this side.<sup>21</sup>

The model assumes that the CEO selects board quality. Of course, some firms have installed nominating committees, sometimes without CEO participation. To the extent that shareholders are able to influence the selection process more strongly (for example because companies are adopting a majority voting rule, rather than a plurality vote, or are proposing director slates that contain more candidate directors than seats to be filled), boards will be more competent. In a regression that aims to explain director competence, we thus expect a negative coefficient on an interaction effect between environment difficulty and CEO participation in the nomination process.<sup>22</sup>

A good reason for a firm not to hire the most competent director available in the market is that he may just be too expensive. With perfect labor markets and identical firm technologies for using board competence, this consideration has no effect on the desired competence level. The reason is that the marginal product of director competence would be exactly offset by the higher wage. However, one could aim to include a measure of the market wage sensitivity of directors with respect to their competence. Clearly, this is a challenging task for the empirical analysis, not least because this wage sensitivity is endogenous to the co-option problem itself.

As indicated in the footnotes to this section, limited direct evidence is as of now available on how board competence affects the choice of boards and on whether CEO's choices of boards take the loyalty-competence tradeoff into account. The studies cited provide some elements of the puzzle, and they are consistent with the model laid out in this paper.

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<sup>18</sup>Becker et al. (2008) find that a measure of strategic capability of a board based on the diversity of their experience is associated with higher firm value and higher announcement returns in acquisitions. See also Cohen et al. (2009) for evidence on the positive relationship between board competence and economic outcomes.

<sup>19</sup>Of course, both interlocking relationships and anti-takeover provisions are endogenous, resulting in econometric challenges no different from other governance studies.

<sup>20</sup>Markarian and Parbonetti (2008) provide evidence that firms choose directors who have more expertise in the business field when the environment is complex.

<sup>21</sup>Consistent with the model, DeFond et al. (2005) find that the market reacts favorably to the appointment of accounting financial experts when corporate governance is strong, i.e., when not much  $x$  can be paid.

<sup>22</sup>There is some indirect evidence in favor of these predictions. Shareholders seem to prefer a majority vote over a plurality rule, where the latter is de facto equivalent to appointment by the CEO Cai et al. (2009a). Gerety et al. (2001) find that stock markets react less favorably to the adoption of director incentive plans when the CEO has greater influence over the director selection process. Because shareholders' welfare is increasing in director competence, the stock market effect is likely to capture, at least to a substantial extent, lower competence of directors. However, Harris and Raviv (2008a), in a model of delegation and private information, show that shareholder participation is far from a one-sided story.

Nonetheless, more systematic tests, guided by the hypotheses developed in this paper, would be desirable.<sup>23</sup>

### 3. Discussion and robustness analysis

#### 3.1. Discussion and further predictions

*Efficient loyalty.* The results so far imply that there is a tradeoff between competence and inefficient board loyalty. If such loyalty is infeasible, this is beneficial for the shareholders. But in reality, shareholders may, in fact, benefit in other ways from a powerful relational contract between the CEO and the board. In particular, mutual loyalty may be efficient if, for example, information sharing depends on a working loyalty agreement. This would be in the spirit of Adams and Ferreira (2007). Also, entrenchment arising from a co-opted board could encourage managers to invest in firm-specific human capital and in projects with long-term payoffs. Fortunately, however, this bright side of loyalty is actually more easily sustained with competent directors. To see this, consider the case where directors find it costly to reveal some useful information to the CEO, and the information transfer is not contractible. (If directors can costlessly share information, there is no problem.) More competent directors have more valuable information, as in the main model. But this means that more competent directors increase the "pie" that is available for distribution in terms of rewards for loyal information-sharing. Consequently, the CEO can promise more credibly that he will reward good relations. This could be formally modeled, but the intuition is clear: It cannot be argued that less competent directors are needed in order to sustain productive cooperative relations between CEOs and boards. Instead, where good CEO-director relations are efficient, this will be easier with competent directors; only inefficient obedience is more easily secured from incompetent directors. A self-interested CEO would take this into account when choosing his board.

In other words, the potential for co-option per se (which is facilitated by the CEO being heavily involved in director choice) is not necessarily bad, but its value implications depend on what co-option is used for. Coles et al. (2008b) find evidence consistent with this idea. They measure co-option by the ratio of the number of board members appointed after the CEO took office to the total size of the board. While boards that score higher on this measure are less likely to fire the CEO for poor performance (thus showing inefficient loyalty), they are also associated with higher research and development expenditures, and co-option is more prevalent in firms benefiting from this. Similarly, the model here implies that the empirical predictions of Corollary 2 obtain especially strongly in a sample of firms for whom efficient loyalty considerations are not important. This is the case, for example, when the CEO does not have a large information advantage (in which case a friendly board is of limited help, see Adams and Ferreira (2007)).

*Optimistic CEOs.* In this model, CEOs recognize that boards have a useful advisory function, but they know that competent directors are hard to induce to loyalty. Of course, some CEOs are very convinced that what they are doing

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<sup>23</sup>Finally, there is some anecdotal evidence of the loyalty-competence tradeoff "the other way around," namely that chairmen of boards, when they "move up" from the CEO's chair, do not want too competent CEOs because they may break with their preferred strategy for the firm. An already classic case in point is Volkswagen. Ferdinand Piëch strongly wanted to induce his successor as CEO, Bernd Pischetsrieder, to keep to the strategy designed by Piëch. In fact, some argued at the time that Piëch favored Pischetsrieder precisely because he was not the most competent CEO available (Manager-Magazin, October 18, 1999, August 19, 2000, January 21, 2001, and February 28, 2001.) It turned out that Pischetsrieder did not behave loyally enough. After a prolonged (and probably costly) struggle, Piëch forced Pischetsrieder out.

is in the best interest of the firm and that they, therefore, do not need a board who advises or occasionally vetoes them. Thus, we would also expect overoptimistic CEOs (and overconfident CEOs, who underestimate the volatility of their forecasts) to prefer less competent boards, because they do not value the board's advice highly, relative to the benefits they reap from board loyalty.

*Term limits.* When inefficient loyalty is the only concern, term limits for directors (and/or CEOs) have clear advantages because they hinder the feasibility of a loyalty agreement between B and C. (Indeed, with a known finite time horizon, a standard backwards induction argument implies that the spot interaction outcome is the only Nash equilibrium.) Once we allow for the possibility of relations between the CEO and the board that enhance shareholder value, this conclusion does not hold anymore. Thus, much as firms face a tradeoff when they decide whether to institute a job rotation program, so do corporations when deciding how long the possible interaction between executives and boards should be.

*Voting on boards.* Although the interactions within the board are not modeled here, we can speculate about how different majority requirements for board decisions might affect the equilibrium. (See also Warther (1998) for a discussion that is similar in spirit.) In particular, consider the unanimity rule and the majority rule. Under majority, it is quite likely that the CEO can more easily sustain the loyalty of the board, perhaps even with high consensus. To see this, consider the decision an individual board member faces who is contemplating deviating from the loyalty agreement with the CEO. A deviation (if it becomes known) results in a loss of future loyalty rewards by the CEO. But it is quite uncertain whether the board member can avoid the implementation of a value-destroying project (or a project he simply does not find appealing). The reason is that the other board members may still vote in favor of the project, leading to a majority for it. Indeed, especially on large boards, the board members have a collective action problem similar to that of any group. A possible equilibrium is that all board members go along with the project because that is still better than to deviate and be punished in the future. This, in turn, implies that the CEO can "afford" a more competent board, leading to better corporate decisions. By contrast, with a unanimity rule, the CEO has to secure each individual director's loyalty, and this will require lower board competence. Although one would have to specify the game more precisely to obtain robust predictions regarding optimal majority rules, board competence, and possibly board size, these speculative hypotheses seem interesting enough to merit further inquiry.

*Easy situations.* The formal analysis for easy situations ( $Ey > 0$ ) is available on request. The economic intuition is very simple, however. Assume that the incentives for the CEO are low-powered. In this case, he prefers to accept all projects. He can obtain this outcome by choosing a board with zero competence and no loyalty reward – he does not need to pay for loyalty, since an independent but incompetent board will accept all projects anyways. Since accepting all projects is the best C can do with any scheme, and it can be achieved at zero cost with an independent but incompetent board, it is obvious that this is best for C. The implication of this observation is nonetheless worth spelling out: In easy situations, the possibility of a repeated loyalty contract introduces no additional conflict between

shareholders and C, because even in spot interaction, optimal board competence is zero. The co-option problem is, therefore, particularly relevant in difficult situations.

### 3.2. Robustness

This section discusses three ways in which we can deviate from the basic model.

*Partial loyalty.* First, consider the possibility that C may engage in a loyalty agreement with B only in some states. It is useful to introduce some terminology for the following results. A *comprehensive loyalty agreement* describes the case where B is loyal in all states and C rewards in all states. This is the type of agreement we have considered so far. A *partial loyalty agreement* describes the case where C rewards loyalty only in either state L or in states U and L, and B is loyal in the rewarded states. (B consents to the project in state H even without additional rewards.)

It turns out that partial loyalty only in state L is never optimal. The proof of Proposition 4 reveals that partial loyalty and competence are complements in terms of feasibility here. That is, the CEO can get a fully competent board member to engage in loyalty in only the low state. In fact, the minimum loyalty rewards are lowest for the most competent boards, and the maximum loyalty rewards C can promise are highest for the most competent boards. Given that C is not planning on inducing loyalty in the uncertain state, and given that B is not agreeing to a project when that state does arise, it is cheapest for C to avoid this state by maximizing competence. But the expected costs of partial loyalty still turn out to be too high relative to the gains from partial loyalty, when compared to the benefits and costs of comprehensive loyalty.

Suppose now that C would like to pay B to be loyal in states L and U. Assuming competence is positive, the minimum required loyalty rewards can be shown to be increasing in board competence, while the maximum rewards C can offer are, under some conditions, decreasing in board competence. Thus, as in the main case, feasibility of this type of partial loyalty is limited. One can show that C's welfare is decreasing in board competence. (At first sight, higher competence might be preferred because this increases the probability of the high and low states compared to the unknown state and because in the high state no loyalty rewards have to be paid. However, it turns out that the required rewards for loyalty are rising even faster, overturning the first effect.) The maximally attainable utility for the CEO, therefore, occurs for minimal board competence. But for zero board competence, state U is certain to arise. Thus, loyalty in states L and U is never desired.

We can summarize these results in the following way:

**Proposition 4.** *If C prefers implementing any loyalty, then a comprehensive loyalty agreement is preferred. In this case, C prefers an incompetent B. Otherwise, spot interaction with a fully competent B is preferred. C never implements a partial loyalty agreement, even though loyalty in the low state is, if at all, feasible for more competent Bs.*

**Proof.** See the Appendix. ■

*Sequential moves.* The simultaneous-move assumption made so far is appropriate when the CEO needs to engage in rewarding actions before the board meeting, which are sunk at the time the meeting takes place, but the board cannot observe whether the actions have been taken until it has taken a decision whether to support the CEO or not. There may be instances where the CEO is tempted to renege on a promised loyalty reward, particularly if they are delayed rewards. Building a reputation for rewarding loyalty certainly is one option, but this is outside the present model. Even so, the basic predictions of the model remain intact.

We will say that *only C is tempted*, if only C's non-renegeing constraint needs to hold, whereas for B, only individual rationality, is required, i.e., the loyalty rewards must be greater than the expected costs of loyalty. First, we find that

**Proposition 5.** *If only C is tempted, a comprehensive loyalty agreement of a too competent B may be infeasible. A partial loyalty agreement is more likely to be feasible for a competent B.*

**Proof.** See the Appendix. ■

These results resemble the previous ones, and the intuition is similar, too: When the board is too competent, a CEO engaged in a comprehensive loyalty agreement may be tempted to renege on the agreement, as the threat of the board not to agree to "unknown" projects weights relatively little. For partial loyalty, competent boards are more appropriate as the unknown state thus arises relatively rarely, minimizing the CEO's temptation to deviate.

When C is allowed to pick his preferred board, one can show that the outcome now depends on whether

$$(\psi + ay_L)(1 - p) + sEy > 0. \quad (13)$$

In particular, we have

**Proposition 6.** *Suppose only C is tempted. If condition (13) holds, C implements a comprehensive loyalty agreement with an indeterminate degree of board competence. If (13) does not hold, C prefers spot interaction with a maximally competent B. C never implements a partial loyalty agreement.*

**Proof.** See the Appendix. ■

The intuition for the result that the degree of competence is indeterminate in the first case is the following: Here, the costs of loyalty are independent of the board's competence, because the board has no commitment problem. Therefore, C's welfare is independent of board competence when he implements loyalty. The empirical predictions of Corollary 2 are thus slightly weakened, but overall they still go in the same direction. This can be seen from comparing conditions (12) and (13). For example, as  $y_L$  becomes more negative, both (12) and (13) are less likely to hold, leading to higher optimal board competence, and less loyalty, in a cross-section of firms. The exception is the discount factor which does not matter for the CEO's choice in this case.

*Contractible loyalty.* Finally, it is instructive to consider the (unrealistic) case of contractible loyalty, i.e., the case where C and B can in fact write a binding contract about loyalty. Rarely would a court enforce such a contract, as it directly violates the director's duty of loyalty to *shareholders*. If it were nonetheless possible, the cheapest way for C

to obtain obedience is to pay  $B - sy_L$  in state L, and  $-sEy$  in state U. Plugging into the objective function for C reveals that he maximizes utility by maximizing

$$\psi + (a + s)Ey - \theta spy_H. \quad (14)$$

Clearly,  $\theta = 0$  is optimal. Comparing the utility C obtains in this case,  $\psi + (a + s)Ey$ , with the utility he obtains from spot interaction with a very competent board,  $p(ay_H + \psi)$  reveals that loyalty is preferred if and only if

$$(1 - p)(\psi + ay_L) + sEy > 0. \quad (15)$$

This is, unsurprisingly, similar to the condition for the case of non-contractibility (Proposition 3). However, comparing the two we find

**Corollary 3.** *If non-contractible loyalty is preferred to spot interaction, so is contractible loyalty, but the opposite does not hold.*

Apart from adding realism to the model, the assumption of non-contractibility thus brings out the role of the repeated interaction between CEOs and boards. Moreover, there are cases when non-contractible loyalty would be desirable, but is infeasible (Proposition 2). By contrast, contractible loyalty is, by definition, always feasible. For the CEO and the board, focusing on the non-contractible features may even be preferred: If loyalty is contractible and they agree on it, shareholders or potentially interested investors could take them to court over it.

#### 4. Optimal incentives and the empirical relevance of the model's predictions

This section studies what shareholders – in particular, activists like hedge funds, private equity groups, and institutional investors – can do within the confines of the model to shape the board-CEO relationship such that it suits their interests. In particular, it investigates how shareholders can set optimal incentives for the CEO and the board. Of course, in reality the board proposes or enacts the CEO's compensation scheme, so this issue is in principle subject to the same co-option problem the main model has studied. (Indeed, with suitable definitions of "projects," and "private benefits," the model can be applied to the setting of compensation schemes for a CEO.) Here, we explore the implications for the co-option problem of shareholders taking the lead in compensation matters.<sup>24</sup>

The analysis first shows that if shareholders are free to choose the board's and the CEO's compensation, they can contract away the co-option problem. In particular, if they give the CEO or the board sufficiently high-powered incentives, the CEO prefers maximal board competence. Thus, the empirical predictions regarding board competence would not hold. However, to the extent that incentive pay also needs to address other challenges (such as a moral hazard problem) and to the extent that the solution of the moral hazard and the co-option problems do not happen to coincide, the empirical predictions of this model will still obtain.

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<sup>24</sup>This is not the only possible shareholder action. Apart from setting incentives, one might analyze takeovers and firing of the board and the CEO, especially when a CEO and board are in the punishment phase of the repeated game. While such interventions by shareholders in the repeated game are interesting (they change the off-equilibrium path), they are outside the scope of the paper. Yet another way for shareholders to approach the problem would be to try to establish a competing loyalty contract with directors.

To develop the results, let us return to the model setup as in section 2. For a given incentive package  $\{a, s\}$  the shareholders' welfare when C can implement loyalty with an incompetent director is  $Eu_S^L = (1 - a - s)Ey < 0$ . By contrast, for the same incentive package, if spot interaction were the outcome, their welfare would be  $Eu_S^S = \theta p(1 - a - s)y_H \geq 0$ . Thus, in difficult environments, shareholders would optimally try to avoid loyalty. In reality, they may not succeed, for various reasons. For example, they may not be able to solve their collective action problem in addressing the issue. The purpose of the analysis here is to determine what would happen to shareholder welfare when shareholders can in fact do what is best for them. In the extreme, of course, B would become obsolete. To motivate the existence of B, assume, for example, that the shareholders cannot gather the information on the project quality. Note also that whichever friction we introduce, it makes it more likely that the shareholders cannot costlessly set the optimal incentives described here – and that in turn implies that the new equilibrium may not obtain, retaining instead the empirical predictions of the main model.

To make loyalty undesirable for C, shareholders need to obtain

$$(1 - p)(\psi + ay_L) + s\frac{Ey}{\delta} \leq 0. \quad (16)$$

Because of the linearity in  $a$  and  $s$ , and because these parameters are perfect substitutes in the shareholders' welfare function, it is not obvious whom the shareholders should optimally incentivize.<sup>25</sup> From (16), we find that:

**Lemma 1.** *To induce C to favor a competent director and forego loyalty, shareholders will use CEO incentive pay only and no incentives for directors if and only if*

$$1 - \delta < \frac{p}{1 - p} \frac{y_H}{-y_L}. \quad (17)$$

*In this case, they set  $s = 0$  and  $a = \frac{-\psi}{y_L}$ . If instead this condition does not hold, they set  $a = 0$  and  $s = \frac{(1-p)\psi\delta}{-Ey}$ .*

The notion that optimal incentives require  $a$  to be just large enough to align C's incentives with those of the shareholders (and  $s = 0$ ) is intuitively obvious – but the Lemma shows that it is not always true, and it specifies the conditions under which this result does not hold. Interestingly, it might be better for shareholders to attack the problem by giving B a bigger incentive to keep it from being co-opted by management. This situation arises when interactions are not too long-lasting (e.g., when term limits are shorter or when takeover provisions are weaker) and when the expected value of good projects is small compared to the expected loss of bad projects.<sup>26</sup>

Consider first  $a = \frac{-\psi}{y_L}$  and  $s = 0$ . Note that in this case, even though C could achieve loyalty at zero cost (because B is not hurt by bad projects), C does not benefit from it. In response to these incentives, C will choose  $\theta = 1$ , which leads to  $Eu_S^S = py_H \left(1 + \frac{\psi}{y_L}\right) > 0$ . Since the shareholders realize positive welfare, they will prefer this outcome to the loyalty outcome. Conversely, when condition (17) does not hold, shareholders only incentivize B, but this again leads

<sup>25</sup>Shareholders set incentives such that loyalty becomes undesirable. They may also make loyalty unfeasible, but one can show that this is going to be more costly unless players are very impatient or the good state is very rare. As this analysis is not particularly revealing, it is omitted for space reasons.

<sup>26</sup>The assumptions made so far do not necessarily guarantee that  $\frac{(1-p)\psi\delta}{-Ey} \leq 1$  but this is assumed here.

C to choose  $\theta = 1$  (this time because loyalty is becoming prohibitively expensive to obtain). And again, shareholders will do at least as well as before.

This analysis can be summarized in the following

**Proposition 7.** *If shareholders can costlessly and freely choose incentives for B and C, they optimally implement high-powered CEO incentive pay or high-powered director incentive pay. This induces C to favor competent directors who behave independently.*

To the extent that shareholders can incentivize their CEO or the directors perfectly, they can avoid inefficient board-CEO loyalty, but only at a cost. High executive pay, especially when the CEO is powerful, can thus partially be explained as a solution to the excessive board loyalty problem.<sup>27</sup> The co-option problem, therefore, remains a relevant threat to shareholder welfare even when they can costlessly impose the optimal incentives on the CEO or the directors.

Two extensions qualify this benchmark result. First, consider costly director competence. That is, suppose that more competent directors require a larger profit share. Alternatively, acquiring knowledge about the quality of a project may require both competence and director effort, with the two factors contributing multiplicatively (i.e., in complementary ways) to the probability that B is informed. In either case, the solution  $s = 0$  may not be attainable. But this in turn means that C may, in fact, hire a too competent and too expensive B for the shareholders' tastes.

Second, under the benchmark Proposition 7, the empirical predictions of Corollary 2 become irrelevant because the board will always be highly competent. Clearly, this is counterfactual. The relevance of the empirical predictions returns when one takes into account that in practice there are other factors, like more traditional versions of moral hazard, that drive incentives for CEOs and boards. In the absence of the co-option problem, shareholders may set, say,  $\hat{\alpha}$  and  $\hat{\delta}$  as the optimal pay-performance sensitivities. These incentives will, in general, differ from the incentives prescribed by Lemma 1. Unless shareholders are willing to depart from the optimal solution to this moral hazard problem, the co-option equilibrium, as developed so far in the paper, may still arise. This is true in particular if  $\hat{\alpha}$  and  $\hat{\delta}$  are such that (16) does not hold. This will happen if only relatively low-powered incentives are needed or optimal to address the moral hazard problem. This in turn holds if, for example, the CEO is very risk-averse or if effort and output are linked through a very noisy process. An explicit model including both a standard moral hazard problem and board co-option is beyond the scope of this paper, but an interesting avenue for future research. For the purposes of empirical research on board competence, we can summarize these considerations as follows:

**Corollary 4.** *Suppose there are reasons, such as a moral hazard problem, to deviate from the optimal incentive scheme that avoids the co-option problem. The empirical predictions regarding board competence of corollary 2 will continue to obtain if optimal incentives in the absence of the co-option problem are relatively low-powered.*

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<sup>27</sup>This reflects the observation of Williamson (2008) that it is necessary and possible "to understand the objective limitations of corporate boards by examining the relevant microanalytics through a focused lens" (p. 268). See Albuquerque and Miao (2007) for an alternative model with a similar result. Also note that to the extent that shareholders can use only compensation techniques with some bound on CEO liability in bad states (e.g., when equity-based compensation goes hand in hand with an option program), their welfare loss compared to a case where there are no private benefits for the CEO would be even greater because the CEO would have a more powerful incentive to push for an incompetent director.

## 5. Concluding remarks

Academics and practitioners alike have emphasized the importance of an effective board. Much of the debate has focused on the advantages and disadvantages of formally independent directors, with mixed results. Also, practitioners emphasize the importance of board competence as such, but rarely recognize its economic relevance for the relationship between directors and the CEO. This paper studies independence of directors as an optimal behavior that is endogenously determined by board competence and other parameters. The basic message of the paper is that board competence is neither equal to nor separate from board independence, but is one of the driving forces behind it.

To allow the sharpest focus, the paper begins by studying inefficient loyalty of boards to CEOs (or *de facto* obedience). Because boards and CEOs often interact over long time horizons, the model uses a relational contracting framework, thus adding to the literature on boards that has so far mostly considered static (if multi-stage) models. The central result of the analysis is that in a wide range of plausible circumstances, more competent boards will behave less loyally to the CEO. Consequently, measures of *de iure* board independence are likely to be only partially related to *de facto* independent board behavior. The paper also shows and provides conditions for the result that even when a CEO could implement inefficient loyalty, he may after all be better off with more competent board members, because loyalty is costly. One implication is that shareholders who succeed in installing a sufficiently competent board will reap the rewards of a board that is *endogenously* less dependent on the CEO. Efficient loyalty (which may, for example, improve information sharing between the CEO and the board) is, in addition, more easily sustained with competent directors because they increase the surplus that supports the relational contract. Shareholder participation in director elections *per se* is not going to improve governance; it does so when shareholders will, in fact, elect more competent directors. The model helps organize some existing empirical facts, and it yields a set of new testable hypotheses. While the model is robust to several changes in modeling assumptions, a number of simplifications had to be made in order to keep the analysis tractable. As such, this paper is a step forward in our understanding of corporate governance, but it leaves substantial room for future research. In particular, employing the framework of a self-enforcing contract between the board and the CEO seems to allow interesting extensions to address issues such as intra-board relationships, interventions by shareholders, and a combination of the co-option problem with a moral hazard problem.

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## 6. Appendix: Proofs

Propositions 1 to 3 are derived in the text.

- Corollary 1:** (i) When C has a greater stake in the firm's performance, he will less likely implement loyalty.  
(ii) When B has a greater stake in the firm's performance, C will less likely implement loyalty.  
(iii) The more private benefits C obtains from implementing projects, the more likely he is to implement loyalty.  
(iv) For a given expected NPV  $Ey < 0$ , the worse the bad project outcome gets, the less likely C is to implement loyalty.  
(v) The shorter the expected duration of the interaction between C and B is, the less likely C is to implement loyalty.

**Proof.** Properties (i) to (iv) follow immediately from inspection of (11). For property (v), this proof will show that if loyalty is preferred to spot interaction at  $\delta = 1$ , then, above a certain cutoff level  $\hat{\delta}$ , longer durations of interactions make loyalty more desirable, i.e.,  $\frac{\partial \Omega}{\partial \delta} < 0$ . If spot interaction is preferred to loyalty at  $\delta = 1$ , then spot interaction is always preferred.

Define  $r = \frac{1-\delta}{\delta}$ ,  $L(r) = \psi + aEy + (1+r)sEy$  and  $K = p(ay_H + \psi)$ . Then,

$$\Omega(r) = \frac{K - L(r)}{r}.$$

Taking the derivative with respect to  $r$ , we have

$$\frac{\partial \Omega}{\partial r} = -\frac{1}{r}(\Omega(r) + sEy).$$

Note that  $\frac{\partial \Omega}{\partial r}$  is positive if and only if  $\Omega(r) + sEy < 0$ . This in turn is true for all  $r$  if  $K - L(0) < 0$ , because then  $\Omega(r) \rightarrow -\infty$  as  $r \rightarrow 0$  (and  $\delta \rightarrow 1$ ), and  $\Omega(r) \rightarrow -sEy$  from below as  $r \rightarrow \infty$  (and  $\delta \rightarrow 0$ ). Therefore, there will be a critical value of  $r$ , say,  $\hat{r}$ , such that C prefers an independent board if and only if  $r \geq \hat{r}$ . This implies that there is a critical value of  $\delta$ , say,  $\hat{\delta}$ , such that C prefers a loyal board if and only if  $\delta \geq \hat{\delta}$ .

If, by contrast,  $K - L(0) > 0$ , this means that loyalty is not even preferred to spot interaction when players are extremely patient. Then,  $\Omega(r)$  is strictly decreasing in  $r$  for all  $r$ :  $\Omega(r) \rightarrow \infty$  as  $r \rightarrow 0$  and  $\Omega(r) \rightarrow -sEy$  from above as  $r \rightarrow \infty$ . In this case, C prefers an independent board for all values of  $r$ .

Overall, we obtain the empirical prediction that increasing  $\delta$  leads C to either continue preferring spot interaction (when  $K - L(0) > 0$ ) or, at some point, to start preferring loyalty. This means that the shorter the expected duration of the interaction between C and B is, the less likely C is to implement loyalty. ■

**Proposition 4: If C prefers implementing any loyalty, then a comprehensive loyalty agreement is preferred. In this case, C prefers an incompetent B. Otherwise, spot interaction with a fully competent B is preferred. C never implements a partial loyalty agreement, even though loyalty is, if at all, feasible for more competent Bs.**

**Proof.** First note that for  $\theta = 0$ , the non-reneging constraint remains unchanged, as in this case loyalty is, by definition, only implemented in the unknown state, as this is the only state that arises. The only question, therefore, is

whether C could possibly do better with a board with positive competence and paying for loyalty only in state  $L$  or in the  $L$  and  $U$  states. B always agrees to the project in the  $H$  state out of his own interest.

(i) Consider first the case where C wishes to induce loyalty in the  $L$  and  $U$  states. In this case, the two non-renegeing constraints are as follows. For C, we have:

$$ay_L + \psi - x + \frac{\delta}{1-\delta} \left[ \begin{array}{c} \theta p (ay_H + \psi) + \theta (1-p) (ay_L + \psi - x) + \\ (1-\theta) (aEy + \psi - x) \end{array} \right] \quad (18)$$

$$\geq ay_L + \psi + \frac{\delta}{1-\delta} [\theta p (ay_H + \psi) + \theta (1-p) (0) + (1-\theta) (0)], \quad (19)$$

which becomes

$$x \leq \frac{\delta [\psi - \theta p (ay_H + \psi) + aEy]}{1 - \delta \theta p}. \quad (20)$$

For B, we have:

$$\begin{aligned} sy_L + x + \frac{\delta}{1-\delta} [\theta p sy_H + \theta (1-p) (sy_L + x) + (1-\theta) (sEy + x)] \\ \geq x + \frac{\delta}{1-\delta} [\theta p sy_H], \end{aligned} \quad (21)$$

which becomes

$$x \geq \frac{-\frac{sy_L}{\delta} + ps [\theta y_H - \Delta]}{1 - \theta p}. \quad (22)$$

The expected payoff for C is

$$EU_C^{PL} = \theta p (ay_H + \psi) + \theta (1-p) (ay_L + \psi - x) + (1-\theta) (aEy + \psi - x) = aEy + \psi - x + \theta px. \quad (23)$$

Taking the derivative with respect to  $\theta$ , we have

$$\frac{\partial EU_C^{PL}}{\partial \theta} = px(\theta) - x'(\theta)(1-\theta p) = -psy_H < 0.$$

Thus, C's welfare is decreasing in board competence. Thus, C would like to choose  $\theta = 0$ . But then the state is always  $U$ , contradicting the starting assumption. Another way to see this is to imagine that C sets a minimally positive  $\theta$ . Plugging in  $\theta \approx 0$  into (22), this leads to loyalty rewards in the amount of

$$x = -s \left( \frac{y_L}{\delta} + p\Delta \right). \quad (24)$$

Thus, the expected payoff for C in partial loyalty becomes

$$EU_C^{PL} = aEy + \psi + s \left( \frac{y_L}{\delta} + p\Delta \right). \quad (25)$$

This is to be compared with the payoff when C implements comprehensive loyalty with zero competence,

$$EU_C^{CL} = aEy + \psi + \frac{sEy}{\delta}. \quad (26)$$

Obviously, (26) is always greater than (25), concluding the proof of the first part.

(ii) The proof that C also does not want to implement a loyalty agreement where B is loyal only in the bad state proceeds along similar lines. C's non-renegeing constraint is

$$ay_L + \psi - x + \frac{\delta}{1-\delta} \left[ \frac{\theta p (ay_H + \psi) + \theta (1-p)(ay_L + \psi - x) + (1-\theta)0}{(1-\theta)0} \right] \quad (27)$$

$$\geq ay_L + \psi + \frac{\delta}{1-\delta} [\theta p (ay_H + \psi) + \theta (1-p)(0) + (1-\theta)(0)], \quad (28)$$

implying

$$x \leq \frac{\delta \theta (1-p)}{1-\delta(1-\theta(1-p))} (ay_L + \psi). \quad (29)$$

B's non-renegeing constraint is

$$\begin{aligned} & sy_L + x + \frac{\delta}{1-\delta} [\theta p sy_H + \theta (1-p)(sy_L + x) + (1-\theta)0] \\ & \geq x + \frac{\delta}{1-\delta} [\theta p sy_H], \end{aligned} \quad (30)$$

implying

$$x \geq -sy_L \frac{1-\delta + \delta \theta (1-p)}{\delta \theta (1-p)}. \quad (31)$$

Note that the right-hand side of (31) is decreasing in  $\theta$ . Thus, for C a highly competent board is cheapest to induce to loyalty. This is different than in the main case studied in the paper, but it is intuitive: Given that C is not planning on inducing loyalty in the uncertain state, and given that B is not agreeing to a project when that state does arise, it is cheapest for C to avoid this state. There are two possibilities now: Either loyalty is not feasible even for  $\theta = 1$ . That would conclude the proof. Or loyalty is feasible for  $\theta = 1$ . Then we need to check whether partial loyalty with  $\theta = 1$  is preferred to comprehensive loyalty. The costs of obtaining partial loyalty from a fully competent board are, by (31),  $x = -\frac{sy_L(1-\delta p)}{\delta(1-p)}$ . Therefore, C's expected payoff from partial loyalty is

$$EU_C^{PL} = aEy + \psi + (1-p) \frac{sy_L(1-\delta p)}{\delta(1-p)}. \quad (32)$$

We know that C's expected payoff from comprehensive loyalty is

$$EU_C^{CL} = aEy + \psi + (1-p) \frac{sEy}{\delta}. \quad (33)$$

Simple algebra confirms that (33) > (32) always. ■

**Proposition 5: If only C is tempted, a comprehensive loyalty agreement of a too competent B may be infeasible. A partial loyalty agreement is more likely to be feasible for a competent B.**

**Proposition 6: Suppose only C is tempted. If condition (13) holds, C implements a comprehensive loyalty agreement with an indeterminate degree of board competence. If (13) does not hold, C prefers spot interaction with a maximally competent B. The CEO never implements a partial loyalty agreement.**

**Proof.** (of both Proposition 5 and 6). If only C is tempted, this means that only C's NR constraint is relevant. The NR for a comprehensive loyalty agreement takes exactly the same form as before:

$$x \leq \delta(\psi + aEy) - \delta\theta p(\psi + ay_H). \quad (34)$$

For B, C just has to ensure that

$$x \geq -sEy, \quad (35)$$

leading to

$$\theta \leq \frac{\delta(\psi + aEy) + sEy}{p(\delta\psi + \delta ay_H)}. \quad (36)$$

That is, there is an upper bound on competence compatible with comprehensive loyalty, as stated in Proposition 5. Conditional on comprehensive loyalty being feasible, the payoff to C is

$$\begin{aligned} EU_C^{comp} &= \theta p(ay_H + \psi + sEy) + \theta(1-p)(ay_L + \psi + sEy) + (1-p)(aEy + \psi + sEy) \\ &= (a+s)Ey + \psi, \end{aligned} \quad (37)$$

which is independent of  $\theta$ . The reason for this independence is that the costs C incurs for inducing B to loyalty are independent of B's type, as B has no commitment problem.

By contrast, consider a partial loyalty agreement where C only pays for (and only receives) loyalty in state L. C's NR constraint in this case is

$$x \leq \frac{\delta\theta(1-p)(ay_L + \psi)}{1 - \delta(1 - \theta(1-p))}, \quad (38)$$

which can be easily shown to be increasing in  $\theta$ , implying that partial loyalty and competence are complements for C, as stated in Proposition 5. Whether loyalty is, in fact, feasible depends, however, on whether

$$-sy_L \leq x(\theta). \quad (39)$$

Plugging in  $\theta = 1$ , we can see that if

$$(\psi + ay_L)(1-p) + sEy > 0, \quad (40)$$

then partial loyalty is feasible. C's utility from optimal partial loyalty (with  $\theta = 1$ ) is

$$EU_C^{partial} = aEy + \psi + s(1-p)y_L. \quad (41)$$

But (37) > (41) always, implying that full loyalty (which as shown above happens with an indeterminate degree of competence) is always preferred to partial loyalty. ■

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