Performance Pay, CEO Dismissal and the Dual Role of Takeovers*

Mike Burkart† Konrad Raff‡

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Abstract

We propose that the takeover market mitigates agency conflicts by creating acquisition opportunities for successful managers, allowing shareholders to reduce monetary incentives. As a consequence, shareholders commit to finance profitable as well as some unprofitable takeovers. While board interference and takeovers are substitutes, their joint impact on managerial turnover is multifaceted: In firms with strong boards, turnover and performance pay are non-monotonic in the intensity of the takeover threat. In firms with weak boards, turnover (performance pay) increases (decreases) with the intensity of the takeover threat. An externality between firms' choices of governance arrangements arises. In equilibrium there is excessive board interference which forces all firms to pay higher compensation.

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†Stockholm School of Economics, London School of Economics, CEPR, ECGI & FMG. Email: mike.burkart@hhs.se

‡SIFR & Toulouse School of Economics. Email: konrad.raff@sifr.org.

1 Introduction

According to the common view an active takeover market can create efficiency gains in two ways, by redeploying corporate assets and by disciplining incumbent managers. A plethora of empirical studies indicates that control transfers indeed create shareholder value when the total gain to acquirer and target is considered (see Andrade, Mitchell, and Stafford (2001) for a recent survey). Prominent proponents of the second effect are Jensen (1986) and Scharfstein (1988) who argue that the threat of being taken over upon poor performance disciplines management and reduces the agency costs which arise from the separation of ownership and control.[1]

The paper takes a new look at the incentive implications of takeovers for incumbent managers. While the focus of theoretical work to date has been on the takeover threat, a comprehensive analysis needs to consider that managerial incentives are shaped not only by the risk of being taken over but also by the chance of taking somebody else over. Our model takes both perspectives into account. Moreover, we study the link between the market for corporate control and other corporate governance mechanisms, in particular board interference. Finally, the model goes beyond the standard single-firm perspective and studies the interactions between governance arrangements in different firms that result from an active takeover market.

We show that the market for corporate control mitigates agency conflicts by creating acquisition opportunities for successful managers. Following a successful bid an acquiring manager enjoys private benefits from running a larger firm. Future control benefits provide an implicit incentive to exert effort today. Acquisition opportunities mitigate moral hazard and reduce CEO pay.[2] Hence, the market for corporate control can benefit shareholders even in the absence of any disciplinary takeovers, i.e., even if it has no impact on turnover risk.

This simple insight has implications for acquisition policies, liquidity management, and the design of CEO compensation. Acquisition opportunities serve as an incentive device for the manager if the firm has sufficient funding. When deciding on the level of financial resources available to the manager for future acquisitions, shareholders face the following trade-off: on the one hand, more funding may enable the manager to sometimes carry out (ex-post) value-decreasing takeovers. On the other hand, a greater chance of "running a larger empire" upon successful performance reduces ex-ante moral hazard and thus reduces CEO pay. Due to the acquisition opportunity effect the optimal level of liquidity is high enough such that not only value-increasing takeovers occur, but also

[1] However, the existing literature also emphasizes potential inefficiencies. For instance, Stein (1988) and Shleifer and Summers (1989) argue that takeover pressure can have detrimental incentive effects, leading to distorted investment decisions. Shleifer and Vishny (1989) point to entrenchment as another adverse effect.

[2] In contrast to the existing literature on empire building, acquisitions are a remedy rather than a source of incentive problems in our model.

some loss-making ones. Our model predicts that expected losses from future acquisitions on the one hand and the level and performance sensitivity of CEO pay on the other should move in opposite directions.

The second part of the paper studies the interaction between takeovers and board interference. In our setting an incumbent manager can be removed either by the board of directors or through a (hostile) takeover. The two governance mechanisms *jointly* determine the overall dismissal threat. In our model, firing a poorly performing manager unambiguously increases firm value for two reasons: it provides incentives for the manager to exert effort ex-ante and it increases firm value ex-post by replacing an unsuitable manager with a more productive one. Board intervention to remove a failed incumbent is costly and more intense takeover pressure always weakens the board's incentive to intervene for two reasons. The prospect of selling the firm reduces the cost of retaining an unsuitable manager and the takeover threat disciplines the manager, thus obviating the disciplinary role of the board.[3]

Like Hirshleifer and Thakor (1998), who have studied the interaction between board interference and takeovers, we find that the two mechanisms are substitutes. Moreover, in our setting a non-monotonic relation can emerge between the intensity of the takeover threat on the one hand and turnover and performance pay on the other hand. If the cost of board interference is low (i.e., if the board is potentially strong), the "crowding-out" effect (of board activity by takeovers) can be so strong that the manager's position may be *less* secure when he is insulated from the takeover market. Supportive evidence is provided by Huang and Zhao (2009) who find that the sensitivity of CEO turnover to performance increases in firms with strong boards following the passage of antitakeover legislation. By weakening the firing threat, takeover pressure can aggravate agency conflicts in our model and force shareholders to raise performance pay. The negative relation between takeover pressure and turnover translates into a non-monotonic relation between takeover pressure and performance pay. In contrast, in firms with weak boards, i.e., with high costs of board interference, the negative impact of the takeover market on board interference is negligible. In this case, the relation between takeover threat and overall dismissal risk (performance pay) is always positive (negative).

In a last step, we close the model and consider a market setting with a large number of similar firms that interact through the takeover market. Thus we endogenize the structure of the takeover market. Two types of externalities between firms arise. First, in equilibrium board interference is inefficiently high. In our model, board interference increases firm value by replacing incompetent managers, thereby reducing the scope for value enhancing takeovers. Hence, if boards are more effective, the takeover market is less liquid and there are fewer acquisition opportunities for successful managers. When designing the internal governance system, shareholders in each firm fail to internalize

[3]See, for example, Kini, Kracaw, and Mian (2004) for supporting empirical evidence.

that the installation of a more vigilant board reduces acquisition opportunities for other managers which in turn necessitates higher compensation in rival firms. It turns out that there is excessive board interference in equilibrium. Secondly, firms' privately optimal financial policies deviate from the socially optimal ones. When determining the level of funding, available to their manager for acquisitions, shareholders in each firm ignore that more funding increases the threat of being taken over for managers in potential targets. Hence, funding levels are inefficiently low in equilibrium.

A formalization of the above ideas requires an integrated model which includes both the takeover market and an internal governance system, i.e., performance pay and board interference. In order for acquisition opportunities and the firing threat to affect the manager's incentives we need a dynamic setting. Furthermore, one needs to consider explicitly the incentive problems in both target and acquiring firms in the takeover market. Along these lines, we develop a simple two-period moral hazard framework in which shareholders hire a manager of initially unknown ability. Subsequently, the manager can be dismissed in one of two ways: either the board hires a replacement or the firm is taken over. While the manager always wants to keep his job to enjoy future private benefits, firm value is maximized if he is fired whenever poor performance indicates that he is incompetent. As a consequence, the manager is exposed to career concerns in the sense that he has an implicit incentive to work in order to signal his suitability to shareholders. We allow for the possibility of an internal governance failure in which case the incumbent retains his position despite poor performance. Importantly, a takeover may correct the board's failure and lead to removal of the incumbent.

Since the focus of the subsequent analysis is on the ex-ante incentive implications of the takeover market we abstract from any incentive or coordination problems pertaining to the takeover process itself. A firm's role in the takeover market (bidder or target) is not a priori determined, but depends on interim-performance. Poorly performing firms are potential targets and well performing firms are potential acquirers.

The theoretical literature has not paid much attention to the ex-ante incentive implications of takeovers. Jensen (1989) and Scharfstein (1988) argue that the takeover threat plays a disciplinary role which improves performance, whereas Stein (1988) and Shleifer and Summers (1989) suggest that it can have detrimental effects, leading to distorted investment decisions. We argue that an active takeover market mitigates agency conflicts both through the creation of acquisition opportunities and through the dismissal threat. In addition, we propose that, under certain circumstances, greater takeover pressure may secure the manager's position in the firm because it weakens the board's incentive to intervene.

Our paper is related to the literature on board of directors. Almazan and Suarez (2003) show that the installation of a weak board (in which the manager can veto his own replacement) may be optimal when incentive provision through future control rents

is cheaper than through incentive pay. In our model, a weak board mitigates agency conflicts in rival firms (by creating acquisition opportunities) but always reinforces the conflicts with one's own manager. Hirshleifer and Thakor (1998) argue, like us, that the takeover market and board interference can be substitutes. We furthremore study the implications of substitutability for CEO turnover and find a non-monotonic relationship between turnover and the takeover threat for firms with strong boards.

Finally, several recent papers study the interaction between firms' choices of governance standards. Acharya and Volpin (2009) and Dicks (2009) uncover an externality in firms' choices of governance that operates through the managerial labor market rather than the takeover market. The crucial assumption in Acharya and Volpin (2009) is competition for (or scarcity of) managerial talent. A firm may be forced to pay more compensation in order to prevent its manager from accepting more generous compensation in a poorly governed rival. A positive externality arises, whereby better governance in one firm allows competitors to reduce compensation. In contrast we argue that there is a negative relationship between a manager's compensation and the quality of governance in rival firms due to diminshed acquisition opportunities.

The next section presents the setup. Section 3 analyses the effect of acquisition opportunities on mangerial incentives in a simplified model and derives the firm's optimal compensation scheme and liquidity policy. Section 4 explicitly models internal governance and derives the optimal combination of board interference and performance pay, as well as the optimal liquidity policy. Section 5 analyzes the relationship between turnover and performance pay on the one hand and the intensity of the takeover threat on the other hand. The interactions between the firms' choices of governance arrangements and their optimal liquidity policies are the focus of section 6. Conclucding remarks are in section 7.

2 Model

We consider a moral hazard problem with two periods of production. Shareholders hire a manager of unknown ability, denoted by θ, to run their firm. The manager may be competent ($\theta = \bar{\theta}$) or incompetent ($\theta = \underline{\theta}$). A priori, neither party knows the manager's type, but both agree on the prior probability $p \in (0, 1)$ that he is competent.[4] Everyone

[4]Following Hermalin and Weisbach (2009) the assumption that the manager does not know his own type can be motivated on the grounds that no one is born knowing whether he or she will be a competent CEO. Like the board, the manager only learns from actual performance whether he or she is suitable for the tasks demanded of him. Alternatively, θ can be interpreted as the fit of the strategy adopted by the manager. In this case, the assumption that the manager and the board share a common prior belief can be justified on the grounds that a strategy is only adopted if both parties are in sufficient agreement on its merits in the first place.

is risk-neutral and there is no discounting.

Initially, the parties sign a contract (described below) and the manager chooses a non-observable effort, denoted by $e \in \{e_l, e_h\}$, where $e_l < e_h$. He enjoys private benefits of $Z_1 > 0$ if he exerts low effort ($e = e_l$). In a next step, the firm's first-period cash flow, $X_1 \in \{0, X_1^H\}$, realizes, where $0 < X_1^H$. Cash-flows are contractible and depend on both managerial ability and effort. Let $q_i(\theta) = \Pr[X_1 = X_1^H \mid e_i, \theta]$ denote the probability of a high cash-flow given managerial abiltiy θ and effort e_i, and let $1 - q_i(\theta)$ denote the probability of a low cash-flow.

Assumption 1 *$q_l(\underline{\theta}) = q_h(\underline{\theta}) = q_l(\bar{\theta}) = 0$ and $q_h(\bar{\theta}) = 1$.*

In words, a bad manager produces a low cash-flow irrespective of his effort, whereas a good manager can ensure a high outcome through high effort.[5] Shareholders receive the cash-flow X_1 net of any wage payments that they owe to the manager. Subsequently, the second-period cash-flow $X_2 \in \{0, X_2^H\}$ realizes, which, to simplify the exposition, is only determined by managerial ability: under competent management X_2 equals $X_2^H > 0$. Otherwise, the cash-flow equals 0.

Between the two periods of production two events occur. First, shareholders decide over the retention of the incumbent.[6] If the incumbent is retained he receives private benefits $Z_2 > 0$; otherwise his payoff is zero. If he is dismissed, a new manager is hired randomly from the labor market and generates an expected second-period cash-flow of pX_2^H. Secondly, a takeover market operates after the dismissal decision. To start with, we only allow the firm to be a bidder. Section 4 presents the general case in which the firm can be either a bidder or a target. To acquire a target the firm has to pay a (for now exogenous) purchase price $P^a \in [0; X_2^H]$.[7] Let $X_2^a \in \{0, X_2^H\}$ be the gross return to acquiring shareholders which is determined by the ability of the acquiring manager: if θ equals $\bar{\theta}$, the post-acquisition value of the target is X_2^H. If θ equals $\underline{\theta}$, it is zero. Hence, the firm simply doubles its scale with an acquisition. A successful transaction imposes a takeover (or retooling) cost, denoted by c, on acquiring shareholders.[8] The cost c is random and drawn from a commonly known, uniform distribution function $F(c)$ on $[0, \bar{c}]$; its realization is publicly observed after the first period of production. Overall, the net return to shareholders from undertaking an acquisition is $X_2^a - c - P^a$. Following a successful bid the acquiring manager enjoys additional private benefits $\Delta Z_2 > 0$ from running a larger firm in the second period. Let ρ^a denote the exogenous probability

[5] As will become clear below, the purpose of the moral hazard problem is to create scope for the provision of implicit incentives through different corporate governance mechanisms. The degenerate problem assumed above suffices for this aim.

[6] In Section 4 we introduce the possibility of an internal governance failure whereby the manager is protected from dismissal by the board.

[7] In Section 6 we endogenize the takeover price.

[8] For instance, it may be costly to make an acquired plant compatible with existing production processes.

that the incumbent manager finds a potential target firm.[9] With probability $1-\rho^a$ no target is available and the firm continues on a stand-alone basis. Since the purpose of the paper is to study the ex-ante incentive effects of takeovers it is assumed for simplicity that a newly installed manager never carries out an acquisition. This assumption can be relaxed without qualitatively affecting our results. We impose the following restriction on the takeover cost:

Assumption 2 $\overline{c} < 2(1-p)X_2^H$.

As will become clear below, this upper bound limits the level of acquisition losses and is merely made to facilitate the exposition.

We assume that the shareholders and the manager can ex-ante contract on all variables save of the effort choice. More specifically, the contract includes an acquisition rule and a compensation scheme. The former takes the form of a funding provision. Shareholders ex-ante grant the manager a level of liquidity for the purpose of buying another company which may be contingent on first-period performance. Let $\widehat{L}(X_1) \geq 0$ denote the level of liquidity over which the incumbent manager has complete discretion when launching an acquisition. While the subsequent analysis is carried out under the assumption that the shareholders can commit to $\widehat{L}$ ex-ante, we also allow the parties to renegotiate at the interim date. However, we compute the optimal contract and show that the renegotiation constraint does not bind. There is never an incentive to renegotiate $\widehat{L}$.

The compensation scheme stipulates payments to the manager contingent on the firm's cash-flows. Since the manager takes no actions in the second period and all information with regard to second-period profits is symmetrically held, we can focus on payments contingent on first-period cash-flows, denoted by $(w(X_1^H), w(X_1^L))$. Finally, the manager is protected by limited liability.

To sum up, the timing of the game is as follows: (i) The parties sign a contract $(w(X_1^H), w(X_1^L), \widehat{L}(X_1^H), \widehat{L}(X_1^L))$ and the manager chooses an unobservable level of effort $e \in \{e_l, e_h\}$. (ii) First-period cash-flows, $X_1 \in \{0, X_1^H\}$, are realized and publicly observed. (iii) Shareholders decide over the retention of the incumbent. (iv) If rehired, the incumbent finds a potential takeover target with probability ρ^a, in which case (c, P^a) is publicly observed. (v) A takeover may or may not occur. (vi) Second-period cash-flows are realized.

Finally, we want to ensure that shareholders always find it optimal to induce high effort. The following condition is sufficient for high effort always being in the shareholders' interest.

Assumption 3 $p[X_1^H + X_2^H - Z_1] \geq pX_2^H$.

[9] The probability ρ^a is endogenized in section 6.

The above framework captures in a simple manner the common definition of corporate governance as a mechanism that "selects the most able managers and makes them accountable to investors" (Tirole (2001)). Following first-stage performance, shareholders update their belief about the incumbent's ability. If they suspect him to be unsuitable a new manager can be hired from the labor market. Recent supportive empirical evidence of this view is provided by Cornelli et al. (2010) who find that boards fire CEOs once they have come to view them as incompetent. In our setting, the level of competence refers to general managerial skills. If a manager proved his competence in one firm, he can also successfully manage a rival following a takeover. This feature is consistent with Kaplan, Klebanov, and Sorensen (2008) who study hiring decisions in LBO and venture capital firms and find that they are driven by general managerial skills. The manager is assumed to obtain additional private benefits, ΔZ_2, from taking over a rival and is therefore apriori biased towards acquisitions or "building a larger empire."[10]

3 Acquisition Opportunities as an Incentive Device

This section analyzes the optimal compensation scheme and liquidity policy from shareholders' perspective. We take a partial equilibrium view and focus on a single firm which takes the structure of the takeover market as given: both the probability of finding a potential target as well as the purchase price are exogenously determined. In section 6, we consider a market setting and endogenize the structure of the takeover market.

The game is solved by backward induction. By assumption no takeover occurs if the manager is dismissed after the first period. Otherwise, the incumbent carrries out an acquisition whenever he finds a target and disposes of enough funds since this allows him to obtain additional private benefits of ΔZ_2. The funding constraint, faced by the manager, requires that pre-arranged liquidity exceeds the total acquisition cost, i.e., that $\widehat{L}(X_1) \geq c + P^a$ holds following a performance X_1.

In a next step we consider the optimal firing policy. The firing decision affects firm value in two ways. It determines the quality of the second-period manager and thus X_2 (ex-post effect). In addition, it affects the incentive to exert effort (ex-ante effect). The optimal policy is to fire the incumbent unless $X_1 = X_1^H$. If the incumbent is rehired he receives a reward in the form of future private benefits. Hence, in terms of its ex-ante incentive effect the optimal firing policy punishes a failed manager with dismissal and rewards a successful one with retention.

Regarding the ex-post effect, let $p(X_1)$ denote the posterior belief that the incumbent is competent following observation of X_1. First-period performance perfectly reveals ability. If $X_1 = X_1^L$ there is no doubt that the incumbent is incompetent, i.e., the $p(X_1^L)$

[10] Empire-building models were pioneered by Baumol (1959) and Marris (1964).

equals 0. On the contrary, if $X_1 = X_1^H$ he is known to be competent with certainty and $p(X_1^H)$ equals 1. It is ex-post optimal to fire the incumbent upon poor performance ($X_1 = X_1^L$) as he can never produce positive profits in the second period ($X_2^a = X_2 = 0$) whereas a new manager generates expected second-period cash-flows of $pX_2^H > 0$. (Given that poor performance always triggers dismissal, the choice of the funding level, $\widehat{L}(X_1^L)$, is immaterial and we ignore it in the rest of this section.) Consider in a next step the case where the manager succeeds in the first period ($X_1 = X_1^H$). Let us define the expected second-period profit from retaining a competent manager given a funding level $\widehat{L}$ as[11]

$$\pi_2(\widehat{L}) \equiv X_2^H + \rho^a[\int_0^{\widehat{L}-P^a} (X_2^H - P^a - c)f(c)dc].$$

The competent incumbent always generates cash-flows X_2^H in his initial firm. In addition, he finds a target with probability ρ^a upon being retained. The integral corresponds to the expected net profit from a takeover given a funding commitment $\widehat{L}$. Assumption 2 implies that $\pi_2(\widehat{L})$ always exceeds pX_2^H. Hence, it is overall optimal to fire the incumbent unless $X_1 = X_1^H$.

By assumption 3 shareholders find it optimal to induce high effort. They maximize expected total profits subject to the incentive compatibility and limited liability constraint for the manager. Obviously, it is never optimal to reward poor performance. Hence, $w^*(X_1^L) = 0$. The optimal contract then solves the following program:

$$\max_{w(X_1^H),\widehat{L}} p\left[X_1^H - w(X_1^H) + \pi_2(\widehat{L})\right] + (1-p)pX_2^H$$

subject to the incentive compatibility constraint

$$p\left[w(X_1^H) + Z_2 + \rho^a F(\widehat{L} - P^a)\triangle Z_2\right] \geq Z_1$$

and the limited liability constraint constraint $w(X_1^H) \geq 0$.

Regarding the objective function, with probability p the incumbent turns out to be competent and generates a first-period profit of X_1^H net of his wage. If he is incompetent, which happens with probability $(1-p)$, expected second-period cash-flows under new management are pX_2^H. The left hand side of the incentive compatibility constraint gives the manager's expected payoff if he exerts high effort, the right hand side if he exerts low effort. Remember that the manager does not know his own type when choosing his effort. If the manager works and turns out to be competent he receives expected private benefits $Z_2 + \rho^a F(\widehat{L} - P^a)\triangle Z_2$ in addition to his monetary reward.

[11] To avoid burdening the notation we drop the argument from $\widehat{L}(X_1^H)$ and simply write $\widehat{L}$.

Rearranging the IC constraint we find

$$w(X_1^H) \geq \frac{Z_1}{p} - \left[1 + \rho^a F(\widehat{L}^* - P^a)\triangle\right] Z_2.$$

Future private benefits serve as an implicit incentive to exert effort. In particular, the takeover market relaxes the IC constraint by offering additional private benefits with ex-ante probability $\rho^a F(\widehat{L}^* - P)$. The positive effect on incentives arises because first-period success is a prerequisite for launching an acquisition. Since the objective function is decreasing in $w(X_1^H)$, either the limited liability or the incentive compatibility constraint determines the optimal wage. If total implicit incentives (or career concerns), as measured by $\left[1 + \rho^a F(\widehat{L}^* - P^a)\triangle\right] Z_2$, are sufficiently large, the limited liability constraint binds (i.e., $w(X_1^H) = 0$) and the IC constraint is slack. In the following we focus on the case where the moral hazard problem is severe enough such that the IC constraint is binding:

Assumption 4 $Z_1 > (1 + \triangle)Z_2 p$.

The assumption implies that monetary incentives are necessary to ensure effort provision. We then obtain the following result:

Lemma 1 *(i) The optimal compensation scheme is*

$$w^*(X_1^H) = \frac{Z_1}{p} - \left[1 + \rho^a F(\widehat{L}^* - P^a)\triangle\right] Z_2 \qquad \textit{and} \qquad w^*(X_1^L) = 0.$$

(ii) The optimal level of liquidity for a successful manager is

$$\widehat{L}^* = X_2^H + \triangle Z_2.$$

Consider first the optimal compensation scheme. Pay is decreasing in the private benefits from running a larger firm, $\triangle Z_2$, and in the probability that a takeover occurs, $\rho^a F(\widehat{L}^* - P^a)$. Thus the takeover market reduces agency costs. The common view of takeovers and incentives focuses on the benefits from the "contestability" of the managerial position. For instance, Jensen (1988) argues that (the prospects of) disciplinary takeovers reduce agency conflicts and improve performance. In the above setting there is no scope for an external disciplinary mechanism since an incompetent or failed manager is always dismissed by the board of directors. Still, the market for corporate control benefits shareholders by providing rewards for successful managers. When assessing the empirical magnitude one needs to taken into account that the acquisition-opportunity-effect, just like the well-established threat-effect, also arises for non-transacting firms. To sum up, we obtain the following result:

Proposition 1 *The takeover market decreases CEO pay even in the absence of disciplinary takeovers.*[12]

The optimal level of liquidity in Lemma 1 is strictly increasing in the gross profit from an acquisition, X_2^H, and in private benefits, $\triangle Z_2$. From shareholders' perspective, the optimal liquidity level ex-post (i.e., after effort has been selected) equals X_2^H. Then an acquisition would occur if and only if it is ex-post profitable. Due to the acquisition-opportunity-effect ($\triangle Z_2 > 0$) investors grant "excessive" funds ex-ante such that the manager can engage in some ex-post loss-making acquisitions ($\widehat{L}^* > X_2^H$). In the absence of acquisition opportunities (i.e., $\triangle = 0$) or of moral hazard (i.e., $Z_1 = 0$), the optimal ex-ante and ex-post policy coincide, and only value-enhancing acquisitions take place. In general, the optimal liquidity policy trades off the ex-post marginal cost of a loss-making acquisition with the ex-ante marginal benefit of lower incentive pay (due to stronger implicit incentives). By taking a dynamic perspective of CEO incentives, the model suggests an explanation for the occurence of loss-making acquisitions.[13] Rather than being a symptom of weak corporate governance, acquisition losses are an integral part of the optimal incentive scheme. The above discussion is summarized in the following statement:

Proposition 2 *Shareholders' optimal liquidity policy allows the manager to undertake not only value-increasing but also some loss-making acquisitions.*

Lemma 1 has several further implications implications. Both the level of pay and its performance sensitivity (as measured by $w^*(X_1^H) - w^*(X_1^L)$) are decreasing in the level of liquidity. A manager with more financial resources under his control should receive lower compensation. Given a funding commitment $\widehat{L}^*$, shareholders' expected acquisition losses from an ex-ante perspective are

$$l = p\rho^a \int_{X_2^H - P^a}^{\widehat{L}^* - P^a} cf(c)dc.$$

The above expression is increasing in $\widehat{L}^*$. Hence, the model predicts that firms with more financial slack experience higher acquisition losses in expectation. Furthermore, the level

[12] The above analysis proceeds on the assumption that the manager is protected limited liability and his reservation utility is normalized to equal zero. Hence, we ignore the participation constraint. Note however that the acquisition opportunity effect relaxes both the IC constraint *and* the participation constraint and therefore arises even if the latter constraint binds. Proposition 1 as well as subsequent results regarding the compensation scheme are spelled out in terms of the "level of compensation". If the participation constraint was binding, the results would simply refer to the minimum performance-based component of the compensation scheme.

[13] Alternative explanations include Malmendier and Tate (2008) who show that overconfident CEOs are more likely to make acquisitions. Goel and Thakor (2009) argue that envy among CEOs can cause merger waves.

of compensation and expected future acquisition losses move in opposite directions: an increase in $\triangle Z_2$ raises l while lowering compensation. Falato (2007) provides empirical evidence and shows that there is indeed a negative relationship between these two variables. In addition, compensation should exhibit less performance sensitivity in firms where expected losses are high. This is consistent with Yang, Unal, and Minnick (2008). Since Z_2 and $\triangle Z_2$ measure the private benefits from running the firm in the future, they should be positively correlated with the manager's career horizon. For instance, they are likely to be lower for a manager who is close to retirement.[14] This suggests that younger managers are more likely to undertake acquisitions (as the acquisition probability is increasing in $\triangle Z_2$). Yim (2010) finds that a firm's acquisition propensity is indeed decreasing in the age of the CEO. Furthermore, both the level of compensation and its performance sensitivity should be lower for managers early in their careers. Conversely, the sensitivity of compensation to liquidity ($\delta w^*(X_1^H)/\delta \widehat{L}^*$) is likely to be larger for younger managers.

Ex-post, once effort has been exerted, shareholders would never voluntarily provide funds in excess of X_2^H for an acquisition. Hence, the optimal level of liquidity has to be fixed in the initial contract. While the analysis has procceded on the assumption that shareholders can indeed commit to $\widehat{L}^*$ in a credible way, the above solution is renegotiation-proof. The joint ex-post surplus of the manager and (acquiring) shareholders is maximized by $\widehat{L}^*$ since a takeover occurs if and only if $X_2^H + \triangle Z_2 \geq P^a - c$.

The optimal level of liquidity can be implemented in many different ways. If the intermediate income is low ($X_1^H < \widehat{L}^*$), implementation requires additional funding beyond those generated internally. For example, the firm can ex-ante obtain a non-revokable credit line, amounting to $\widehat{L}^* - X_1^H$, in combination with a commitment to leave the intermediate income in the firm. Instead of using a credit line, shareholders can ex-ante endow the manager with cash reserves or other liquid assets of the same amount. Conversely, if the intermediate income is larger than the optimal level of liquidity ($\widehat{L}^* < X_1^H$), funds need to be pumped out of the firm to prevent the manager from undertaking too many loss-making acquisitions ex-post. For instance, short-term debt of $X_1^H - \widehat{L}^*$ can reduce the resources under the manager's control.

Existing research emphasizes firms' need to disgorge "excess" liquidity or free cashflow in order to prevent management from undertaking suboptimal investment decisions, in particular bad acquisitions. Jensen (1986) argues that, in certain circumstances, this can be achieved through short-term debt; in Easterbrook (1984) payouts take the form of dividends. In the present model shareholders ex-ante optimally endow the manager with "excess cash."

The standard view identifies two means by which an active takeover market can en-

[14] This interpretation of Z_2 suggests that explicit incentives should, ceteris paribus, be lower for younger managers which is supported by empirical evidence in Gibbons and Murphy (1992).

hance efficiency, the reallocation of corporate resources (ex-post) and the disciplinary role of the takeover threat (ex-ante). We uncover a third channel that may arise independently from these two. The takeover market reduces agency conflicts by providing growth opportunities for successful managers. Discretion over the acquisition decision is part of the optimal incentive scheme and shareholders allow some loss-making acquisitions.[15]

4 Internal Governance and the Dual Role of Takeovers

The previous section proceeded on the assumption that the board could always freely intervene and dismiss a poorly performing manager. If internal governance is flawless, there is no scope for takeovers to discipline a manager by threatening him with removal. This section extends the initial setup in two ways. First, we assume that board interference is costly and allow for the possibility of an internal governance failure whereby the incumbent is protected from dismissal by the board. Secondly, the firm is no longer confined to be a bidder in the takeover market; it can be acquired by another company. The incumbent can removed through a disciplinary takeover.

We refer to the ability of the board of directors to interfere with the operation of the firm and to dismiss the manager after the first period as internal governance. Let $s \in \{g, b\}$ denote the state of the firm. The focus is on two polar cases: with probability $\tau \in [0, 1]$ the firm is well governed ($s = g$) in which case the board can decide to hire a new manager from the labor market after observation of X_1. With probability $(1 - \tau)$ internal governance breaks down ($s = b$) in which case the incumbent is protected from dismissal by the board. (Note that the analysis in the previous section corresponds to the case $s = g$.) We assume that shareholders commit to a level of internal governance at the outset of the game: they determine τ at a cost $K(\tau) = \frac{1}{2}k\tau^2$, with $k \geq 0$, before contracting with the manager. The realization of the state s is publicly observed after the first period.

In the absence of any delegation problems between the board and shareholders the cost $K(\tau)$ can be interpreted as the resources spent by all investors on evaluating managerial performance (for instance by installing a transparent accounting system).[16] If the board is self-interested, $K(\tau)$ may simply reflect the residual incentives of its members to pursue an excessively lenient firing policy at the expense of the interest of shareholders.[17]

[15] The idea that managerial autonomy comes not only with costs but also with benefits has been emphasized in previous research. Almazan and Suarez (2003) show that the installation of a weak board (in which the manager can veto his own replacement) may be optimal when incentive provision through future control rents is cheaper than through incentive pay. Burkart, Gromb and Panunzi (1997) argue that a dispersed ownership structure acts as a commitment device through which shareholders can foster managerial initiative by committing not to micromanage.

[16] Similarly, one can interpret τ as the monitoring effort exerted to prevent a poorly-performing manager from entrenching himself through a manager-specific investment à la Shleifer and Vishny (1989).

[17] The failure to intervene may be due, for example, to board members' lack of independence, excessive

We extend the initial setup in a second direction by allowing the firm to be a target in the takeover market at the interim date. Following poor first-period performance, an acquirer shows up with probability ρ^t and offers to purchase the firm for a price $P^t \geq pX_2^H$. (Both ρ^t and P^t, for now exogenous, are endogenized in section 6.) Following a sale, the incumbent is always removed, irrespective of the state s.[18] To simplify the exposition, it is assumed that the firm cannot be taken over if the incumbent proved his competence through a high outcome in the first stage.[19]

Note that the setup coincides with the one in the previous section if internal governance is flawless ($k = 0$ and $\tau = 1$) and if there is no takeover threat ($\rho^t = 0$). The game is solved by backward induction, starting with the takeover market and the optimal dismissal policy at the interim date. If the incumbent succeeds in the first period, the solution is the same as in section 3. He is retained and finds a potential target with probability ρ^a. Following poor performance, the firm is taken over whenever a bidder shows up which happens with probability ρ^t. The sale offer, P^t, always exceeds shareholders' reservation price which is pX_2^H if $s = g$ and zero if $s = b$. If no acquirer shows up following poor performance, the board can still hire a new manager as long as $s = g$. Otherwise, the incompetent incumbent continues to run the firm. Obviously, a poorly perfoming manager, who keeps his position due to a breakdown of internal control, is optimally prevented from launching an acquisition. Hence, $\widehat{L}^*(X_1^L) = 0$.[20]

As before, shareholders never find it optimal to reward failure ($w^*(X_1^L) = 0$). They maximize firm value net of interference cost $K(\tau)$ when choosing $(w(X_1^H), \widehat{L}, \tau)$:

$$\max_{w(X_1^H),\widehat{L},\tau} p\left[X_1^H - w(X_1^H) + \pi_2(\widehat{L})\right] + (1-p)[\rho^t P^t + (1-\rho^t)\tau p X_2^H] - \frac{1}{2}k\tau^2$$

subject to

$$p\left[w(X_1^H) + Z_2 + \rho^a F(\widehat{L} - P^a)\triangle Z_2\right] + (1-p)(1-\tau)(1-\rho^t)Z_2 \geq Z_1 + (1-\tau)(1-\rho^t)Z_2$$

$$w(X_1^H), w(X_1^H) \geq 0 \qquad \text{and} \qquad \tau \in [0,1]$$

workload, or simply the desire to avoid conflicts. A positive interference cost captures in a reduced form the notion that internal control can break down even if incentive mechanisms for the board are designed optimally.

[18] Martin and McConnell (1991) find that managers are usually removed following a successful takeover. Kini, Kracaw, and Mian (2004) study CEO turnover and provide evidence that the takeover market indeed constitutes a "court of last resort" which intercedes when internal control mechanisms fail. Similarly, Morck, Shleifer, and Vishny (1989) show that takeovers usually play a role in replacing managers when the board is unable to do so.

[19] The focus of the present paper is on the ex-ante incentive implications of takeovers. Mergers among successful firms are likely to be incentive-neutral. One way of formalizing this idea in our framework would be to postulate that, given a merger among two successful firms, each manager faces a probability of $\frac{1}{2}$ to run the combined firm, implying a gain of ΔZ_2, and a probability of $\frac{1}{2}$ to be demoted to divisional manager, implying a reduction of private benefits of $-\Delta Z_2$.

[20] Shareholders can obtain contingent liquidity provision by making access to $\widehat{L}$ conditional on a contribution of funds by the incumbent. Since a poorly performing manager disposes of no intermediate income at the interim date, he is unable to take over a rival.

Regarding the objective function, for example with probability $(1-p)\rho^t$ shareholders sell their firm for P^t. The IC constraint shows that the manager may receive the private benefit Z_2 even upon poor performance if both internal and external control mechanisms fail (which happens with probability $(1-\tau)(1-\rho^t)$) .

Rearranging the incentive compatibility constraint yields:

$$w(X_1^H) \geq \frac{Z_1}{p} - [\tau + (1-\tau)\rho^t + \rho^a F(\widehat{L} - P^a)\triangle]Z_2$$

The board now has three instruments at its disposal to ensure that the manager exerts high effort. It can offer a monetary reward for good performance or provide funds for acquisitions. In addition, it can threaten the incumbent with interference in the case of poor performance through its choice of τ.[21]

The following assumption ensures an interior solution for τ in the subsequent analysis:

Assumption 5 $k \geq pZ_2 + (1-p)pX_2^H$.

The lower bound on k implies that the optimal level of internal governance is lower than one. Let τ^* denote the privately optimal level of internal governance. We then obtain the following result:

Lemma 2 *The optimal internal governance system is*

$$w^*(X_1^H) = \frac{Z_1}{p} - \left[\tau^* + \rho^t(1-\tau^*) + \rho^a F(\widehat{L} - P^a)\triangle\right] Z_2 \qquad \text{and} \qquad w^*(X_1^L) = 0 \tag{1}$$

and

$$\tau^* = \frac{1}{k}\left\{p(1-\rho_b^t)Z_2 + (1-p)(1-\rho^t)pX_2^H\right\}. \tag{2}$$

The optimal level of liquidity is

$$\widehat{L}^* = X_2^H + \triangle Z_2. \tag{3}$$

The optimal level of liquidity in (3) is unchanged compared to the previous section. Consider the optimal compensation scheme in (1). Internal and external governance reduce compensation by providing implicit incentives which are captured by the term $\left[\tau + \rho^t(1-\tau) + \rho^a F(\widehat{L} - P^a)\triangle\right] Z_2$. Both governance mechanisms discipline the manager by threatening him with dismissal and the loss of private benefits. The probability of being fired upon poor performance is $\tau + \rho^t(1-\tau)$. Thus, stronger internal control due to lower costs of interference (decrease in k) improves incentives unless $\rho^t = 1$. Conversely, the disciplinary role of the takeover market is redundant if internal governance

[21] In our framework, monitoring prevents entrenchment and thus relaxes the incentive compatibility constraint. To the contrary, other forms of monitoring by the board may inhibit effort. For example, direct observation of the manager's intrinsic ability ex-post may weaken the firing threat ex-ante and thus make it more costly to induce effort (Crémer 1995).

is flawless. If $\tau = 1$, turnover risk is independent of the takeover threat (which was the case in the previous section). Overalll, the takeover market plays a dual role. It disciplines poorly-performing managers and offers rewards to successful ones in the form of acquisition opportunities.

The expression in braces on the RHS in (2) gives the marginal benefit from internal governance. Board interference increases firm value in two ways, by replacing an incompetent manager (ex-post effect) and by providing stronger incentives to exert effort (ex-ante effect). The ex-ante effect is captured by the term $p(1-\rho_b^t)Z_2$ which is the marginal reduction in expected compensation due to the threat of board interference.[22] The second summand in braces reflects the ex-post effect, i.e., the marginal change in future firm value due to the installation of a new manager. With probability $(1-p)(1-\rho^t)$ no acquirer shows up upon poor performance in which case board interference raises expected second-period cash flows by pX_2^H. Assumption 5 implies that τ^* is strictly lower than one. Hence, internal control sometimes breaks down.[23]

The comparative statics for τ^* are as follows. A reduction in the cost k improves internal governance. In the case of a benevolent board interference costs may decrease if a more efficient accounting system becomes available to evaluate performance. Alternatively, with a self-interested board a reduction in k may result from a more effective incentive scheme for the board or regulation.[24] The higher is the manager's future private benefit Z_2, the greater is the board's scope for providing implicit incentives. Hence, τ^* is increasing in Z_2. The higher the future cash-flow, the more valuable is the board's ability to interfere. Therefore, τ^* is increasing in X_2^H. In addition, we obtain the following result:

Proposition 3 *A more active takeover market discourages board interference.*

Internal and external governance are substitutes in our framework (i.e., $\partial\tau^*/\partial\rho^t < 0$). The intuition is straightforward. The takeover market weakens the board's incentive to exert control for two reasons: fear of being removed through a takeover relaxes the IC constraint and thus obviates the disciplinary role of the board. In addition, the prospect of selling the firm for P^t reduces the ex-post benefit from internal control. In the limit, as ρ^t goes to one, the board becomes inactive. Hirshleifer and Thakor (1998) also argue that the takeover market can crowd out board interference. When taking a firing decision the board faces the following tradeoff in their model: retaining the incumbent creates the option of selling the firm to an acquirer with superior information about managerial performance who may take a more efficient (i.e., better informed) firing

[22] Note that the ex-ante benefit disappears if the limited liability constraint binds.

[23] Jensen (1993, p. 863) notes that "the available evidence does suggest that CEOs are removed after poor performance, but the effect, ..., seems too late and too small to meet the obligations of the board".

[24] For instance, if excessive leniency of board members results from their reluctance to face a conflict with the CEO, a regulatory requirement that the board meet without the CEO might improve internal control.

decision. On the other hand there is a positive probability that board members themselves are dismissed by the takeover. The crucial assumption that drives substitutability within their framework is that the cost of dismissing the board is sufficiently high. Otherwise, complementarity between takeovers and internal governance obtains. In contrast, in our model substitutability results from the crowding-out effect between different governance mechanisms. In the next section we derive empirical predictions about CEO turnover based on this interaction.

5 Managerial Turnover and Compensation

In a next step we study the effect of an active takeover market on managerial turnover. For future reference, let τ^*_{NT} denote the optimal level of internal governance in the absence of a takeover market, i.e. when $\rho^t = 0$. Then

$$\tau^*_{NT} = \frac{1}{c}[pZ_2 + (1-p)pX_2^H]. \tag{4}$$

In the absence of takeovers the probability that the manager is fired following poor performance is simply equal to τ^*_{NT} given in (4). With an active takeover market, turnover conditional on $X_1 = X_1^L$ is

$$\Gamma^* = \tau^* + (1-\tau^*)\rho^t$$

where τ^* is given in (2) above. Even if the board is ineffective the incumbent is fired with probability ρ^t. Overall turnover is *jointly* determined by the intensity of the takeover threat and by the vigilance of the board.

Surprisingly, greater takeover pressure may lead to a decrease in managerial turnover. Two opposing effects of takeover pressure on the overall turnover probability have to be distinguished: on the one hand, according to Proposition 3 an active takeover market ($\rho^t > 0$) increases the probability of an internal control failure ($\tau^* < \tau^*_{NT}$). On the other hand, the incumbent may be removed through a takeover if the board is inactive. Depending on which of the two effects dominates, overall turnover can increase or decrease compared to the no-takeover case. It is clear that the second effect always dominates as ρ^t gets sufficiently large, implying that turnover increases ($\Gamma^* > \tau^*_{NT}$). In this case, the negative impact of a weaker board on overall turnover becomes negligible since the manager faces a high risk of being taken over whenever internal control breaks down. Conversely, one finds that if internal governance is very high in the absence of takeovers (i.e., if τ^*_{NT} is large) and if ρ^t is sufficiently small, then the "crowding-out" effect of takeovers dominates and $\Gamma^* < \tau^*_{NT}$. Managerial turnover is higher in the absence of a takeover market.

In the appendix we prove the following result.

Proposition 4 *In firms with strong boards, turnover is non-monotonic in the intensity of the takeover threat.*

If the takeover market operates with little or no friction, the relation between takeover pressure and overall turnover is always (weakly) positive. To the contrary, if the board mechanism is effective (τ^*_{NT}) then Huang and Zhao (2009) study changes in the sensitivity of CEO turnover to performance following the adoption of antitakeover legislation. They find that the sensitivity indeed increases in firms with strong boards.

In a next step, we consider the relation between, on the one hand, compensation, and, on the other hand, board interference and the takeover market. In the absence of a takeover market, the optimal reward for the manager in case of first-period success is simply

$$w^*_{NT}(X_1^H) = \frac{Z_1}{p\triangle q} - \tau^*_{NT} Z_2.$$

With an active market for corporate control, the optimal reward is

$$w^*(X_1^H) = \frac{Z_1}{p\triangle q} - [\Gamma^* + \rho^a F(\widehat{L}^* - P^a)\triangle] Z_2.$$

The difference in compensation is

$$w^*_{NT}(X_1^H) - w^*(X_1^H) = [\Gamma^* - \tau^*_{NT} + \rho^a F(\widehat{L}^* - P^a)\triangle] Z_2.$$

In essence, compensation changes are the sum of changes in the aggregate dismissal probability and the acquisition opportunity. For instance, if the takeover market becomes more of a disciplining device (change in ρ^t only), then compensation moves in opposite direction as managerial turnover, and the entire wage effect is due to the net change in Γ.

Proposition 5 *In firms with strong boards, managerial compensation is non-monotonic in the probability of a disciplinary takeover.*

Agrawal and Knoeber (1998) study the effect of the takeover threat on CEO compensation empirically and find that a greater risk of being taken over may lead to higher compensation. In their interpretation this is due to the fact that a risk averse CEO needs to be compensated for a greater dismissal risk. Alternatively, our model points to a crowding-out effect of internal governance by external governance as a possible interpretation. Moreover, the result should be confined to firms with strong boards.

Furthermore, we find that, ceteris paribus, compensation and pay-for-performance sensitivity is lower if the board is more effective, i.e., if the cost of interference is c is low. Pay-for-peformance sensitivity is measured as the difference between $w(X_1^H) - w(X_1^L)$ and since $w(X_1^L)$ is normalized to zero, it is simply $w(X_1^H)$. Supportive evidence is provided

by Fahlenbrach (2009) who finds that high board quality is associated with lower CEO pay-for-performance sensitivity.

To sum up, an active takeover market offers both "sticks" to poorly performing managers and "carrots" to successful ones and thus mitigates agency conflicts. A higher risk of being taken over discourages board interference. As a consequence, greater takeover pressure may reduce turnover risk for the CEO and thus aggravate agency conflicts. The non-monontonicity in turnover translates into a non-monotonicity in CEO compensation.

6 Market Outcome and Externality

This section endogenizes the structure of the takeover market. We consider a continuum of ex-ante identical firms with unit mass. Shareholders in each firm solve the problem described above: they fix a level of internal governance and contract with a manager of unknown ability. A specific matching technology pairs firms in the takeover market at the interim date. We can thus endogenize the takeover probabilities ρ^t and ρ^a as well as the transaction price. The Nash equilibrium in internal governance systems and liquidity policies is derived and compared to the socially optimal outcome.

All firms are endowed with the production and governance technology described above. Managerial ability is assumed to be distributed independently across firms. Because there is a continuum of firms there is no aggregate uncertainty (given that each manager exerts high effort). By the law of large numbers the realized fraction of successful firms after period 1 is p and the realized fraction of poorly performing firms is $(1-p)$. The analysis continues to proceed on the assumption that a manager who produced a high outcome in period 1 cannot be taken over. As before, a poorly performing manager cannot launch an acquisition either because he is dismissed or due to lack of funding. Hence, the set of potential acquirers (respectively targets) in the economy after the first period equals p (respectively $1-p$).[25]

We consider the following matching technology: after the first period, all firms are placed on a circle. If at all, a manager can only bid for the firm positioned to his right.[26] The transaction price simply equals the sum of the target's outside option, denoted by $\omega \in \{0; pX_2^H\}$, and a takeover premium. The premium equals a fraction λ of the gross surplus, $X_2^H - \omega$, which is generated by the takeover.[27] For instance, a positive premium

[25] We do not explicitly model the labor market in which firms can compete for competent managers at the interim date. However, the private benefit Z_2 can be interpreted as the outcome of a bargaining game between a competent manager and shareholders whereby the former obtains a fraction λ of the surplus he generates (i.e., $Z_2 = \lambda(1-p)X_2^H$).

[26] To facilitate the exposition we will speak of firms located at a point rather than the density at a point.

[27] Alternatively, we could model the transaction price as the outcome of a bargaining game between the two sides where the buyer can make a take-it-or-leave-it offer with probability $\zeta \in [0,1]$ and the seller holds all the bargaining power with probability $1-\zeta$.

may be due to free-riding by target shareholders in a tender offer.

Consider a firm i in the takeover market that has prepared a bid for a firm j. Suppose that manager i produced a high outcome in the first period whereas manager j produced a low one. (Otherwise, a transaction cannot occur.) Also, assume that manager i has liquidity $\widehat{L}$ at his disposal in excess of X_2^H (this will indeed be the case in equilibrium). If firm j is poorly governed, the funding condition is $\widehat{L} \geq c + P_b$ where $P_b = \lambda X_2^H$. If firm j is well governed, the funding condition is $\widehat{L} \geq c + P_g$ where $P_g = \lambda(X_2^H - pX_2^H) + pX_2^H$. Note that in contrast to section 4, a firm receives a higher sale price if it is well governed ($P_g > P_b$). In order to undertake comparative statics analysis in equilibrium we introduce a parameter $\gamma \in [0, 1]$ which captures frictions in the takeover market: given that the relevant funding condition is satisfied, a transaction is assumed to take place only with probability γ. It can be interpreted as a measure of the takeover friendliness of the regulatory and legal environment. Finally, note that an acquisition is ex-post efficient if $c < (1-p)X_2^H$.

Let ρ_b^t (respectively ρ_g^t) denote the probability that a firm is taken over upon poor performance for a price P_b (respectively P_g) given its state of internal governance is b (respectively g). Let $\widehat{L}_E$ and τ_E denote the levels of liquidity and internal governance of the representative firm in the economy. The above matching technology then implies that a firm with pre-arranged liquidity $\widehat{L}$ faces the following takeover probabilities from an ex-ante perspective:

$$\rho_g^t = \gamma p F(\widehat{L}_E - P_g) \qquad \text{and} \qquad \rho_b^t = \gamma p F(\widehat{L}_E - P_b) \tag{5}$$

$$\rho^a(\tau_E) = \gamma(1-p)[\tau_E F(\widehat{L} - P_g) + (1-\tau_E)F(\widehat{L} - P_b)] \tag{6}$$

For example, the probability of being taken over following a governance failure, ρ_b^t, simply equals γ times the probability that the neighboring manager turned out to be competent, p, and has sufficient funds, $F(\widehat{L}_E - P_b)$. A firm is more likely to be taken over if it is poorly governed ($\rho_b^t > \rho_g^t$) because it demands a lower price. Furthermore, a firm's probability of being taken over is increasing in the level of liquidity of the representative firm, $\widehat{L}_E$, i.e., takeover pressure is greater if rival managers are well funded. While the risk of being taken over depends on other firms' behavior through $\widehat{L}_E$, the chance of taking somebody else over, $\rho^a(\tau_E)$, depends on rival firms through τ_E. The probability that a successful manager can acquire another firm, $\rho^a(\tau_E)$, is decreasing in τ_E. If the economy-wide level of internal governance increases, a successful manager is more likely to face a well-governed target. Better internal governance, in turn, reduces the probability that a transaction takes place ($F(\widehat{L} - P_g) < F(\widehat{L} - P_b)$). In a nutshell, board interference reduces the scope for takeovers.

Suppose that firms simultaneously and non-cooperatively choose their liquidity levels and governance arrangements. In the Appendix we prove the following result:

Lemma 3 *There exists a unique symmetric equilibrium* $(\widehat{L}^e, \tau^e, w^e(X_1^H))$*. The equilibrium system of internal governance solves*

$$w^e(X_1^H) = \frac{Z_1}{p} - \left[\tau^e + \rho_b^t(1-\tau^e) + \rho^a(\tau^e)\triangle\right] Z_2 \quad \textit{and} \quad w^e(X_1^L) = 0 \tag{7}$$

and

$$\tau^e = \frac{1}{k}\left\{p(1-\rho_b^t)Z_2 + (1-p)\left[pX_2^H + \rho_g^t(P_g - pX_2^H) - \rho_b^t P_b\right]\right\}. \tag{8}$$

where ρ_b^t *and* ρ_g^t *are given by (5) and* $\rho^a(\tau^e)$ *is given by (6). The equilibrium level of liquidity is*

$$\widehat{L}^e = X_2^H + \triangle Z_2. \tag{9}$$

In words, the equilibrium level of liquidity in (9) is unchanged compared to Lemma 2 and determines the takeover probabilities in (5). In turn, these probabilities can be inserted into (8) to obtain the equilibrium level of board interference, τ^e. The difference compared to (2) results from the fact that board control now affects the expected returns as a target in the takeover market. Consider the marginal ex-post benefit of internal governance, captured by the expression in squared brackets on the RHS in (8). The second summand, $\rho_g^t(P_g - pX_2^H)$, is the expected takeover premium for the seller if he is well governed and the last term, $\rho_b^t P_b$, is the expected premium if internal control breaks down. Finally, the structure of the optimal compensation scheme in (7) corresponds to the solution in Lemma 2 with the important difference that the takeover probabilities, ρ_b^t and $\rho^a(\tau^e)$, are now endogenous.

The following comparative statics results obtain which are proven in the Appendix. Fewer frictions in the takeover market reduce the equilibrium level of internal governance, i.e., τ^e is decreasing in γ. Thus, Proposition 3 remains valid in equilibrium, albeit in a slightly modified form. Also, Proposition 4 continues to hold: in equilibrium overall turnover risk, Γ^e, is non-monotonic in the intensity of the takeover threat as measured by γ. Furthermore we obtain the following result:

Corollary 1 *CEO compensation is non-monotonic in legal shareholder protection (k).*

A lower cost of board interference has two opposing effects on compensation. Better legal shareholder protection increases τ^e, and hence Γ. A greater dismissal threat lowers compensation. On the other hand, a lower k improves board control in rival firms. Acquisition opportunities are thereby reduced which increases compensation. Finally, if an exogenous shock improves board control in rival firms compensation increases due to diminished acquisition opportunities.

What is the socially optimal liquidity and governance arrangement, i.e., the arrangement that maximizes joint profits for all firms? An acquisition is ex-post efficient if $X_2^a - c \geq pX_2^H$, i.e., if the takeover cost is lower than the gross surplus, $X_2^a - pX_2^H$,

generated by a takeover. An acquisition is loss-making, or value-decreasing, from the perspective of shareholders in the acquiring firm if the total acquisition cost exceeds the gross return, i.e., if $X_2^a \geq c + P^a$. Let $(\widehat{L}^o, \tau^o, w^o(X_1^H), w^o(X_1^H))$ denote the socially optimal governance arrangement and the socially optimal liquidity policy that are derived in the Appendix. We find the following result:

Proposition 6 *There is excessive board interference in equilibrium ($\tau^o < \tau^e$).*

In equilibrium, shareholders fail to internalize the negative impact of their governance effort on the acquisition opportunities of rival firms which hardens the incentive compatibility constraints for all other managers in the economy. Hence, $\tau^o < \tau^e$. Thus, profits of the corporate sector would increase if each firm deviated from the privately optimal governance arrangement and installed a weaker board. Weak boards create a more liquid takeover market by increasing the supply of potential target firms. However, the liquidity of the takeover market is a public good and the supply of targets is too low in equilibrium.

Proposition 7 *The equilibrium level of liquidity is inefficiently low ($\widehat{L}^e < \widehat{L}^o$).*

The privately optimal level of liquidity is lower than the socially optimal one. In equilibrium, each firm ignores that a higher level of $\widehat{L}$ imposes more intense takeover pressure on rival managers. A lax liquidity policy relaxes funding constraints of acquirers and thus creates a more liquid takeover market. The takeover threat is inefficiently low is inefficiently low.

Both the level of internal governance and the level of liquidity, that are chosen in equilibrium, deviate from the socially optimal levels. In general, privately optimal choices entail an externality in our model as long as they affect the probability of making an acquisition or of being acquired (or both) of other firms in the economy. In these cases, privately optimal choices will not lead to a constrained efficient market outcome.

Our results contrasts with other recent papers that study the peer group or spillover effects in corporate governance. Archaya and Volpin (2009) uncover an externality in firms' choices of governance that operates through the managerial labor market rather than the takeover market.[28] In their model poorly governed firms pay their manager higher compensation. If there is competition for managerial talent, a firm may be forced to overpay its manager in order to prevent him from accepting a more generous compensation package in a weakly governed rival. While their definition of governance (as shareholders' ability to interfere and fire the manager) is very similar to our definition of τ, we obtain opposing empirical predictions. In the above framework, the manager's compensation should increase if an exogenous shock improves the effectiveness of boards in rival firms.

[28] See also Dicks (2009) who presents an externality that is simila to Archaya and Volpin (2009) and focuses on the impact of governance regulation.

A positive shock diminishes acquisition opportunities and thus reduces the manager's incentive to exert effort. Conversely, Archaya and Volpin (2009) argue that a manager's compensation decreases if rival firms are better governed. Better governed rivals offer lower wages which reduces the manager's outside option. Hence, compensation can be reduced. Moreover, while we find overprovision of governance in equilibrium, there is underprovision in their model.

Excessive board interference results from spillover effects between firms. This contrasts with existing theories of overmonitoring. Pagano and Röell (1998) argue that monitoring by a large blockholder can be excessively high because he fails to internalize the negative effect of interference on the manager's rent. In Burkart, Gromb, and Panunzi (1997) a block holder's interference stifles the manager's initiative to generate new projects and ideas. Overmonitoring can be avoided through a sufficiently dispersed ownership structure.

7 Conclusion

Previous research on the incentive implications of takeovers has focused on the threat of being taken over and its effect on management behavior. We argue that the takeover market mitigates agency conflicts by providing acquisition opportunities for successful managers. As a consequence, takeovers may benefit shareholders even if they neither play any disciplinary role vis-a-vis target firms nor create any value directly (e.g. through the installation of a new management team). At the same time, takeover pressure stifles the board's incentive to discipline management, possibly to the extent that it aggravates agency conflicts in target firms. In firms with strong boards, a higher risk of being taken over may, under certain conditions, secure management's position in the firm. Finally, a liquid takeover market with a sufficient supply of potential targets constitutes a public good that enhances career concerns for all managers in the economy. In equilibrium, an externality in governance choices across firms arises. Board interference, which reduces the scope for value-enhancing acquisitions, is excessive and takeover activity is inefficiently low.

Appendix

Proof of Lemma 1, part (ii): Assumption 4 implies that the incentive compatibility constraint will be binding. Substituting the IC constraint in the objective function yields the following simplified program:

$$\max_{\widehat{L}} p\left[X_1^H - (\frac{Z_1}{p} - [\tau + (1-\tau)\rho^t + \rho^a F(\widehat{L} - P^a)\triangle]Z_2)\right]$$

$$+p\left[X_2^H+\rho^a[\int_0^{\widehat{L}-P^a}(X_2^H-P^a-c)f(c)dc\right]+(1-p)pX_2^H.$$

The first-order condition is

$$p\rho^a f\triangle Z_2+p\rho^a(X_2^H-\widehat{L}^*)f=0\Leftrightarrow\widehat{L}^*=X_2^H+\triangle Z_2.$$

Proof of Lemma 2: Assumption 4 implies that the incentive compatibility constraint is binding. Substituting the IC constraint in the objective function yields

$$\max_{\widehat{L},\tau}p[X_1^H-(\frac{Z_1}{p}-[\tau+(1-\tau)\rho^t+\rho^aF(\widehat{L}-P^a)\triangle]Z_2)]$$

$$+p\left[X_2^H+\rho^a[\int_0^{\widehat{L}-P^a}(X_2^H-P^a-c)f(c)dc\right]+(1-p)[\rho^tP^t+(1-\rho^t)\tau pX_2^H]-\frac{1}{2}k\tau^2$$

The first order conditions with respect to τ and $\widehat{L}$ give the results in (2) and (3).

Proof of Proposition 4. $\Gamma^*=\tau^*+(1-\tau^*)\rho^t$ with

$$\tau^*=\frac{1}{k}p(1-\rho_b^t)Z_2+(1-p)(1-\rho^t)pX_2^H\}. \tag{1}$$

Then

$$\frac{\partial\Gamma^*}{\partial\rho^t}=1-\tau^*+(1-\rho^t)\frac{\partial\tau^*}{\partial\rho^t}$$

with

$$\frac{\partial\tau^*}{\partial\rho^t}=\frac{1}{k}\left\{-pZ_2-(1-p)pX_2^H\right\}<0. \tag{2}$$

Furthermore

$$\frac{\partial^2\Gamma^*}{\partial(\rho^t)^2}=-2\frac{\partial\tau^*}{\partial\rho^t}>0.$$

Hence, Γ^* is a strictly convex function of ρ^t. As $\rho^t\to1$, $\Gamma^*\to1$, and as $\rho^t\to0$, $\Gamma\to\tau_{NT}^*$ where

$$\tau_{NT}^*=\frac{1}{k}[pZ_2+(1-p)pX_2^H].$$

As $\rho^t\to1$, $\partial\Gamma^*/\partial\rho^t\to1-\tau^*\mid_{\rho^t=1}$, where

$$1-\tau^*\mid_{\rho^t=1}=1-0>0.$$

As $\rho^t\to0$, $\partial\Gamma^*/\partial\rho^t\to1-\tau_{NT}^*+\partial\tau^*/\partial\rho^t$ where

$$\begin{aligned}1-\tau_{NT}^*+\partial\tau^*/\partial\rho^t&=1-\frac{1}{k}[pZ_2+(1-p)pX_2^H]+\frac{1}{k}\left\{-pZ_2-(1-p)pX_2^H\right\}\\&=1-2\tau_{NT}^*\end{aligned}$$

Hence, turnover decreases in takeover pressure around for small ρ^t if $\tau^*_{NT} > \frac{1}{2}$. More generally, the sensitivity of turnover with respect to the takeover threat is:

$$\frac{\partial \Gamma^*}{\partial \rho^t} = 1 - \tau^* + (1-\rho^t)\frac{\partial \tau^*}{\partial \rho^t} = 1 - (1-\rho^t)2\tau^*_{NT}$$

Therefore, turnover is always increasing in the takeover threat as ρ^t becomes large. However, if ρ^t is sufficiently small and τ^*_{NT} sufficiently high, the above expression can be negative and overall turnover is decreasing in the takeover threat. ■

PROOF OF LEMMA 3:

Given $\widehat{L}_E$ and τ_E, shareholders in each firm solve:

$$\max_{w(X_1^H),\tau,\widehat{L}} p\left[X_1^H - w(X_1^H) + X_2^H + (1-p)\tau_E[\int_0^{\widehat{L}-P_g}(X_2^H - P_g - c)f(c)dc)]\right] +$$
$$p\left[(1-p)(1-\tau_E)[\int_0^{\widehat{L}-P_b}(X_2^H - P_b - c)f(c)dc)]\right] +$$
$$(1-p)[\tau(\rho_g^t P_g + (1-\rho_g^t)pX_2^H) + (1-\tau)\rho_b^t P_b^t] - \frac{1}{2}k\tau^2$$

subject to

$$w(X_1^H) \geq \frac{Z_1}{p} - \left[\tau + (1-\tau)\rho_b^t + \Delta\rho^a(\tau_E)\right] Z_2$$
$$w(X_1^H) \geq 0 \qquad \text{and} \qquad \tau \in [0,1]$$

The binding incentive compatibility constraint yields $w^e(X_1^H)$ in (7). The FOC with respect to τ yields (8). The first-order condition with respect to $\widehat{L}$ is

$$\begin{aligned} p[(-\frac{\partial w^e(X_1^H)}{\partial \widehat{L}}) + (1-p)(X_2^H - \widehat{L})f] &= 0 \Leftrightarrow \Delta Z_2 \frac{\partial \rho^a(\tau_E)}{\partial \widehat{L}} + (1-p)(X_2^H - \widehat{L})f = 0 \\ &\Leftrightarrow \widehat{L} = X_2^H + \Delta Z_2 \end{aligned}$$

Proof that $\frac{\partial \tau^e}{\partial \gamma} < 0$ (Section 6):

$$\frac{\partial \tau^e}{\partial \gamma} = \frac{1}{k}\left\{p(-\frac{\partial \rho_b^t}{\partial \gamma})Z_2 + (1-p)\left[\frac{\partial \rho_g^t}{\partial \gamma}(P_g - pX_2^H) - \frac{\partial \rho_b^t}{\partial \gamma}P_b\right]\right\}$$

To prove that the above expression is negative is suffices to show that the term in squared brackets on the RHS is negative. Substituting the takeover probabilities and prices into $\left[\frac{\partial \rho_g^t}{\partial \gamma}(P_g - pX_2^H) - \frac{\partial \rho_b^t}{\partial \gamma}P_b\right]$ yields

$$\lambda X_2^H(1-p)pF(\widehat{L}^e - P_g) - \lambda X_2^H pF(\widehat{L}^e - P_b)$$

which is equivalent to

$$\frac{\lambda X_2^H p}{\overline{c}}[(1-p)(\widehat{L}^e - P_g) - (\widehat{L}^e - P_b)] = \frac{\lambda X_2^H p}{\overline{c}}[-p\widehat{L}^e - (1-p)(\lambda X_2^H(1-p) + pX_2^H) + \lambda X_2^H].$$

Further simplification gives

$$\frac{\lambda X_2^H p}{\overline{c}}[-p\widehat{L}^e + (2-p)p\lambda X_2^H - (1-p)pX_2^H].$$

Setting $\lambda = 1$, yields $\frac{\lambda X_2^H p}{\overline{c}}[-p\widehat{L}^e + pX_2^H] < 0$.

Proof that overall turnover risk is non-monotonic in γ (Section 6):

...

Proof of Lemma 7 and Lemma 8:

$$\max_{w(X_1^H),\tau_E,\widehat{L}_E} p\left[X_1^H - w(X_1^H) + X_2^H + (1-p)\tau_E[\int_0^{\widehat{L}_E - P_g}(X_2^H - P_g - c)f(c)dc)]\right] +$$
$$p\left[(1-p)(1-\tau_E)[\int_0^{\widehat{L}_E - P_b}(X_2^H - P_b - c)f(c)dc)]\right] +$$
$$(1-p)[\tau_E(\rho_g^t P_g^t + (1-\rho_g^t)pX_2^H) + (1-\tau_E)\rho_b^t P_b^t] - \frac{1}{2}k\tau^2$$

subject to

$$w(X_1^H) \geq \frac{Z_1}{p} - \left[\tau_E + (1-\tau_E)\rho_b^t + \Delta\rho^a(\tau_E)\right] Z_2$$
$$w(X_1^H) \geq 0 \qquad \text{and} \qquad \tau_E \in [0,1]$$

Let ε denote the price difference: $\varepsilon = P_g - P_b$. The first order condition with respect to τ yields:

$$\begin{aligned}\tau^o &= \frac{1}{k}\{p(1-\rho_b^t)Z_2 + (1-p)[pX_2^H + \rho_g^t(P_g - pX_2^H) - \rho_b^t P_b] \\ &\quad -p(1-p)[\int_0^{\widehat{L}_E - P_b - \varepsilon}\varepsilon f(c)dc + \int_{\widehat{L}_E - P_b - \varepsilon}^{\widehat{L}_E - P_b}(X_2^H - P_b - c)f(c)dc]\}\end{aligned}$$

The first order condition with respect to $\widehat{L}_E$ yields:

$$\widehat{L}^o = X_2^H + \Delta Z_2 + \frac{p}{1-p}(1-\tau^o) + [\tau^o(P_g - pX_2^H) + (1-\tau^o)P_b]$$

From the first order conditions it is immediately apparent that $\widehat{L}^o > \widehat{L}^*$ and $\tau^* > \tau^o$.

References

Acharya, Viral and Paolo Volpin, 2009, "Corporate Governance Externalities," *Review of Finance*, forthcoming.

Almazan, Andres and Javier Suarez, 2003, "Entrenchment and Severance Pay in Optimal Governance Structures," *Journal of Finance*, 58(2), 519-547.

Andrade, Gregor, Mark Mitchell and Erik Stafford, 2001, "New Evidence and Perspectives on Mergers," *Journal of Economic Perspectives*, 15(2), 103-120.

Bolton, Patrick and Ernst-Ludwig von Thadden, 1998, "Blocks, Liquidity, and Corporate Control," *Journal of Finance*,...

Bruner, Robert, 1988, "The Use of Excess Cash and Debt Capacity as a Motive for Merger," *Journal of Business*, 23(2), 199-217.

Cheng, Ing-Haw, 2008, "Corporate Governance Spillovers," working paper.

Cornelli, Francesca, Zbigniew Kominek and Alexander Ljungqvist, 2010, "Monitoring Managers: does it matter?" ECGI - Finance Working Paper.

Crémer, Jacques, 1995, "Arm's Length Relationships," *Quarterly Journal of Economics*, 110(2), 275-295.

Dicks, David L., 2009, "Executive Compensation, Incentives, and the Role for Corporate Governance Regulation," Kenan-Flagler Business School, University of North Carolina.

Fahlenbrach, Rüdiger, 2009, "Shareholder Rights, Boards, and CEO Compensation," *Review of Finance*, forthcoming.

Falato, Antonio, 2007, "Superstars or Superlemons? Top Executive Pay and Corporate Acquisitions," working paper.

Gibbons, Robert and Kevin J. Murphy, 1992, "Optimal Incentive Contracts in the Presence of Career Concerns: Theory and Evidence," *Journal of Political Economy*, 100, 468-505.

Goel, Anand and Anjan Thakor, 2008, "Overconfidence, Leadership Selection and Corporate Governance," *Journal of Finance*, 63, 2737-2784.

Harford, Jarrad, 1999, "Corporate Cash Reserves and Acquisitions," *Journal of Finance*, 54(6), 1969-1997.

Hermalin, Benjamin and Michael Weisbach, 2009, "Information Disclosure and Corporate Governance," working paper.

Hirshleifer, David and Anjan Thakor, 1998, "Corporate Control through Board Dismissals and Takeovers," *Journal of Economics and Management Strategy*, 7-4, 489-520.

Huang, Jun and Shan Zhao, 2009, "CEO Turnover and Takeover Threats: New Evidence from Antitakeover Legislation," working paper.

Jensen, Michael and Richard Ruback, 1983, "The Market for Corporate Control: The Scientific Evidence," *Journal of Financial Economics*, 11, 5-50.

Jensen, Michael, 1986, "Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers," *American Economic Review,* 76, 323-329.

Kaplan, Steven, Mark Klebanov and Morten Sorensen, 2008, "Which CEO Characteristics and Abilities matter?", working paper.

Kini, Omesh, William Kracaw and Shehzad Mian, 2004, "The Nature of Discipline by Corporate Takeovers," *Journal of Finance*, 59(4), 1969-1997.

Martin, Kenneth and John McConnell, 1991, "Corporate Performance, Corporate Takeovers, and Management Turnover," *Journal of Finance*, 46(2), 671-687.

Pagano, Marco and Ailsa Röell, 1998, "The Choice of Stock Ownership Structure: Agency Costs, Monitoring, and the Decision to go Public," *Quarterly Journal of Economics*,...

Scharfstein, David, 1988, "The Disciplinary Role of Takeovers," *Review of Economic Studies*, 55(2), 185-199.

Shleifer, Andrei and Lawrence Summers, 1988, "Breach of Trust in Hostile Takeovers," in Alan J. Auerbach, editor, *Corporate Takeovers: Causes and Consequences*, Chicago: University of Chicago Press.

Shleifer, Andrei and Robert Vishny, 1989, "Management Entrenchment: The Case of Manager-Specific Investments," *Journal of Financial Economics*, 25, 123-139.

Stein, Jeremy, 1988, "Takeoer Threats and Managerial Myopia," *Journal of Political Economy*, 96(1), 61-80.

Tirole, Jean, 2001, "Corporate Governance," *Econometrica*, 69, 1-35.

Tirole, Jean, 2006, *The Theory of Corporate Finance*, Princeton University Press.

Yang, Liu, Haluk Unal and Kristina Minnick, 2008, "Pay for Performance? CEO Compensation and Acquirer Returns in BHCs," working paper.

Yim, Soojin, 2010, "The Acquisitiveness of Youth: CEO Age and Acquisition Behavior," working paper.