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Mike Burkart and Konrad Raff

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Mike Burkart, Stockholm School of Economics, London School of Economics, ECGI, FMG and CEPR
Konrad Raff, VU University

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Centre for Economic Policy Research
77 Bastwick Street, London EC1V 3PZ, UK
Tel: (44 20) 7183 8801, Fax: (44 20) 7183 8820
Email: cepr@cepr.org, Website: www.cepr.org

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ABSTRACT

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

We propose that an active takeover market provides incentives by offering acquisition opportunities to successful managers. This allows firms to reduce performance-based compensation and can rationalize loss-making acquisitions. At the same time, takeovers remain a substitute for board dismissal in the replacement of poorly performing managers. The joint impact of the two mechanisms on managerial turnover is, however, multi-faceted: In firms with strong boards, turnover and performance-based pay are non-monotonic in the intensity of the takeover threat. In firms with weak boards, turnover (performance-based pay) increases (decreases) with the intensity of the takeover threat. When choosing its acquisition policy and the quality of its board, each firm ignores the adverse effect on other firms' acquisition opportunities and takeover threat. As a result, the takeover market is not sufficiently liquid and too few takeovers occur.

JEL Classification: G34
Keywords: board interference, CEO turnover, compensation and takeover

Mike Burkart
Department of Finance
Stockholm School of Economics
Sveavägen 65, Box 6501
SE-113 83 Stockholm
SWEDEN

Email: mike.burkart@hhs.se

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Konrad Raff
VU University Amsterdam
THE NETHERLANDS

Email: k.f.raff@vu.nl

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1 Introduction

An active takeover market is commonly considered to create value by redeploying corporate assets. A plethora of empirical studies documents that target shareholders as well as target and acquiring shareholders taken together benefit from takeovers (Andrade et al., 2001). Moreover, an active market for corporate control also affects managerial behaviour. In particular, the threat of a takeover is seen to discipline incumbent managers, thereby reducing agency costs (Jensen, 1988; Scharfstein, 1988).[1]

This paper takes a new look at the incentive implications of takeovers. While extant theoretical and empirical work emphasizes the risk of being a target, we draw attention to the flip side, namely, the prospect of acquiring another firm. We posit that the market for corporate control shapes managerial incentives through two channels: the takeover threat and the acquisition opportunity. Taking both these sides into account, we derive the optimal internal governance in a single-firm setting. We also analyse how firm governance choices and takeover activities interact in equilibrium.

Specifically, we consider a simple two-period moral hazard model in which a firm hires a manager whose ability is unknown to all parties. First-period performance is a function of both managerial effort and ability. Second-period performance depends only on ability, and dismissing an incompetent manager increases expected second-period profits. A manager deemed competent retains her job for the second period and may, in addition, have the opportunity to acquire another firm. Managers are induced to exert effort explicitly through performance-based compensation and implicitly through future private benefits. Since managers enjoy more private benefits from running larger firms, acquisition opportunities provide (additional) incentives. This, in turn, mitigates moral hazard and the need to offer performance-based compensation. Thus, the market for corporate control can benefit shareholders even in the absence of disciplinary takeovers, that is, even if incompetent managers are never retained.

This insight has implications for firms' acquisition policies. When shareholders, or the board of directors, on their behalf, decide on an acquisition budget, they face a trade-off: On the one hand, more funds enable the manager to undertake an unprofitable, or more unprofitable, takeover. On the other hand, a larger budget increases the chance of making an acquisition and therefore provides more incentives. Due to the latter effect, the optimal acquisition budget never permits only profitable acquisitions but always allows for some unprofitable takeovers as well. Contrary to the literature on empire building (Jensen 1986), in the present paper acquisitions are a remedy rather than a source of incentive problems. Since our model assumes that shareholders can limit the acquisition budget, takeovers against their best interest do not occur in equilibrium. Our model

[1] However, the literature also points out potential inefficiencies of takeover threats. For instance, Stein (1988) and Shleifer and Summers (1988) argue that takeover pressure can lead to distorted investment decisions.

predicts an inverse relation between (managerial discretion over) the acquisition budget and (performance-based) CEO pay, and worse acquisition performances for firms with larger budgets.[2]

For the sake of clarity, we derive the acquisition opportunity effect in a simplified setting in which disciplinary takeovers play no role since incompetent managers are always dismissed by the board. To explore the interaction between board quality and the takeover market, we extend the framework in two ways: First, we let the firm choose the quality of its internal governance, modelled as the probability that an incompetent manager is dismissed by the board. Second, a firm can be a potential acquirer or target, depending on its first-period performance. Board interference and (hostile) takeovers are both means of dismissing incompetent managers and jointly determine managerial turnover. Since board interference is costly to the firm, more intense takeover pressure crowds out internal governance. Better prospects of selling the firm reduce the cost of retaining an incompetent manager and hence the benefits of good internal governance.

While takeovers and boards are substitutes with respect to disciplining managers as in, for example, Hirshleifer and Thakor (1998), their combined impact on managerial turnover and performance-based compensation is more complex. In particular, more takeover pressure can exacerbate the agency problem and necessitate more performance-based pay. When board interference is not very costly, the quality of internal governance is high, and introducing a small takeover probability entails a strong crowding out effect. As a result, an incompetent manager is less likely to retain her job in the absence of disciplinary takeovers, compared to being exposed to a small takeover risk.[3] When the takeover risk is sufficiently large, increases in the takeover probability always lead to higher managerial turnover. Thus, we obtain a non-monotonic relation between takeover threat and managerial turnover when internal governance is intrinsically strong. This, in turn, translates into a non-monotonic relation between takeover threat and performance-based compensation, since compensation is inversely related to managerial turnover. In contrast, when internal governance is costly and hence weak, more takeover pressure always increases the overall dismissal risk. Therefore, the relation between takeover threat and managerial turnover (performance-based pay) is always positive (negative) in this case.

The last part of the paper shows how governance externalities can arise through interactions in the takeover market. To this end, we consider a large number of ex ante identical firms whose role in the takeover market depends on their first-period cash flows. Poorly performing firms become potential targets and well-performing firms are potential acquirers. In equilibrium, firms choose too much board interference (quality) and too

[2]Harford (1999) finds that high-cash firms make more acquisitions than other firms and that those acquisitions have lower announcement returns.

[3]In support of this prediction, Huang and Zhao (2009) document that the sensitivity of CEO turnover to performance increases in firms with strong boards following the passage of anti takeover legislation.

small acquisition budgets. On the one hand, each firm fails to internalize the fact that improvements in board quality reduce the acquisition opportunities for other firms. On the other hand, each firm does not take into account that a larger budget would strengthen the takeover threat to other firms and discipline their managers.

Our paper is related to theoretical work on takeovers, boards of directors, and governance spillovers. While takeovers are but a threat to incumbent managers in existing takeover models, we argue that they are also opportunities that offer implicit incentives. The importance of implicit incentives was first recognized by Fama (1980) and Holmström (1982). Rather than analysing CEO incentives driven by career concerns, we explore the incentive effect of acquisition opportunities (and takeover threat). To fully exploit the implicit incentives of acquisitions in our model, the manager must be given the discretion to also undertake some loss-making acquisitions. This builds on the idea that managerial autonomy comes with both costs and benefits, as in Almazan and Suarez (2003), Burkart et al. (1997), and Pagano and Roell (1998). In these studies, discretion increases managerial rents ex post, which in turn provide incentives ex ante. We employ the same trade-off and implement managerial discretion through the budget policy. In contrast, Burkart et al. (1997) and Pagano and Roell (1998) ensure managerial discretion through partial ownership dispersion, whereas Almazan and Suarez (2003) rely on weak boards to commit to a lenient firing policy.[4] In our model, a weak board exacerbates the agency conflict within the firm but creates an acquisition opportunity, thereby mitigating agency problems in other firms.

Hirshleifer and Thakor (1998) also analyse the joint functioning of board dismissals and takeovers. In their model, the acquirer can replace the manager, as well as dismiss the board. Because of this latter possibility, the takeover market and board interference are complementary when the costs of removing the board are low. When these costs are sufficiently large, internal and external control mechanisms are substitutes, as in our model where the position of the board is never under threat. Our study further differs from that of Hirshleifer and Thakor (1998) by exploring the dual role of the takeover market and the joint impact of board dismissal and takeovers on managerial turnover and performance-based compensation. Ferreira et al. (2011) also allow the takeover market to remove an incompetent manager if the board fails to intervene; however, a takeover occurs in their model only if the stock price is informative. This creates a link between stock price informativeness and board monitoring which is the focus of their analysis. We abstract from information revealed through stock prices.

Finally, some recent papers study the interaction between firms' choices of corporate governance. Acharya and Volpin (2010) identify an externality that operates through

[4] Adams and Ferreira (2007) provide an alternative argument in favour of weak boards. In their model, the board performs the dual role of monitoring and advising the CEO. Close board monitoring may not be desirable, because it makes the manager reluctant to share private information, thereby compromising the board's advisory role.

the competition for scarce managerial talent. To incentivize managers, firms with weaker governance offer more generous compensation packages. To remain attractive employers, other firms also must pay high(er) salaries, which reduces the benefits of investing in corporate governance. As a result, overall governance in the economy is too weak. Dicks (2010) also derives a governance externality operating through executive compensation and explores its regulatory implications. Cheng (2011) explores governance spillovers in a setting where relative performance evaluation provides incentives for managers to manipulate earnings. Our model differs from these, since governance externality operates through the takeover market rather than the managerial labour market or CEO compensation.

The remainder of this study is organized as follows. Section 2 presents the basic model. Section 3 develops the acquisition opportunity effect. Section 4 analyses the interactions between takeovers and board interference and their implications for CEO turnover and compensation. Section 5 studies the link between firm governance arrangements and takeover market outcome. Concluding remarks are presented in Section 6. All mathematical proofs are in the Appendix.

2 Model

We consider a moral hazard problem with two periods of production. A firm hires a manager who is either competent or incompetent. As in Holmström (1982) or Gibbons and Murphy (1992), the manager's type $\theta \in \{\underline{\theta}, \bar{\theta}\}$ is initially unknown, even to her. All parties hold the common prior $p \in (0,1)$ that the manager is competent ($\theta = \bar{\theta}$). Everyone is risk neutral and there is no discounting.

Once hired, the manager chooses an unobservable effort $e \in \{e_l, e_h\}$. She enjoys private benefits Z_1 if she exerts low effort ($e = e_l$). At the end of the first period, a cash flow $X_1 \in \{0, X_1^H\}$ is realized that is contractible and depends 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 ability θ and effort e_i.

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

A manager generates a high cash flow only if she works and is competent. A richer technology where sometimes a competent manager fails despite high effort or an incompetent manager succeeds would not qualitatively change our results. Shareholders receive the cash flow X_1 net of any wage paid to the manager.

If the manager is retained after the first period, she receives private benefits $Z_2 > 0$ and produces a second-period cash flow $X_2 \in \{0, X_2^H\}$, which only depends on her ability. A competent manager produces $X_2 = X_2^H$, whereas an incompetent manager produces 0. A retained manager finds a potential takeover target with probability ρ^a, which she can

acquire if she has sufficient funds. The acquisition budget is part of the contract that the manager accepts at the outset (see below). Following a successful bid, the manager enjoys additional private benefits $\Delta Z_2 > 0$ from running a larger firm in the second period. Such private benefits can come in many guises. For instance, managers are able to foster their prestige and influence through acquisitions. Avery et al. (1998) find that managers who undertake acquisitions are more likely to become board members in other firms.

Let $X_2^a \in \{0, X_2^H\}$ be the gross return to acquiring shareholders from a successful takeover that is determined by the ability of their manager: If she is competent ($\theta = \overline{\theta}$), the gross return is X_2^H. If she is incompetent ($\theta = \underline{\theta}$), the second-period cash flow is zero. Hence, the firm simply doubles its scale with an acquisition. For simplicity, we abstract from incentive or coordination problems in the acquisition process and assume a (for now exogenous) purchase price $P^a \leq X_2^H$. Besides the price, a successful transaction imposes a takeover (or retooling) cost c. The cost c is random and drawn from a commonly known uniform distribution function $F(c)$ on $[0, \overline{c}]$; its realization is publicly observed prior to the takeover bid. The resulting shareholder net return from an acquisition is $X_2^a - c - P^a$. The purpose of the random cost is to introduce uncertainty about takeover profitability, which is more convenient than letting the target cash flow be random for a given managerial ability.

If the manager is dismissed at the end of the first period, a new manager of unknown ability is hired and the expected second-period cash flow is pX_2^H. For simplicity, a newly hired manager cannot undertake an acquisition. This assumption can be relaxed without qualitatively affecting our results.

Throughout the paper, we assume that the board makes decisions on behalf of the shareholders and does so in their best interest. At the hiring stage, the board offers the manager a contract comprising a compensation scheme and an acquisition budget. The compensation scheme stipulates payments to the manager contingent on the firm's cash flow. Since the manager takes no actions in the second period, there is no role for second-period wage payments. Let (w_H, w_L) denote the payments in case of first-period success or failure, neither of which can be negative.

The manager has complete discretion over the budget when attempting a takeover. The budget is contingent on first-period performance. Let (L_H, L_L) be the non-negative budgets in case of first-period success or failure, respectively. The manager can only carry out a takeover if the budget covers the total acquisition cost $c + P^a$.[5]

To sum up, the timing of the game is as follows: (i) The parties sign a contract (w_H, w_L, L_H, L_L) and the manager chooses an unobservable effort level $e \in \{e_l, e_h\}$. (ii) First-period cash flow $X_1 \in \{0, X_1^H\}$ is realized and publicly observed. (iii) The board

[5] From the condition $L \geq c + P^a$, it is clear that contracting on an acquisition budget is equivalent to contracting on a cut-off rule for the cost c. More generally, we can allow the parties to contract on all variables except for the effort choice.

decides to retain or dismiss the manager. (iv) If retained, the manager 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 and second-period cash flow is realized.

Finally, we want to ensure that shareholders always find it optimal to induce high effort.

Assumption 2 $p\left[X_1^H + (1-p)X_2^H\right] \geq Z_1$.

High effort is surely in the shareholders' interest if the disutility of the effort is smaller than its expected benefits. A high effort not only is a prerequisite for a high cash flow in the first period, but also may allow the manager's ability to be inferred (whereas nothing is learned if the manager exerts low effort). Hence, high effort increases the expected payoff in the second-period by $(1-p)X_2^H$. The assumption is stricter than necessary, since it abstracts from the manager's future private benefits and the potential gains from an acquisition.

Reflecting the increased importance of transferable managerial skills, as opposed to firm-specific human capital (Murphy and Zabojnik, 2007), competence in our model refers to general skills. If a manager proved her competence in one firm, she can also successfully manage a target firm. This modelling choice has two implications. First, it makes takeovers a more effective incentive device, compared to a setting where managerial competence is firm-specific. Second, competent managers with transferable skills are attractive to all firms that are currently run by incompetent managers. These firms would want to poach managers whose first-period performance reveals them as competent. We intentionally do not model the managerial labor market in which firms compete for competent managers. However, the private benefit Z_2 can be interpreted as an additional payment that a competent manager can extract when bargaining with a firm over the surplus she generates relative to a random replacement.

3 Acquisitions and CEO Incentives

This section analyses the optimal compensation scheme and acquisition policy for a given purchase price and probability of finding a potential target. To start with, suppose the manager's incentive compatibility constraint is satisfied. Given that the manager exerts high effort, the first-period cash flow perfectly reveals her ability. Hence, the posterior belief that the manager is competent $p(X_1)$ equals zero following poor performance and one following good performance.

The firing decision after the first period influences firm value in two ways. It determines the ability of the manager in the second period and thus X_2 (ex post effect). In addition, it affects the manager's incentive to exert effort, because she receives private benefits if retained (ex ante effect). It is straightforward to see that the optimal firing

policy is to dismiss the manager unless $X_1 = X_1^H$. An incompetent manager never produces positive profits in the second period ($X_2^a = X_2 = 0$), whereas hiring a new manager generates expected cash flow of pX_2^H.[6] Furthermore, it is also optimal to punish poor performance from an ex ante perspective. Given that poor performance triggers dismissal, the choice of the corresponding budget L_L is immaterial and is subsequently ignored. The only caveat against retaining a successful manager is the risk that she will subsequently incur excessive losses in an acquisition. Indeed, a manager always favours an acquisition because of the additional private benefits ΔZ_2. However, (very) poor acquisitions can be avoided through a tight(er) acquisition budget.

A retained manager finds a target with probability ρ^a. Provided that the acquisition budget exceeds the total cost ($L_H \geq c + P^a$), she purchases the target and gets additional private benefits ΔZ_2. The shareholders' expected second-period payoff from retaining a successful manager with an acquisition budget L_H is

$$\pi_2(L_H) \equiv X_2^H + \rho^a \left[\int_0^{L_H - P^a} (X_2^H - P^a - c) f(c) dc \right],$$

where the integral corresponds to the expected net profit from a takeover.

Having established the outcome for competent and incompetent managers, we can derive the contract offered at the outset of the game. By Assumption 2, shareholders find it optimal to induce high effort. Since it is never beneficial to reward poor performance, wages are set to zero in case of a low first-period cash flow ($w_L = 0$). Given that the acquisition budget following poor performance is immaterial, the shareholders' expected payoff simplifies to

$$p\left[X_1^H - w_H + \pi_2(L_H)\right] + (1-p)pX_2^H.$$

With probability p, the manager turns out to be competent and produces a first-period profit of X_1^H net of her wage plus $\pi_2(L_H)$ in the second period. With probability $(1-p)$, the manager is incompetent and the expected second-period cash flow under the newly hired manager is pX_2^H. The manager's incentive compatibility constraint is

$$p\left[w_H + Z_2 + \rho^a F(L_H - P^a) \triangle Z_2\right] \geq Z_1.$$

If the manager works and turns out to be competent, she receives expected private benefits $Z_2 + \rho^a F(L_H - P^a) \triangle Z_2$ in addition to her (non-negative) wage w_H. Recall that the manager does not know her own type when choosing her effort. Rearranging the incentive constraint, we find

$$w_H \geq \frac{Z_1}{p} - \left[1 + \rho^a F(L_H - P^a) \triangle\right] Z_2.$$

[6] Cornelli et al. (2010) find that boards fire CEOs once they come to view them as incompetent.

Future private benefits serve as an implicit incentive to exert effort. In particular, the takeover market relaxes the incentive constraint by offering additional private benefits with probability $\rho^a F(L_H - P^a)$. The positive effect on incentives arises because first-period success is a prerequisite for an acquisition. Since the objective function is decreasing in w_H, the incentive constraint determines the optimal wage unless the constraint $w_H \geq 0$ is binding. If the implicit incentives as measured by $[1 + \rho^a F(L_H^* - P^a)\triangle]\, Z_2$ are sufficiently large, the optimal wage is zero. In the following, we focus on the case where the incentive constraint is binding (see further discussion below).

Assumption 3 $Z_1 > p(1 + \triangle)Z_2$.

Given that monetary incentives are necessary to ensure effort provision, the following result holds.

Lemma 1 *The optimal performance-based wage is*

$$\widetilde{w}_H = \frac{Z_1}{p} - \left[1 + \rho^a F(\widetilde{L}_H - P^a)\triangle\right] Z_2 \qquad \textit{and} \qquad \widetilde{w}_L = 0,$$

and the optimal acquisition budget for a successful manager is

$$\widetilde{L}_H = X_2^H + \triangle Z_2.$$

The wage is increasing in private benefits from shirking and decreasing in private benefits from running the firm in the second period. The optimal acquisition budget equals the sum of the shareholders' gross return and the manager's private benefits from an acquisition. The above argument and subsequent analysis assume that the manager is risk neutral with a reservation utility equal to zero. Together with the assumption of a positive wage, this allows us to ignore the participation constraint of the manager. A more general setting would allow for risk aversion and an outside option, which may lead to a binding participation constraint. In this case, the optimal compensation scheme would include a fixed payment in addition to the performance-based reward. While we continue to assume that the participation constraint is slack, we henceforth interpret the wage w_H as the performance-based component of the compensation scheme rather than the overall level.

Proposition 1 *The market for corporate control provides managerial incentives even in the absence of disciplinary takeovers.*

The common view of takeovers emphasizes the benefits of contestability. 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 manager is always dismissed by the

board. Still, the market for corporate control benefits shareholders by reducing agency costs through acquisition opportunities. Compensation is decreasing in the acquisition probability $\rho^a F(\widetilde{L}_H - P^a)$ and in the private benefits from running a larger firm $\triangle Z_2$.

The acquisition opportunity effect also arises in more general settings with risk aversion and outside options, since it relaxes both the incentive constraint *and* the participation constraint.[7] Furthermore, the effect is also more broadly applicable. The prospect of undertaking other types of investments, such as green field or research and development, also provides incentives as long as these investments generate private benefits.

Assessing the empirical relevance of the acquisition opportunity effect is challenging. First, just like the well-known takeover threat effect, the acquisition opportunity effect also arises for non-transacting firms. Hence, one needs a proxy for the probability of making an acquisition which is challenging not least because mergers and acquisitions cluster in time and industry, and many targets are privately held. Second, identifying the effect of acquisition opportunities on compensation is difficult, since it usually operates jointly with the takeover threat effect. For instance, changes in takeover regulation affect both acquisition opportunities and the takeover threat. Consequently, observed changes in internal governance mechanisms such as performance pay and board monitoring cannot easily be attributed to one effect or the other. A more nuanced approach is needed, for instance, by studying how firms' internal governance arrangements react when potential target firms adopt anti takeover provisions.[8] An alternative approach is to consider a setting where only changes in acquisition opportunities occur. Such settings are most likely found outside of the takeover market, such as changes in opportunities for foreign direct investment due to deregulation in host countries.

From the shareholders' perspective, the ex post optimal budget equals X_2^H and only allows for profitable acquisitions. However, a more generous budget is in the shareholders' best interest.

Proposition 2 *The optimal acquisition budget also allows for some loss-making acquisitions ($\widetilde{L}_H > X_2^H$).*

The optimal budget policy trades off the cost of a loss-making acquisition with the benefit of lower incentive pay. Since both effects are proportional to the acquisition probability ρ^a, $\widetilde{L}_H$ does not depend on the acquisition probability.

By taking future control benefits into account, the model provides a novel rationale for loss-making acquisitions.[9] In particular, the theory is meant to apply to those acquisitions

[7] This does not hold for the disciplinary effect of takeovers. While a stronger takeover threat provides additional incentives, it may violate the manager's participation constraint by reducing private benefits.

[8] Admittedly, the adoption of anti takeover provisions is likely to affect not only the acquisition opportunities of other firms but also their risk of becoming a target (John and Kadyrzhanova, 2010).

[9] Alternative explanations include empire building (Marris, 1963), managerial overconfidence (Roll, 1986), and envy (Goel and Thakor, 2010).

that result in small losses to acquiring firms. It does not aim to explain deals that entail significant losses, or "wealth destruction on a massive scale" (Moeller et al., 2005). Rather than being a symptom of weak corporate governance, acquisition losses are part of the optimal incentive scheme. Note, however, that the acquisition opportunity effect (Proposition 1) arises even in the absence of loss-making acquisitions. Even if shareholders only allow for ex post profitable acquisitions ($\widetilde{L}_H = X_2^H$), the market for corporate control still reduces agency conflicts through acquisition opportunities.

Once effort has been exerted, shareholders would never voluntarily provide funds in excess of X_2^H for an acquisition. Hence, the optimal acquisition budget must be fixed ex ante. While the board or the shareholders must be able to commit to $\widetilde{L}_H$, the above solution is renegotiation proof in the sense that the manager cannot be bribed into accepting a lower acquisition budget ex post. The joint surplus of the manager and (acquiring) shareholders is maximized by $\widetilde{L}_H$, since a takeover occurs if and only if $X_2^H + \triangle Z_2 \geq P^a - c$. Hence, there is no scope to renegotiate.

The manager is given discretion over the acquisition decision through the budget. Suggestive evidence for the deliberate design of acquisition budgets is presented in Almazan et al. (2010), who study the influence of acquisition opportunities on financial policies. Using firm location as a measure of acquisition prospects, the authors find that firms located in industry clusters maintain more financial slack.

In the above setting, the optimal budget policy can be implemented in many different ways. If the intermediate income is low ($X_1^H < \widetilde{L}_H$), implementation requires additional funds beyond those generated internally. For example, at the hiring stage the firm can obtain a non-revocable credit line, amounting to $\widetilde{L}_H - X_1^H$, in combination with a commitment to leave the intermediate income in the firm. Indeed, chief financial officers consider funding certainty for acquisitions one of the main purposes of credit lines (Lins et al., 2010). Instead of using a credit line, the board 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 budget ($\widetilde{L}_H < X_1^H$), funds must be pumped out of the firm to prevent the manager from incurring excessive acquisition losses. For instance, short-term debt of $X_1^H - \widetilde{L}_H$ can reduce the resources under the manager's control.

Lemma 1 has several further implications. Shareholders' expected acquisition losses are equal to

$$l = p\rho^a \int_{X_2^H - P^a}^{\widetilde{L}_H - P^a} [c - (X_2^H - P^a)] f(c) dc$$

and are increasing in $\widetilde{L}_H$. Hence, the model predicts that firms with more financial slack have higher expected acquisition losses. At the same time, performance-based compensation, $\widetilde{w}_H$, should be lower if a manager has more financial resources under her control.

Hence, performance-based compensation and expected future acquisition losses move in opposite directions: An increase in $\triangle Z_2$ raises l while lowering $\widetilde{w}_H$. Interpreting w_H as a measure of pay-for-performance sensitivity, this result is consistent with Yang et al. (2011), who find that banks whose CEOs have higher pay-for-performance sensitivity are less likely to undertake value-reducing acquisitions.[10] To the extent that more performance-based compensation is also associated with a higher level of compensation, our model is consistent with Falato (2007), who documents a negative relation between the level of compensation and acquisition losses. Further supportive evidence is provided by Datta et al. (2001), who find a positive relation between acquiring managers' equity-based compensation and the stock price reaction to acquisition announcements.

The career concerns literature argues that future private benefits are positively correlated with the manager's career horizon (Gibbons and Murphy, 1992). The larger future private benefits of young managers imply in our model that their salary is lower which is consistent with evidence reported by Gibbons and Murphy (1992). In addition, larger private benefits also translate into larger budgets for young managers, which in turn raises their chances of acquiring another firm. Yim (2010) documents that firms' acquisition propensity decreases with the age of the CEO.[11]

4 Board Interference, Takeovers and CEO Turnover

This section extends the model in two ways to allow for the possibility of both internal governance failure and disciplinary takeovers. First, we let the firm choose the quality of its board. Second, the firm can now be an acquirer or a target in the takeover market, depending on its first-period performance. Hence, a poorly performing manager can be dismissed either by the board or through a disciplinary takeover.

Like Ferreira et al. (2011), we model internal governance as choosing the probability that the board is able to dismiss the manager or not. Let $s \in \{g, b\}$ denote the state or quality of internal governance and $\tau \in [0, 1]$ be the probability that the firm is well governed ($s = g$), in which case the board can replace the manager at the interim date. Internal governance breaks down ($s = b$) with probability $(1 - \tau)$, in which case board dismissal never occurs. The state s is realized and becomes observable at the end of the first period. Before hiring the manager, shareholders choose the probability τ at a cost $K(\tau) = \frac{1}{2}k\tau^2$ with $k > 0$. To ensure an interior solution for the probability that the firm is well governed we impose a lower bound on the interference cost parameter.

Assumption 4 $k \geq pZ_2 + (1 - p)pX_2^H$.

[10] An alternative interpretation of their finding is that CEO pay is linked to long-run performance and thus depends on how well their acquisitions perform.

[11] According to Yim (2010), the documented age effect cannot be explained by the selection of young CEOs by acquisition-prone firms, or by the effect of time-invariant CEO characteristics that may be cross-sectionally correlated with age.

The cost $K(\tau)$ can be interpreted literally as the resources spent on evaluating managerial performance (e.g., by installing a transparent accounting system). Alternatively, $K(\tau)$ can be understood as a measure of the conflict of interest between the board and shareholders. Failure to dismiss a poorly performing manager may be due to board members' lack of independence, excessive workload, or simply the desire to avoid conflicts. A positive interference cost captures in reduced form the notion that board compensation and other incentive schemes cannot fully resolve the conflict of interest.

A firm with a failed manager can now be taken over. Following poor first-period performance, an acquirer shows up with probability ρ^t and offers to purchase the firm for a price P^t. For now we assume that this price is exogenous and greater than the (expected) value of the target under a newly hired manager. Since $P^t \geq pX_2^H$, target shareholders always accept the offer. If the target manager has not already been replaced by the board, she loses her position in the takeover.[12] A firm can also be a target when the board has previously dismissed the manager. To highlight the incentive effects of takeovers, however, we rule out the possibility that a firm with a high first-period cash flow can be acquired. Arguably, mergers among successful firms are likely to be (more) incentive neutral. Indeed, such mergers will not affect incentives in our model if each manager is as likely to become CEO of the combined firm, implying a gain of ΔZ_2, as to be demoted to divisional manager, implying a loss of $-\Delta Z_2$ private benefits.

The outcome of the game remains the same following high first-period cash flow. The manager is retained and makes an acquisition at the exogenous price P^a with probability $\rho^a F(L_H - P^a)$. Following poor first-period performance, the firm is taken over with probability ρ^t at a price P^t. In the absence of a takeover, the manager retains her job if internal governance fails. The previous model is the special case with flawless internal governance ($k = 0$ and $\tau = 1$) and no takeover threat ($\rho^t = 0$).

When a poorly performing manager escapes dismissal, she should be prevented from making an acquisition. Hence, L_L is no longer indeterminate but must be set equal to zero. A performance-contingent budget can be implemented, for instance, through a co-financing arrangement, requiring the manager to contribute internally generated funds to a bid. With no internal resources, a poorly performing manager is thereby prevented from making any acquisition.[13] As will become clear below, if the budget cannot be made contingent on performance, the acquisition opportunity effect will be weakened, necessitating an increase in compensation.

Regarding wages, we do not allow for severance payments. Unless we impose such constraints on the wage contract, our simple model has no role for either internal or external governance mechanisms. That is, neither board interference nor disciplinary takeovers

[12] Increased managerial turnover in target firms after the takeover has been documented by several studies (e.g., Kini et al., 2004; Martin and McConnell, 1991; Morck et al., 1989).

[13] Sufi (2009) suggests that lines of credit are a poor subsitute for (the lack of) internal funds because access to these credit facilities is contingent on maintaining high cash flow.

would be needed to remove an incompetent manager, since she would voluntarily accept the severance payment. Given that it remains optimal to never reward failure ($w_L = 0$), the maximization problem of the extended game is

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

subject to the incentive constraint

$$\begin{aligned} p\left[w_H + Z_2 + \rho^a F(L_H - P^a)\triangle Z_2\right] + (1-p)(1-\tau)(1-\rho^t)Z_2 \\ \geq Z_1 + (1-\tau)(1-\rho^t)Z_2 \end{aligned}$$

and the constraints

$$w_H \geq 0 \qquad \text{and} \qquad \tau \in [0,1].$$

The manager can now receive the private benefit Z_2 despite poor performance when both internal and external governance mechanisms fail (which happens with probability $(1-\tau)(1-\rho^t)$). Rearranging the incentive constraint yields

$$w_H \geq \frac{Z_1}{p} - [\tau + (1-\tau)\rho^t + \rho^a F(L_H - P^a)\triangle]Z_2.$$

The firm has three means at its disposal to incentivize the manager. It can offer a monetary reward for good performance and provide funds for future acquisitions. In addition, it can choose the quality of internal governance which translates into a dismissal threat following poor performance.[14]

Lemma 2 *The optimal performance-based wage is*

$$w_H^* = \frac{Z_1}{p} - \left[\tau^* + \rho^t(1-\tau^*) + \rho^a F(L_H^* - P^a)\triangle\right] Z_2 \qquad \textit{and} \qquad w_L^* = 0, \tag{1}$$

the optimal acquisition budget is

$$L_H^* = X_2^H + \triangle Z_2 \textit{ and } L_L^* = 0, \tag{2}$$

and the optimal board quality is

$$\tau^* = \frac{1}{k}\left\{p(1-\rho^t)Z_2 + (1-p)(1-\rho^t)pX_2^H\right\}. \tag{3}$$

[14] In our framework, board activity corresponds to interference, which prevents entrenchment, thereby relaxing the incentive constraint. In contrast, when board activity amounts to learning about managerial quality, it can aggravate agency conflicts (Crémer 1995).

Since the modifications only pertain to the contingency of poor performance, the optimal acquisition budget for competent managers remains unchanged. In contrast, internal governance failure now becomes a possibility due to the interference cost (Assumption 4). That is, the optimal board quality in equation (3) is strictly lower than one. Performance-based compensation is decreasing with the implicit incentives embedded in the acquisition opportunities and dismissal risk. The overall dismissal risk comprises the probability of being dismissed by the board, τ^*, and the takeover threat in case of internal governance failure, $\rho^t(1-\tau^*)$. Thus, the takeover market plays now a dual role, rewarding performing managers with acquisition opportunities and disciplining the others. Both effects work in the same direction and lower performance-based pay. Unless the takeover market operates as a flawless disciplinary device ($\rho^t = 1$), an incompetent manager no longer loses her job with certainty. Consequently, performance-based compensation must be greater than in Lemma 1.

Better board quality adds value by replacing incompetent managers in the absence of a takeover and by relaxing the incentive constraint. The former benefit is reflected in the second term of equation (3): With probability $(1-p)(1-\rho^t)$, no bidder appears upon poor performance, in which case board interference raises expected second-period cash flow by pX_2^H. The latter benefit is the expected pay reduction $p(1-\rho^t)Z_2$ due to the threat of board dismissal. Since board intervention is costly, flawless internal governance ($\tau = 1$) is not optimal. Optimal board quality increases with the manager's private benefits Z_2, since the dismissal threat becomes a more effective means for lowering managerial pay. Higher future cash flow X_2^H and lower interference cost k also increase board quality.[15] Higher board interference in turn reduces CEO compensation. Fahlenbrach (2009) finds that CEO performance-based pay in the United States is indeed lower in firms with higher board quality. In addition, Hallman et al. (2011) document that pay-for-performance sensitivity in real estate organizations is much higher for managers who face lower dismissal threats.

We now examine how the takeover market and board quality interact and the implications for managerial turnover and performance-based compensation.

Corollary 1 *A more active takeover market discourages board interference.*

The takeover market weakens the incentive to exert board control for two reasons: The takeover threat relaxes the incentive constraint and thus obviates the board's disciplinary role. In addition, the prospect of selling the firm reduces the ex post benefit from internal

[15] A decrease in k may be due to more transparent accounting standards. Alternatively, with a self-interested board, a reduction in k can result from a more effective incentive scheme for the board or new regulation. For instance, if excessive board member leniency results from their reluctance to face a conflict with the CEO, a regulatory requirement that the board meet without the CEO may improve internal control.

control. In the limit as ρ^t goes to one, internal governance becomes superfluous. In support of this result, Gillan et al. (2006) find that firms with strong boards are more likely to have corporate charter provisions that impede takeovers. Kini et al. (1995) also provide evidence of the substitutability between takeovers and internal governance. The authors find that takeovers increase the dismissal risk for poor performance only in firms with weak (insider-dominated) boards.

While board interference and takeovers are substitutes, their joint impact on managerial turnover is multifaceted. Let us define overall turnover risk conditional upon poor first-period performance as

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

where τ^* is given in equation (3) above.

Surprisingly, a greater takeover risk does not necessarily increase managerial turnover due to opposing effects: On the one hand, it makes it more likely that the manager is removed through a takeover when internal governance fails. On the other hand, greater takeover pressure discourages board interference, thereby indirectly lowering the dismissal threat.

When the takeover market is an efficient disciplining device (high ρ^t values), the direct effect of an increase in ρ^t always dominates, and the overall dismissal threat increases. For low ρ^t values, the relative strength of the two effects depends on the optimal board quality. To distinguish between strong and weak boards we define the threshold level $\overline{k} = 2[pZ_2 + (1-p)pX_2^H]$.

Proposition 3 *In firms with strong boards ($k \leq \overline{k}$), managerial turnover following poor performance is first decreasing and then increasing in the intensity of the takeover threat.*

For low interference costs, the optimal board quality is high in the absence of a takeover threat. Since the board operates, in this case, at high marginal interference costs, the introduction of a small takeover risk leads the firm to substantially cut board quality. That is, the indirect effect of an increase in ρ^t dominates and a greater takeover threat makes the manager's position not less but, rather, more secure. Once the takeover probability is sufficiently large, the reverse holds. An increase in ρ^t always implies a higher turnover risk. The negative effect on board quality is of little consequence, since the takeover market is likely to intercede. In the case of high interference costs ($k > \overline{k}$), board quality is low, irrespective of the intensity of the takeover threat. Therefore, an increase in the takeover threat always raises the overall dismissal risk because its adverse effect on board quality is smaller.

This non-monotonic relation is supported by Huang and Zhao (2009) who document that the sensitivity of CEO turnover to performance increases following the adoption of anti takeover legislation in firms with strong boards. Similarly, Huson et al. (2001) find

increased frequencies of forced turnovers in the 1990s relative to the 1980s, despite the decline in takeover activity.

From the optimal wage in equation (1), it is clear that performance-based compensation and overall turnover risk move in opposite directions. Hence, if turnover is non-monotonic in takeover pressure, so is compensation.

Corollary 2 *In firms with strong boards ($k \leq \overline{k}$), the optimal performance-based wage is non-monotonic in the intensity of the takeover threat.*

Agrawal and Knoeber (1998) find that more takeover pressure increases CEO pay. In contrast, Bertrand and Mullainathan (1999) report that anti takeover legislation leads to an increase in CEO pay. Similarly, Borokhovich et al. (1997) find that the adoption of anti takeover charter amendments is associated with higher CEO compensation. Leaving aside the fact that these studies overlook the acquisition opportunity effect, our model suggests a possible explanation for these mixed findings. Depending on the quality of the board, a greater takeover threat can reduce or increase overall turnover risk for managers thereby necessitating higher or lower salaries. Hence, it would be of interest to learn the extent to which the above divergent findings are driven by board quality.

5 Market Outcome and Externality

This section goes beyond the single-firm partial equilibrium analysis and explores how firms' governance choices affect the outcome in the takeover market. We consider a continuum of ex ante identical firms with unit mass and a sufficiently large pool of managers who all play the game of the previous section. That is, firms simultaneously choose the quality of their board and then agree with a manager on performance-based pay and an acquisition budget. Managerial ability is initially unknown, and the probability of hiring a competent manager is p and independent across firms. After the managers' effort choices, first-period cash flows realize, board (non-)interference takes place, and the takeover market opens. Given that managers exert effort in equilibrium, first-period performance fully reveals their type. Firms with a competent manager cannot, by assumption, be targets, whereas incompetent managers are, in equilibrium, precluded from undertaking an acquisition. Therefore, the proportions of potential acquirers and targets in equilibrium are p and $1-p$, respectively.

Depending on whether p is larger or smaller than $1/2$, each target, in the absence of friction, is approached by an acquirer or each acquirer finds a target. We instead assume that the takeover market is plagued by frictions such that both ρ^a and ρ^t are always smaller than one. Besides being plausible, this assumption allows us to work with formal

expressions that are independent of which side of the market is the short one.[16] To this end, we impose the following matching technology. Firms are uniformly distributed along a circle, and each firm is a potential target or acquirer, depending on its first-period performance. Following a high first-period performance, a firm can only bid for the neighbouring firm to its right, if that firm is indeed a target. Provided the budget L_H is sufficient to cover the takeover price and costs, the bid succeeds with probability $\gamma \in [0,1]$, where γ captures the extent to which the institutional and regulatory environments are conducive to takeovers.

The transaction price comprises the outside option of the target $\Psi \in \{0; pX_2^H\}$ and a takeover premium that is equal to a fraction $\lambda \in [0,1]$ of the gross takeover surplus $X_2^H - \Psi$. If the target is poorly governed, the price is $P_b = \lambda X_2^H$, whereas the price increases to $P_g = \lambda(X_2^H - pX_2^H) + pX_2^H$ if the target is well governed. Using the fraction of outside directors as a measure of board quality - as done in most empirical research (Masulis and Mobbs, 2011) - there is evidence that firms with better boards obtain higher premia: Cotter et al. (1997) document that targets with majority-independent boards realize roughly 20% higher returns than targets without majority-independent boards and that these higher returns come at the expense of lower bidder returns. Similarly, Lee et al. (1992) find that shareholders receive higher premia in management buyouts if the firm has a majority-independent board. Going beyond firm-level governance, Rossi and Volpin (2004) report that takeover premia are higher in countries with better shareholder protection. Furthermore, Ellis et al. (2011) find that acquirer gains are higher when targets are from countries with worse governance.

Let ρ_b^t and ρ_g^t denote the probabilities that a firm is taken over following poor performance for prices P_b and P_g, respectively. Let $\widehat{L}_H$ and $\widehat{\tau}$ be the acquisition budget (following success) and interference intensity of the representative firm in the economy, respectively. Then a firm with budget L_H faces the following conditional takeover probabilities:

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

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

For example, the probability of being taken over following a governance failure, ρ_b^t, simply equals the probability that the neighbouring manager to the left turns out to be competent and have sufficient funds, $pF(\widehat{L}_H - P_b)$, times the institutional friction γ. 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.[17] Furthermore, the probability of being taken over is increasing in the

[16] Our qualitative results, notably market externality, do not rely on frictions, provided that each target (acquirer) does not keep being matched with acquirers (targets) until a favourable takeover cost is realized.

[17] Shivdasani (1993) reports that firms with high-quality directors, as proxied by the number of direc-

acquisition budget of the representative firm, $\widehat{L}_H$. Takeover pressure is greater if rival managers are well funded. While the risk of being taken over depends on other firms' behaviour through the budget $\widehat{L}_H$, the chance of taking another firm over, $\rho^a(\widehat{\tau})$, depends on rival firms through $\widehat{\tau}$. The probability that a successful manager can acquire another firm, given in equation (6), is decreasing in $\widehat{\tau}$. 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, raises the potential target's reservation price and thus reduces the probability of a transaction taking place, $(F(L_H - P_g) < F(L_H - P_b))$. All in all, the prominent new feature in the firms' decision problem is the endogeneity of the takeover probabilities.

Lemma 3 *In equilibrium, the ex ante identical firms all choose the performance-based wage*

$$w_H^{**} = \frac{Z_1}{p} - \left[\tau^{**} + \rho_b^t(L_H^{**})(1-\tau^{**}) + \rho^a(\tau^{**})\triangle\right] Z_2 \quad \textit{and} \quad w_L^{**} = 0, \tag{7}$$

the acquisition budget

$$L_H^{**} = X_2^H + \triangle Z_2 \textit{ and } L_L^{**} = 0, \tag{8}$$

and the equilibrium board quality

$$\tau^{**} = \frac{1}{k}\left\{p(1-\rho_b^t(L_H^{**}))Z_2 + (1-p)\left[pX_2^H + \rho_g^t(L_H^{**})(P_g - pX_2^H) - \rho_b^t(L_H^{**})P_b\right]\right\}, \tag{9}$$

where $\rho_b^t(L_H^{**})$, $\rho_g^t(L_H^{**})$, and $\rho^a(\tau^{**})$ are given by equations (5) and (6).

As discussed earlier, the trade-off that determines the optimal budget is independent of the takeover probabilities. Hence, the equilibrium acquisition budget in equation (8) coincides with that in Lemma 2. In particular, a firm's budget is independent of the level of board interference in other firms. As in the single-firm case, the equilibrium budget allows for some loss-making acquisitions.

Loss-making takeovers can also be inefficient, which holds whenever takeover costs c and target outside options Ψ exceed the gross return X_2^H.[18] More precisely, a takeover is loss making and inefficient when $X_2^H - \Psi < c < X_2^H - P + \triangle Z_2$ holds, which is possible for $\triangle Z_2 > P - \Psi$. Conversely, if the latter condition is violated, some efficient takeovers may not occur, that is, $X_2^H - \Psi > c > X_2^H - P + \triangle Z_2$ may hold. In other words, the price P weakly exceeds the outside option Ψ, and therefore profitability (inefficiency) implies efficiency (losses).

The equilibrium budget determines the takeover probabilities in equation (5), which in turn fix the equilibrium intensity of board interference in equation (9). The expected

torships, are less likely to become a target.

[18] Alternatively, one can include in the efficiency criterion managerial private benefits, in which case all takeovers are efficient, though some efficient takeovers may still fail to occur.

returns of a target now depend on the quality of its board: The second summand in the squared brackets on the right-hand side of (9), $\rho_g^t(P_g - pX_2^H)$, is the expected takeover premium for a well-governed target, and the last term, $\rho_b^t P_b$, is the expected premium if internal control breaks down. Note that a firm's choice of τ depends on the budget policies in other firms through ρ_b^t and ρ_g^t.

In equilibrium, the performance-based compensation in equation (7) depends on both the budget policy and board quality in other firms. Both variables affect compensation directly through the takeover probabilities. Moreover, other firms' budget policies have an indirect effect since they also alter the optimal level of board interference.

The comparative statics analysis in Section 4 generalizes to the market setting. An exogenous reduction in the takeover probabilities - now reflected in lower values of the friction parameter γ - increases the equilibrium level of internal governance (τ^{**}). That is, Corollary 1 remains valid. In addition, Proposition 3 continues to hold: In equilibrium, overall turnover risk $\Gamma^{**} = \tau^{**} + \rho_b^t(1 - \tau^{**})$ is non-monotonic in the intensity of the takeover threat, again measured by γ.

Proposition 4 *Better firm governance (τ^{**}) can strengthen or weaken the need to provide managerial incentives.*

An economy-wide increase in board quality due to a reduction in the interference cost k has opposing effects on managerial incentives. As in the single-firm setting, better board quality increases the dismissal threat in each firm, which, in turn, strengthens managerial incentives. At the same time, the economy-wide improvement in governance diminishes the acquisition opportunities for all managers, which necessitates higher performance-based wages. Overall, the effect on managerial incentives is ambiguous.

Consistent with Proposition 4, the empirical evidence on the effect of board quality on CEO compensation is mixed. Several papers use the recent adoption by U.S. stock exchanges of more stringent board independence requirements to study this question. On the one hand, Coles et al. (2008) and Chhaochharia and Grinstein (2009) find that CEO pay decreases in firms that are more strongly affected by this rule change. Similarly, Chung (2008) shows that CEO pay-for-performance sensitivity decreases following the new regulation. On the other hand, Guthrie et al. (2011) find no overall effect of the independence mandate on CEO pay. In fact, the authors document that one particular measure, the requirement of an independent compensation committee, even contributes to an increase in CEO compensation.

Fewer frictions in the takeover market (higher γ) can increase or decrease compensation. On the one hand, an increase in γ raises - for a given board quality and acquisition budget - all takeover probabilities, which lowers wages. On the other hand, a greater takeover threat leads to an economy-wide decline in board interference, which has, as

just discussed, an ambiguous effect on managerial incentives. Consequently, the overall effect of a more active takeover market on wages is ambiguous.

Having derived the market equilibrium, we now turn to the socially optimal outcome. The social planner is assumed to choose wages, acquisition budget and board quality to maximize shareholder wealth. As with the efficiency criterion, the welfare function abstracts from managerial rents. If it included private benefits, the social planner would be biased towards using compensation, since both board interference and takeovers engender a deadweight loss.

The Appendix states the problem of the social planner and presents its solution, which parallels Lemma 3. Here, we directly compare the social optimum and the equilibrium outcome.

Proposition 5 *In equilibrium, acquisition budgets are too small ($L_H^{**} < L_H^o$) and there is excessive board interference ($\tau^o < \tau^{**}$).*

Equilibrium acquisition budgets are too low for two reasons: First, acquiring firms appropriate only part of the takeover gains and therefore provide too little funding. In addition, even if they were to appropriate the entire surplus, the budgets would, from a social perspective, still be too small. Firms do not take into account the fact that (larger) budgets have a positive externality, since they increase the takeover threat for incompetent managers. Indeed, only if all takeover gains accrue exclusively to acquiring firms ($P = \Psi$), and if internal governance is flawless ($\tau = 1$), will the equilibrium budget coincide with the socially optimal one. Under these conditions, acquiring firms base their budget decisions on the entire takeover surplus, and takeovers play no disciplinary role because all incompetent managers are dismissed by their boards.

In equilibrium, firms choose too much board interference due to two effects: First, internal governance must compensate for an inefficiently low takeover threat. Takeover pressure is too low because equilibrium acquisition budgets are too small. Second, board interference is excessive because higher board quality also increases the return when being acquired. This effect is purely redistributive, that is, the division of takeover gains is immaterial from the perspective of the social planner. In fact, raising the takeover price through more board interference has social costs because it diminishes acquisition opportunities for other firms. This effect would not arise if the acquisition price were independent of the quality of the target board ($P_g = P_b$). In this special case, internal governance is not distorted by the endeavour to catch a higher price, and acquisition opportunities are not compromised by (too) well-functioning boards.

Implicit in the above discussion is the result that the takeover price creates inefficiencies irrespective of its level. Unless $P = \Psi$, acquirer returns are smaller than the social takeover returns and the takeover threat is inefficiently low. At the same time, unless

$P_g = P_b$, the private returns from board interference exceed the social benefits. However, these two conditions cannot be satisfied simultaneously because the outside option of target firms, $\Psi \in \{0; pX_2^H\}$ depends on board interference. Hence, firms always devote too many resources to internal governance in equilibrium.

The equilibrium wage may be larger or smaller than the wage associated with the socially optimal board quality and budget. While budgets that are too small increase the wage, excessive board interference can increase or decrease performance-based compensation relative to its socially optimal level (Proposition 4). Consequently, the overall effect is unclear.

Proposition 5 underlines the social value of a liquid takeover market. Weak boards create a more liquid takeover market by increasing the supply of potential target firms. In turn, more generous budgets enhance the supply of acquiring firms. However, the liquidity of the takeover market is a public good and is therefore underprovided in equilibrium. Consequently, the incidence of takeovers is too low from a social perspective.

The above reasoning provides a novel argument against takeover defences. The common criticism holds that anti takeover devices entrench incumbent managers, thereby exacerbating agency conflicts at target firms. In addition, these devices are seen to preclude value-enhancing takeovers. Our analysis suggests an additional cost: By reducing acquisition opportunities, takeover defences force potential acquirers to offer their managers more incentive pay.[19]

Our results contrast with those of other recent papers that study peer group or spillover effects in corporate governance. Acharya and Volpin (2010) uncover an externality in firm governance choices that operates through the managerial labour market rather than the takeover market. 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 to prevent her from accepting a more generous compensation package in a weakly governed firm. 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 our framework, managerial compensation should increase if an exogenous shock improves the effectiveness of boards in other firms. A positive shock diminishes acquisition opportunities and thus reduces the manager's incentive to exert effort. Conversely, Acharya and Volpin (2010) argue that managerial compensation decreases if other firms are better governed. Better governed rivals offer lower wages, which reduces the manager's outside option. Hence, compensation can be reduced. Moreover, while overprovision of governance is found in equilibrium, their model finds underprovision.

[19] For the same reason, the presence of leveraged buyout funds can be detrimental for public firms: They deprive managers of acquisition opportunities, though they also exert disciplinary pressure on managers of poorly performing firms.

6 Conclusion

Previous research on the incentive implications of takeovers has focussed on the threat of being taken over and its effect on managerial behaviour. 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 do not play any disciplinary role or generate any synergies. At the same time, takeover pressure stifles a 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 can secure management's position in the firm. Finally, a liquid takeover market with a sufficient supply of potential targets and acquirers constitutes a public good that provides implicit incentives to all managers in the economy. In equilibrium, externality in governance choices across firms arises. Board interference, which reduces the scope for acquisitions, is excessive and acquisition budgets are too small. As a consequence, takeover activity is inefficiently low.

7 Appendix

7.1 Proof of Lemma 1

Assumption 3 implies that the incentive compatibility constraint is binding which in turn determines $\tilde{w}_H$. Substituting $\tilde{w}_H$ in the objective function yields the following simplified program

$$\max_{L_H} p\left[X_1^H - (Z_1/p - [1+\rho^a F(L_H - P^a)\triangle]Z_2) + \pi_2(L_H)\right] + (1-p)pX_2^H$$

with the first order condition

$$p\rho^a f\triangle Z_2 + p\rho^a(X_2^H - L_H)f = 0 \qquad \Leftrightarrow \qquad \widetilde{L}_H = X_2^H + \triangle Z_2. \qquad \blacksquare$$

7.2 Proof of Lemma 2

As in Lemma 1, the incentive compatibility constraint determines the wage w_H^*. Substituting w_H^* in the objective function yields the following program

$$\begin{aligned}\max_{L_H,\tau} p\left[X_1^H - \left(Z_1/p - [\tau + (1-\tau)\rho^t + \rho^a F(L_H - P^a)\triangle]Z_2\right) + \pi_2(L_H)\right] \\ +(1-p)\left[\rho^t P^t + (1-\rho^t)\tau p X_2^H\right] - \frac{1}{2}k\tau^2\end{aligned}$$

The first order conditions with respect to L_H and τ give equations (2) and (3). $\blacksquare$

7.3 Proof of Proposition 3

Differentiating the overall turnover risk Γ^* with respect to ρ^t yields

$$\frac{\partial\Gamma^*}{\partial\rho^t} = 1 - \tau^* + (1-\rho^t)\frac{\partial\tau^*}{\partial\rho^t} = 1 - (1-\rho^t)\frac{2}{k}\left[pZ_2 + (1-p)pX_2^H\right]$$

Hence, for $k > \overline{k} = 2[pZ_2 + (1-p)pX_2^H]$, $\partial\Gamma^*/\partial\rho^t > 0$ for all ρ^t. For $k \leq \overline{k}$, $\partial\Gamma^*/\partial\rho^t \geq 0$, provided that $\rho^t \geq \overline{\rho}^t(k) = 1 - k/2[pZ_2 + (1-p)pX_2^H]$, and $\partial\Gamma^*/\partial\rho^t < 0$ otherwise ($\rho^t < \overline{\rho}^t$). $\blacksquare$

7.4 Proof of Corollary 2

$$\frac{\partial w^*}{\partial\rho^t} = -\left[\frac{\partial\tau^*}{\partial\rho^t} + (1-\tau^*) - \rho^t\frac{\partial\tau^*}{\partial\rho^t}\right]Z_2 = -\left[\frac{\partial\Gamma^*}{\partial\rho^t}\right]Z_2$$

From Proposition 3 it follows that performance-based compensation in firms with strong boards ($k \leq \overline{k}$) is non-monotonic in ρ^t. That is, $\partial w_H^*/\partial\rho^t \leq 0$ for $\rho^t \geq \overline{\rho}^t(k)$, whereas $\partial w_H^*/\partial\rho^t > 0$ for $\rho^t < \overline{\rho}^t(k)$. $\blacksquare$

7.5 Proof of Lemma 3

Taking budget $\widehat{L}_H$ and interference intensity $\widehat{\tau}$ of other firms as given, each firm solves

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

subject to

$$w_H \geq \frac{Z_1}{p} - \left[\tau + (1-\tau)\rho_b^t + \Delta\rho^a(\widehat{\tau})\right]Z_2$$

and $w_H \geq 0$ and $\tau \in [0,1]$.

As in Lemmata 1 and 2, the binding incentive compatibility constraint determines w_H^{**} in equation (7). The first order condition with respect to τ gives equation (9). The first order condition with respect to L_H is

$$p\left[-\frac{\partial w_H^{**}}{\partial L_H} + (1-p)(X_2^H - L_H)f\right] = 0$$

$$\Leftrightarrow \quad \frac{\partial\rho^a(\widehat{\tau})}{\partial L_H}\Delta Z_2 + (1-p)(X_2^H - L_H)f = 0$$

$$\Leftrightarrow \quad L_H^{**} = X_2^H + \Delta Z_2 \qquad \blacksquare$$

7.6 Takeover Frictions and Board Quality ($\partial\tau^{**}/\partial\gamma$)

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

Inserting the expressions for ρ_b^t, ρ_g^t, P_b, and P_g and rearranging yields

$$\frac{\partial\tau^{**}}{\partial\gamma} = -\frac{p}{k}\left[pF(\hat{L}_H - P_b)Z_2 + (1-p)\lambda X_2^H\left(F(\hat{L}_H - P_b) - (1-p)F(\hat{L}_H - P_g)\right)\right]$$

which is negative since $F(\hat{L}_H - P_b) - F(\hat{L}_H - P_g) = (1-\lambda)pX_2^H/\bar{c} > 0$. $\blacksquare$

7.7 Takeover Frictions and Managerial Turnover ($\partial\Gamma^{**}/\partial\gamma$)

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

with

$$\frac{\partial \tau^{**}}{\partial \gamma} = -\frac{1}{k}\left\{p\frac{\partial \rho_b^t}{\partial \gamma}Z_2 + (1-p)\left[\frac{\partial \rho_b^t}{\partial \gamma}P_b - \frac{\partial \rho_g^t}{\partial \gamma}(P_g - pX_2^H)\right]\right\} < 0.$$

and

$$\frac{\partial \rho_b^t}{\partial \gamma} = pF(\hat{L}_H - P_b)$$

If the interference cost is very large ($k \to \infty$), $\partial\tau^{**}/\partial\gamma$ and τ^{**} go to zero. Hence, $\partial\Gamma^{**}/\partial\gamma$ is positive. Conversely, if the interference cost approaches its minimum, $pZ_2+(1-p)pX_2^H$ given by Assumption 4 in Section 4, $\partial\Gamma^{**}/\partial\gamma$ approaches $\partial\tau^{**}/\partial\gamma < 0$, as γ goes to zero. ■

7.8 Proof of Proposition 4

Consider an increase in the economy-wide board quality due to a reduction in the interference cost k:

$$\frac{\partial w_H^{**}}{\partial \tau^{**}} = -\left[1 - \rho_b^t + \frac{\partial \rho^a}{\partial \tau^{**}}\triangle\right]Z_2 = -(1-\rho_b^t)Z_2 + \gamma(1-p)\left[F(L_H^{**} - P_b) - F(L_H^{**} - P_g)\right]\triangle Z_2$$

Hence, if $\triangle$ is sufficiently large (small), the above derivative is positive (negative). ■

7.9 Social Planner Choice

Lemma A1 *The socially optimal performance-based wage is*

$$w_H^o = \frac{Z_1}{p} - \left[\tau^o + \rho_b^t(L^o)(1-\tau^o) + \rho^a(\tau^o)\triangle\right]Z_2 \quad \text{and} \quad w_L^o = 0. \tag{10}$$

The socially optimal acquisition budget and the socially optimal board quality are uniquely defined by the following linear system of first order conditions:

$$L_H^o = X_2^H + \Delta Z_2 + (1-\tau^o)Z_2\frac{p}{1-p} + [\tau^o(P_g - pX_2^H) + (1-\tau^o)P_b] \quad \text{and} \quad L_L^o = 0 \tag{11}$$

$$\tau^o = \frac{1}{k}\left\{p(1-\rho_b^t(L^o))Z_2 + (1-p)\left[pX_2^H + \rho_g^t(L^o)(P_g - pX_2^H) - \rho_b^t(L^o)P_b\right]\right\} - \frac{1}{k}\left\{p(1-p)\gamma\frac{1}{\overline{c}}[P_g - P_b](\Delta Z_2 + X_2^H - \frac{1}{2}P_g - \frac{1}{2}P_b)\right\} \tag{12}$$

The takeover probabilities $\rho_b^t(L^o)$, $\rho_b^t(L^o)$ and $\rho^a(\tau^o)$ are given by equations (5) and (6).

Proof of Lemma A1

The social planner solves the following program:

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

subject to

$$w(X_1^H) \geq \frac{Z_1}{p} - \left[\widehat{\tau} + (1-\widehat{\tau})\rho_b^t + \Delta\rho^a(\widehat{\tau})\right] Z_2$$

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

As in Lemmata 1, 2, and 3, the incentive compatibility constraint determines the wage w_H^o. The first order condition with respect to $\widehat{L}_H$ is

$$p\left[(1-\tau)\gamma pf + (1-p)\gamma f)\Delta\right] Z_2 + p(1-p)\gamma\tau(X_2^H - P_g - (\hat{L}_H - P_g))f$$

$$+p(1-p)\gamma(1-\tau)(X_2^H - P_b - (\hat{L}_H - P_b))f + (1-p)\tau\gamma p(P_g - pX_2^H)f$$

$$+(1-p)(1-\tau)\gamma pP_b f = 0$$

which, rearranged, yields equation (11). The first order condition with respect to $\widehat{\tau}$ is

$$k\tau^o = p(1-\rho_b^t(L^o))Z_2 + (1-p)[pX_2^H + \rho_g^t(L^o)(P_g - pX_2^H) - \rho_b^t(L^o)P_b] - p\Delta Z_2\gamma(1-p)[P_g - P_b]\frac{1}{c}$$

$$+p(1-p)\gamma[\int_0^{\widehat{L}_H - P_g}(X_2^H - P_g - c)f(c)dc)] - p(1-p)\gamma[\int_0^{\widehat{L}_H - P_b}(X_2^H - P_b - c)f(c)dc)]$$

which, rearranged, yields equation (12). It can easily be verified that the optimization program is concave, that is, the Hessian matrix is negative semi-definite. ■

7.10 Proof of Proposition 5

The difference between the equilibrium acquisition budget in equation (8) and the socially optimal acquisition budget in equation (11) is

$$L_H^{**} - L_H^o = -(1-\tau^o)Z_2\frac{p}{1-p} - [\tau^o(P_g - pX_2^H) + (1-\tau^o)P_b]$$

which is negative. The difference between the equilibrium board quality in equation (9) and the socially optimal board quality in equation (12) is

$$\begin{aligned}\tau^{**} - \tau^{o} = \frac{1}{k}\{&p[\rho_b^t(L^o) - \rho_b^t(L^{**})]pZ_2 \\ &+ (1-p)[(\rho_g^t(L^{**}) - \rho_g^t(L^o))(P_g - pX_2^H) - (\rho_b^t(L^{**}) - \rho_b^t(L^o))P_b]\} \\ &+ \frac{1}{k}\{p(1-p)\gamma\frac{1}{\bar{c}}[P_g - P_b](\Delta Z_2 + X_2^H - \frac{1}{2}P_g - \frac{1}{2}P_b)\}.\end{aligned}$$

Since $L_H^o > L_H^{**}$, the takeover probabilities are higher in the socially optimal solution. Consequently, the first term is positive. The second term is positive because

$$(1-p)(\rho_b^t(L^o) - \rho_b^t(L^{**}))P_b > (1-p)(\rho_g^t(L^o) - \rho_g^t(L^{**}))(P_g - pX_2^H)$$

$$\Leftrightarrow \qquad \frac{L^o - L^{**}}{\bar{c}} > (1-p)\frac{L^o - L^{**}}{\bar{c}}$$

The third term is positive because $X_2^H > P_g > P_b$. ■

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